7º Simpósio da Fundação Bial

A Fundação Bial é uma instituição sem fins lucrativos, considerada de utilidade pública pelo Governo português, que tem como missão incentivar o conhecimento científico do Homem, tanto do ponto de vista físico como espiritual.

Constituída em 1994 pelos Laboratórios Bial e pelo Conselho de Reitores das Universidades Portuguesas, tem os altos patrocínios do Senhor Presidente da República e da Ordem dos Médicos.

A actividade da Fundação Bial desenvolve-se através da atribuição do Prémio Bial, um dos maiores galardões na área da saúde em toda a Europa, e do lançamento de Bolsas de Investigação Científica na área das Neurociências.

Bianualmente, a Fundação Bial organiza os simpósios Aquém e Além do Cérebro, um espaço de diálogo aberto que reúne alguns dos mais prestigiados especialistas mundiais nas áreas da Psicofisiologia e da Parapsicologia e os seus bolseiros.

Nestes encontros, através da exposição de posters e das sessões de comunicações orais de um conjunto de projectos, a Fundação Bial apresenta à comunidade científica os resultados das investigações dos seus bolseiros.

O livro de actas que agora se publica é uma compilação dos textos das palestras apresentadas durante o 7º Simpósio da Fundação Bial dedicado ao tema "Emoções".

7º Simpósio da Fundação Bial

AQUÉM E ALÉM DO CÉREBRO
BEHIND AND BEYOND THE BRAIN

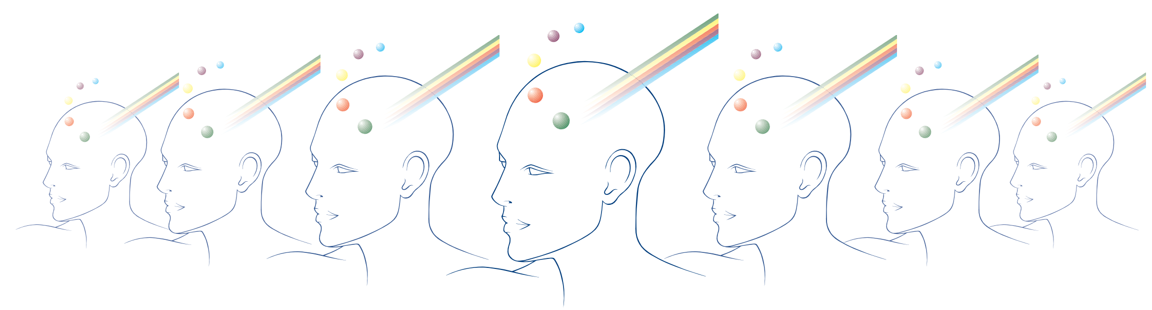
Bial

37

7º Simpósio da Fundação Bial

Aquém e Além do Cérebro
Behind and Beyond the Brain

Casa do Médico - Porto • 26 a 29 de Março de 2008



FUNDAÇÃO
Bial
Instituição de utilidade pública
Institution of public utility

Emoções
Emotions

O livro "Aquém e Além do Cérebro" contém as actas do 7º Simpósio da Fundação Bial, realizado na Casa do Médico, de 26 de Março a 29 de Março de 2008, tendo como membros da Comissão Organizadora os Senhores Professores Fernando Lopes da Silva, Alexandre Castro-Caldas, Caroline Watt, Dick Bierman, Mário Simões e Rui Mota Cardoso.
Os textos estão disponíveis em www.bial.com.

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SESSÃO DE ABERTURA
OPENING SESSION

DISCURSO DO PRESIDENTE DA FUNDAÇÃO BIAL

Luís Portela

Senhor representante do Conselho de Reitores das Universidades Portuguesas e Magnífico Reitor da Universidade do Porto, Professor José Carlos Marques dos Santos, Senhora Governadora Civil do Porto, Dra. Isabel Oneto, Senhor Presidente da Comissão de Coordenação e Desenvolvimento Regional do Norte, Dr. Carlos Lage, Senhor Vice-Presidente da Câmara Municipal do Porto, Dr. Álvaro Castello-Branco, Senhor Presidente do Conselho Regional do Norte da Ordem dos Médicos, Dr. José Pedro Moreira da Silva, Senhor Presidente da Comissão Organizadora deste Simpósio, Professor Fernando Lopes da Silva, demais autoridades presentes, minhas Senhoras e meus Senhores.

Antes de mais, quero agradecer a presença de todos nesta sala e expressar os meus votos de que aqui passemos em conjunto alguns dias agradáveis, com conferências de alto nível, esclarecedoras trocas de impressões, frutuosos contactos e um bom ambiente entre todos.

Quando a Comissão Organizadora deste VII Simpósio "Aquém e Além do Cérebro" delineou o programa, estava prevista nesta sessão de abertura uma homenagem ao Senhor Professor Nuno Grande, que, por força dos nossos estatutos, deixará de ser administrador da Fundação Bial no final do actual mandato, o que ocorrerá no próximo ano. Mas, tendo sido decidido convidar o Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Professor José Mariano Gago, para presidir a essa sessão, e verificando-se que o Senhor Ministro não podia estar hoje aqui connosco, entendemos transferir a referida homenagem para a sessão de encerramento deste simpósio, no próximo sábado, pelas 16:30. Contamos que todos possam aqui estar, manifestando ao nosso homenageado o carinho que ele merece. Deixarei para essa altura algumas palavras dirigidas àquele que é para muitos de nós um mestre da Academia e para muitos também - entre os quais eu me incluo - um mestre de Vida.

Por hoje, desejo saudar a Comissão Organizadora deste simpósio, agradecendo a colaboração de todos: Professores Alexandre Castro-Caldas, Caroline Watt, Dick Bierman, Mário Simões, Rui Mota Cardoso e, muito especialmente, o Presidente da Comissão - Professor Fernando Lopes da Silva. Bem hajam pela forma dedicada e competente como organizaram mais esta edição do já tradicional simpósio da Fundação Bial.

O tema deste ano - Emoções - parece-me muito interessante e actual. Num mundo onde tantas vezes se privilegia o material, o intelectual e o racional ou, pelo menos, o aparentemente racional, é bom que se estude, se aprofunde e se discuta a vida das emoções. O Professor Fernando Lopes da Silva vai naturalmente falar sobre o tema na sua intervenção.

Pela minha parte, gostaria apenas de sublinhar a riqueza que, mais uma vez, deverá resultar do facto de reunirmos neste simpósio investigadores com perspectivas diferentes. Não sei se fomos pioneiros, mas, na verdade, não é habitual reunirem-se num mesmo fórum investigadores de áreas mais tradicionais, como a Psicofisiologia e a Neurofisiologia, com investigadores de áreas mais atrevidas, como de certa forma é a Parapsicologia.

Ora, quando em 1994 criámos o nosso primeiro pacote de Bolsas de Investigação Científica, beneficiando as duas áreas citadas, tínhamos por objectivo, não só contribuir para o esclarecimento científico em cada uma delas, mas também incentivar uma progressiva aproximação entre as duas, proporcionadora de um enriquecimento cruzado e de um superior esclarecimento global. Congratulamo-nos hoje com a forma respeitosa como cada um tem defendido os seus pontos de vista e escutado e apreciado os pontos de vista dos outros. Por vezes percebe-se claramente que as perspectivas são diferentes, ou até bastante diferentes, mas sempre houve educação e respeito na discussão, o que certamente acontecerá uma vez mais neste simpósio.

Aqui estarão muitos dos nossos bolseiros - que já se contam em 842, de 22 países diferentes, sendo cerca de 50% da área da Psicofisiologia e outros tantos da área da Parapsicologia. De facto, desde 1994 até hoje, apoiámos 261 projectos, envolvendo 842 investigadores de 22 países, sendo a maioria hoje do Reino Unido e dos Estados Unidos da América, países de onde nos têm chegado em grande quantidade projectos que têm sido melhor avaliados pelos membros do nosso Conselho Científico.

E esses nossos bolseiros aqui estão para apresentarem os resultados do seu trabalho. Temos 42 posters, com resultados definitivos, em exibição na galeria ao lado deste salão e teremos 20 apresentações orais, que foram seleccionadas pela Comissão Organizadora para serem apresentadas nas tardes dos dias 27 e 28. A generalidade dos resultados, provisórios ou definitivos, poderá ainda ser consultada na nossa página da Internet, através de um dos computadores disponíveis para esse efeito também na galeria aqui ao lado. Os nossos bolseiros estarão disponíveis para discutir com os restantes participantes os resultados dos seus trabalhos, especialmente nessas duas tardes, após as apresentações orais.

Mas também aqui estarão alguns deles para vos apresentarem as suas conferências e, sobretudo, para discutirem com os restantes conferencistas convidados. Tendo, mais uma vez, conseguido reunir aqui um excelente conjunto de palestrantes, faço votos de que tenhamos excelentes prelecções e excelentes intervenções também por parte da plateia.

Entretanto, é meu privilégio anunciar-lhes que a Fundação Bial decidiu lançar um novo pacote de bolsas de investigação científica, de características semelhantes aos anteriores, cujo concurso abrirá no próximo mês de Abril e encerrará em 31 de Agosto p.f. As áreas beneficiadas continuarão a ser a Psicofisiologia e a Parapsicologia. Apoiamos a investigação do ser humano saudável. Não apoiamos a investigação em patologia e muito menos em terapêutica. Esta é uma instituição sem fins lucrativos, considerada pelo Governo Português de utilidade pública. A nossa postura é mecenática, não solicitando, nem aceitando qualquer contrapartida por parte dos nossos bolseiros. Mas, para que as coisas sejam claras, nem sequer apoiamos áreas de patologia ou de terapêutica.

Apenas queremos incentivar o esclarecimento do ser humano, na perspectiva física e na perspectiva espiritual, na convicção de que continuam a existir muitos milhões de neurónios que não se sabe exactamente para que servem, bem como muitos fenómenos relativamente estranhos que continuam sem explicação científica, e muitas vezes, sem sequer percebermos se são reais ou apenas abstracções ou até fraudes. Cabe aos cientistas estudarem, investigarem, aprofundarem o seu conhecimento até se esclarecerem e, assim, esclarecerem a humanidade.

As nossas bolsas terão valores mínimo de €5.000 e máximo de €50.000 e não poderão beneficiar bolseiros com projectos pendentes. Aguardamos muitas candidaturas de qualidade nos próximos meses.

Para terminar, desejo agradecer a todos os prelectores convidados para este simpósio, terem aceite estarem connosco e brindarem-nos com o perfume do seu saber. Ao Conselho de Reitores das Universidades Portuguesas, à Ordem dos Médicos e a todas as instituições que aqui hoje estão representadas, também a expressão da nossa gratidão por todo o apoio prestado à Fundação Bial.

Fui percebendo ao longo da vida que cabe a cada um de nós fazer a sua parte de um complexo puzzle que é a vida; em seu proveito, em proveito dos outros e em proveito do Todo. Penso que a mais não somos obrigados. Acreditem que, na Fundação Bial, estamos convictos de que procuramos fazer a nossa parte. Temos consciência de que é apenas um pouco, do muito que precisa de ser feito. Mas acreditamos que, apoiando um número significativo dos presentes que queira fazer a sua parte, juntos, conseguiremos ir um pouco mais além. Talvez até mais além.

Bem hajam!

Muito obrigado pela vossa atenção.

DISCURSO DO PRESIDENTE DA COMISSÃO ORGANIZADORA

Fernando Lopes da Silva

Muito boa noite a todos os membros da mesa, em particular às autoridades aqui presentes, bem como a todas as restantes pessoas que aqui hoje quiseram estar.

E como a hora já vai adiantada vou ser bastante breve mas queria focar 5 pontos. Primeiro focar a Fundação Bial. É uma organização única em Portugal, e mesmo a nível mundial, na medida em que tem como missão, como ouvimos já há pouco, perceber melhor como é que o nosso cérebro funciona em todos os seus aspectos e, ao mesmo tempo, tornar esse trabalho de investigação acessível às camadas mais jovens através do sistema de bolsas de incentivo de variados projectos de investigação, que é notável e que é raro em Portugal. E por isso também acho que devo dizer bem-haja à Fundação Bial.

Em segundo lugar o cérebro. A Fundação Bial procura incentivar a investigação de todos os aspectos do cérebro. O problema do cérebro é muito complexo e o principal problema é que para percebermos o cérebro só temos à disposição o nosso cérebro, o que torna as coisas um pouco complicadas. Porque para perceber o coração também temos o nosso cérebro, mas o coração é muito simples: é um órgão que é uma bomba. O cérebro é muito mais do que isso. Estamos ainda nesta fase dos nossos conhecimentos a procurar perceber por onde é que podemos entrar para melhorar a nossa compreensão dos mecanismos do cérebro.

As novas técnicas que têm sido desenvolvidas, particularmente nos últimos dez anos, dão-nos grandes possibilidades que eram há uma ou duas décadas impossíveis de pensar. E nesse aspecto a Fundação Bial procura todos os aspectos que sejam susceptíveis de trazer um melhor conhecimento das funções do cérebro, acessível aos investigadores neste momento, não só portugueses como também de fora de Portugal, como há pouco ouvimos falar.

Em terceiro lugar queria referir-me à escolha do programa, porque compete à Comissão Organizadora escolher um programa. A Comissão Organizadora neste aspecto teve em consideração o facto de que este é o 7º Simpósio e que, particularmente nos últimos simpósios, se trataram de problemas específicos de funções cerebrais. Assim foram tratadas as chamadas experiências especiais - vivências excepcionais -, foi tratado o tema da consciência, o tema da memória e agora o tema das emoções.

Ora, na nossa perspectiva, isto não significa que estamos a tratar cada vez de aspectos diferentes - estamos simplesmente a tratar de temas que estão todos relacionados uns com os outros - porque se há alguma coisa que nós aprendemos sobre as funções do cérebro é que não é possível separar as funções porque elas estão integradas num conjunto e que, de qualquer forma, apenas num simpósio como este podemos focar certos aspectos dentro de um conjunto.

Em quarto lugar quero dizer algo a respeito do programa mais especificamente. Num programa constituído por uma série de sessões que são simpósios nas manhãs de todos os dias e oportunidade dos bolseiros apresentarem os seus trabalhos à tarde, o esquema é, digamos, bastante evidente. Mas há uma parte do programa para a qual eu gostaria de chamar a vossa atenção porque podia passar despercebido: é o facto de no segundo dia do simpósio haver a possibilidade de um encontro directo entre os investigadores, os palestrantes e o público, aquilo a que nós chamamos o *Evening Encounter*, que reúne questões acerca e à volta de todos os temas das emoções que podem ser discutidos directamente entre o público e os investigadores. Foi uma ideia do Professor Mário Simões, que já teve lugar no último simpósio sobre a memória e vai ser realizado outra vez, dado ter tido muito êxito. Gostaria de chamar à atenção para as pessoas poderem participar activamente neste encontro.

E por último só queria dizer uma palavra muito breve para agradecer uma vez mais à Fundação Bial a oportunidade de juntar cientistas de vários países e de várias direcções num mesmo esforço de procurar perceber o nosso cérebro e todas as suas facetas.

Muito obrigado.

DISCURSO DO PRESIDENTE DA COMISSÃO DE COORDENAÇÃO E DESENVOLVIMENTO REGIONAL DO NORTE

Carlos Lage

Muito boa noite Senhor Reitor da Universidade do Porto, Senhora Governadora Civil, Senhor Professor Fernando Lopes da Silva, Senhor Presidente da Fundação Bial - caro Dr. Luís Portela.

É para mim deveras gratificante ter sido convidado por si, Dr. Luís Portela, para participar na sessão de abertura do 7º Simpósio "Aquém e Além do Cérebro", promovido pela Fundação Bial que, desde 1996, consegue reunir na cidade do Porto cientistas nacionais e outros de renome mundial na área das neurociências. Da elevada qualidade científica e intelectual destes simpósios dizem bem os livros que a Fundação tem publicado ao longo dos anos, alguns dos quais já tive a oportunidade de ler.

Ao Dr. Luís Portela, à sua inteligência, cultura, afabilidade, à sua capacidade de liderança, se deve a construção de uma empresa - a Bial -, que se afirma e internacionaliza numa área com uma progressão farmacêutica altamente exigente e selectiva onde poucos logram sucesso. Mas deve-se ao Dr. Luís Portela ainda mais do que isso: deve-se-lhe um exercício de cidadania e um espírito de solidariedade verdadeiramente exemplares. O Dr. Luís Portela não é apenas uma pessoa que se admira, mas sim alguém de quem se gosta.

Devo confessar que experimentei alguma perplexidade sobre as palavras e o estilo discursivo que poderia adoptar numa sessão de abertura como esta. Lembrei-me e lembro-me sempre daquele célebre aforismo, do episódio do pintor Apeles que estava a pintar na Grécia Antiga e passa um sapateiro que critica a sua arte de pintura. O Apeles respondeu-lhe: — "Sapateiro não subas acima do chinelo". Ao falar numa sessão destas tão marcadamente científica senti um pouco essa velha perplexidade.

Mas devo confessar que estes temas abordados à volta do cérebro não estão fora da minha esfera de interesses e de interrogações. Na verdade, sempre procurei acompanhar a cultura científica do nosso tempo, desde a cosmologia à genética, passando pela física das partículas, procurando aqui respostas às questões que a tradição filosófica ocidental levanta e para as quais as teologias já não têm explicações. Sempre achei que a dicotomia entre a cultura científica e a cultura literária era, e é, empobrecedora. Desde o tempo, já bem recuado, em que um escritor, não sei se alguém se recorda, intitulou o seu livro tão lido "As duas culturas" traduzido, aliás, para português. Para mim não há duas culturas separadas; quem olha e evidencia são justamente os sábios contemporâneos que na sua maior parte revelam uma cultura filosófica artística e literária por vezes surpreendente.

A sociedade portuguesa tem um grande défice de cultura científica. As instituições educativas, apesar da massificação e da democratização do ensino, têm falhado no despertar do gosto e do culto das ciências exactas, perdoe-se-me a expressão, e o ensino da matemática tem contribuído para afastar muitos jovens dos jardins da ciência e dos seus belos frutos. O país sofre cruelmente com a falta de ciência e investigação e da sua debilidade nos contributos para o avanço do conhecimento. É isso que tem de mudar rapidamente nos próximos anos, se queremos ter uma economia dinâmica e competitiva, e se queremos ser uma sociedade inovadora e criativa. Afinal, se a Bial consagra à volta de 20%, creio eu, do seu volume de negócios em investigação, porque é que o país só logrou chegar a uns magros 1% do seu PIB dedicados a esse mesmo fim em 2008? E porque será que quando ambicionamos que a região Norte venha a atingir em 2015 1,8% do seu PIB regional afecto à ciência isso seja considerado como algo de quimérico ou de um sonho deslocado? Não se trata, claro está, de clamar que os portugueses não são amigos da ciência, longe disso, mas lá que é verdade que todos reclamam apoios e ajudas para tudo e mais alguma coisa, poucos são os que reclamam os direitos da ciência.

A antiquíssima máxima "reconhece-te a ti próprio", inscrita no templo de Delphos na Grécia Antiga da qual o filósofo Sócrates fez um princípio de sabedoria, não se pode hoje divorciar do conhecimento do nosso século, é evidente. Já não nos podemos restringir à introspecção para nos conhecermos a nós próprios, embora o sentido original da referida máxima seja mais branco e subtil do que o deixa transparecer, perdoe-se-me a simplificação.

Todavia somos nós, humanos, algo mais do que o nosso cérebro? Esta pergunta hoje tem toda a pertinência. Sem dúvida que sim, respondo, embora dogmaticamente, não sei bem porque é que respondo assim. Mas nada somos sem este órgão do pensamento, da linguagem, dos afectos e das emoções, que vai ser o objecto deste 7º simpósio. Diria mesmo que o "eu" individual, o nosso "eu", é um conjunto que resulta da combinação dos factores biológicos e da nossa história pessoal. A minha memória, a minha afectividade, os meus pensamentos, as minhas relações com os outros testemunham esta dupla pertença. É isso que faz, em definitivo, que me reconheça como eu próprio e que os outros me reconheçam como uma pessoa diferente deles, diferente, igual, diferente.

Pode-se representar a consciência como um absoluto: alma, espírito, cogito. A filosofia tradicional e a psicologia introspectiva aceitam este ponto de vista e mesmo, mais recentemente, até a própria filosofia sartriana quando afirmava que estamos condenados à liberdade e punha a consciência como algo de vazio no centro da sua especulação. A esta irredutibilidade da consciência não é preciso replicar como fez Watson e os seus seguidores, que chegaram ao ponto de negar a consciência dizendo que não se pode mostrá-la numa proveta.

Prefiro recorrer, para terminar, a Jean-Pierre Changeux, autor muito conhecido pelo seu livro magnífico, aliás traduzido em português, chamado "O Homem Neuronal", o qual, num texto posterior mais recente, não este, já de 2000/2002, escreveu, e estou a citar: "O nosso cérebro, o órgão do conhecimento, é uma máquina química, um sistema material em constante evolução, simultaneamente fechado sobre si próprio e aberto ao mundo físico, social e cultural, cuja complexidade, adaptabilidade e criatividade não têm paralelo". "A minha conclusão" - continua Jean-Pierre Changeux - "é de que não é necessário fazer apelo a quaisquer influências misteriosas e imateriais para compreender a origem das produções mais nobres da nossa espécie qualificadas a maior parte das vezes como espirituais. Ignoramos ainda muitas coisas mas recuso dizer nós ignoraremos. É certo que o nosso saber sobre o cérebro é ainda extremamente limitado" - como disse o Professor Fernando Lopes da Silva -"embora os últimos dez anos nos tenham trazido muita luz sobre o cérebro e continuará, sem dúvida," - conclui o autor - “por muito tempo”.

O cérebro é ainda um continente desconhecido para explorar e não é um continente qualquer, é o suporte do nosso “eu”, da consciência de nós mesmos, da nossa linguagem, do nosso pensamento, das nossas emoções. Eu diria epicuristicamente que, no cálculo do prazer e da dor, afinal faz parte também esse órgão - o cérebro.

Foi um prazer estar aqui convosco. Muito obrigado.

DISCURSO DA GOVERNADORA CIVIL DO PORTO

Isabel Oneto

Dr. Luís Portela os meus cumprimentos e, acima de tudo, agradecimento pelo honroso convite para estar aqui hoje. Senhor Professor e Magnífico Reitor da Universidade do Porto, Senhor Presidente da Comissão Organizadora, Senhor Presidente da Comissão de Coordenação e Desenvolvimento Regional do Norte, Dr. Carlos Lage meu amigo, a todos os presentes, as boas vindas acima de tudo ao Porto, a esta região e a este distrito. Queria agradecer à Fundação Bial, em nome do Governo, a realização deste evento e acima de tudo o apoio que a Fundação Bial e a empresa Bial têm dado à ciência portuguesa e ao nosso país.

Eu não vou falar sobre o tema que está em debate, que é a emoção. Eu tenho uma noção de como o Professor António Damásio se chegou a referir a esta matéria, à qual creio que deu a resposta. Li atentamente o livro "O Erro de Descartes" devido à minha preocupação como jurista: saber se afinal é o homem que é criminoso ou se é a sociedade que procura que é criminosa. Sei que acima de tudo ao estarmos aqui vivemos emoções e são essas emoções que nos ajudam à razão e, portanto, são essas emoções que nos fazem sentir como seres, como homens e mulheres naturalmente e, acima de tudo, que nos fazem tomar consciência de nós próprios e sabermos que nada se faz sem emoção. Eu creio que isto, não sei se é um dado científico, para mim é um dado adquirido. Não se faz nada sem emoção e é isso que nos faz viver o nosso dia-a-dia com a consciência de nós e a consciência do outro. E estes simpósios, estas iniciativas, permitem-me acima de tudo reflectir sobre não só o avanço obviamente da investigação científica nestas matérias mas, acima de tudo, nunca consigo desligar estas matérias da questão de que quanto maior é o nosso conhecimento - quanto maior são os dados adquiridos que nós conseguimos depois ou a informação que conseguimos transformar em conhecimento -, maior é a capacidade de gerarmos homens livres para o mundo. É por isso que eu agradeço à Bial pela aposta que faz e pelo que proporciona nesta matéria, de forma a podermos ser cada vez mais homens livres no mundo, que é isso que, no fundo, eu creio que justifica a nossa presença, a nossa passagem por este mundo. E aquilo que nos faz sentir bem connosco é quando temos capacidade de decisão e podemos decidir por nós próprios, em comunidade, com as nossas emoções e com a nossa consciência de que a razão formada também pela emoção vai pelo caminho certo.

Portugal, como se referia o Senhor Dr. Carlos Lage, tem vindo a percorrer um caminho difícil e eu creio que o tratado de Lisboa veio marcar uma posição e um novo rumo também para os portugueses, não só para a Europa, mas também para os portugueses. Há uma aposta na qualificação dos portugueses, há uma aposta na preocupação de termos mais e melhor emprego, mais qualificação. Aquilo que tem vindo a ser feito nos últimos anos, quer em matéria de qualificação, quer em matéria de investigação científica, e eu sei que 1% é pouco mas é uma meta que foi difícil de alcançar, eu creio que já é um sinal de que podemos continuar a investir em investigação. E temos sinais também na nossa sociedade. Eu recordo - e está aqui o Professor Sobrinho Simões que saúdo - a recente iniciativa I3S que, no fundo, representa a conjugação de três grandes grupos e que acabam por formar uma superestrutura com 600 investigadores, creio eu que é este o número de investigadores que se dedicam nesse instituto. Temos o Laboratório Internacional de Nanotecnologia, temos um grande investimento também aqui na Universidade do Porto - a Universidade do Porto produz 1/3 da investigação, ou seja, 25% da investigação produzida em Portugal. Eu creio que nós vamos, apesar de tudo, no bom caminho, principalmente com impulsos como este que a Bial tem proporcionado.

Permitam-me também que refira, com emoção naturalmente, que é aqui no Norte que as coisas se estão a fazer e eu gosto que isso seja assim. Tenho o prazer de sentir que no Norte as coisas estão a mexer e que a investigação está a avançar no Norte e, portanto, creio que com este simpósio a que a Fundação Bial já nos habituou vai ser dado mais um grande passo para que Portugal possa competir com os melhores do mundo e que possa também ser uma referência a nível internacional. Já o é através da Bial, já o é com outros grandes nomes da nossa ciência, eu creio que nos podemos orgulhar e, em nome o Governo Português, eu saúdo a Fundação Bial por esta iniciativa e por tudo quanto tem feito em nome da ciência e desejo a todos, com muita emoção, bom trabalho durante os próximos dias.

Muito obrigada.

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EMOTION PROCESSES: HOW EMOTIONS WORK

Nico Frijda*

Since the meeting has emotion as its topic, I think the best I could do is to present an overview of what I think the word "emotion" might refer to.

What "emotion" refers to is perhaps less clear than one might suspect. The word is not as ancient as it sounds. It has no origin deep in the wisdom of human experience. It is not a technical term, and it never was. In the sense that we use it today, the word "emotion" is in fact no older than 1632 or thereabouts. In that sense it was introduced by Descartes (1632). Up to that time it merely meant what in current French is denoted by the word *emeute*: popular unrest or uproar. Descartes employed it because of his interest in the unruly bodily manifestations like fast respiration, high heart rate and perspiration.

There is no accepted definition of "emotion". In the literature more than one hundred definitions can be found. There is no distinct thing that "emotion" refers to. But there do exist striking phenomena of feeling and behavior that stand out among what people and animals can be observed to do, that mark those off from other experiences and behaviors, and that words like emotion were created for, just as still more ancient words like the Greek *pathèma*, the Latin *affectus,* and the French and English *passion*.

There are three sets of phenomena that strike the eye and that, I think, called for some special word. They are, first, that people and animals sometimes show reactions and undergo experiences that engage them as a whole. Second, that the reactions and experiences take them in their grip, overtake them, take control of all of the individual's activities, and appear to control everything they do and think. Third, these reactions concern their relationship with some other individual or some object, issue, or event, and have to do with what that individual or object means to them.

Let me briefly expand. What we call emotions are responses that engage the entire person. The responses at one and the same time involve a

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multitude of components that in some variable manner interact and cohere. A number of components are active together and mutually call and reinforce each other. Attention is engaged; and perception; and expectation; and entertaining beliefs concerning an ongoing event; and memory about what it might mean; and bodily response; and striving to do something about it; and action; and action control: effort to give it direction or to restrain it. All these processes, moreover, appear active to jointly deal or cope, in functional cooperation, with a given event. The "entire person" appears engaged in achieving or modifying a particular relationship with that event or some object in it.

The second kind of phenomenon: what we call "emotions" are responses that manifest what I call "control precedence". They tend to take control of an individual's various mental processes and resources needed for them. They take control of cognition, action, and experience. They usurp attention and thought, they interrupt ongoing behavior, they may modify the individual's beliefs; they prevent attention for issues that are not connected with the main issue at hand. Moreover: striving and action may proceed in spite of obstacles and interruptions. Attention, feeling, thought, and action with regard to what the total response is about have priority and precedence.

The third kind of phenomena is that of evaluation. Responses indicate that other individuals or objects or events are of interest to the individual. The individual appears to care about them, and he or she adopts a position towards them. He or she accepts or rejects them, and appears interested in what they do and what they are.

Emotions are passions

The preceding argues: emotions are passions. What we now call emotions was formerly called passions, and that is what they are. They are best viewed as passions because they are motive states with control precedence. They are motive states that tend to overrule deliberate intentions of the individual, who thus appears passive in their regard; traditionally, passions were seen as opposed to actions.

The activities with any of the three mentioned phenomena - and the phenomena of feeling as well as of behavior- suggests that the states that give rise to the phenomena are states of *striving*, or modifications of states of striving as such (as, for instance, apathy represents such a modification). Focusing the three kinds of phenomena puts motivational aspects of the phenomena, and their underlying dynamics and conditions in the center of attention.

One may wonder whether what we call emotions indeed are generally passionate. Are not most everyday emotions weak? Yes, they are. But some measure of control precedence tends to be present even when the response is weak. Even weak emotions tend to cause intrusive thoughts. Even they disturb concentration, or demand effort to keep one's mind on the task. A fleeting emotion still makes one pensively glance out of the window for a second or two.

The three features do not constitute a definition of "emotion". Together, they outline the object for interest of research on "emotion", by this or any other name. They at most form a working definition that indicates the point of departure for investigation, as well as the reason for distinguishing "emotions" from behavioral and experiential phenomena in general. Each of these features, and the phenomena that manifest them, forms a challenge in the search for underlying processes and aspects of system architecture. What properties do we have to assume, and can we find evidence for them? They do not presuppose clear boundaries between the features, nor high correlations between the three. Empirical evidence will show whether they indeed form part of a unitary and coherent set of mechanisms. Whether or not that search will point to a definition containing necessary and sufficient properties for "emotions" has to be awaited. But I do think it allows sketching an integrative theory of the phenomena that we call emotions.

The notion of action readiness

The motive states under concern are specified as relational: they aim at establishing or modifying subject-object relationships (including relationships to representations of oneself and to the world as a whole).

Such motive states are called *states of action readiness:* states of readiness to establish or modify a relationship. They are not mere wishes. They are not cognitive states. They are states of being set for action. They often do lead to action, to action preparation, or to central potentiation of relevant action representations or programs (Jeannerod, 1997). That they are motive states means, however, that they do not represent states of readiness for specific actions. Action readiness plays at a different level. The motive states are states of readiness for *having to do or not having to* do with some object, and for having to do or not to do with it in some particular mode, such as by moving away from it, rejecting it, or moving against it. Any behavior goes that is capable of achieving the readiness' aim. The aim defines the state of action readiness.

That is to say: they define the states of action readiness distinguished as *action tendencies* (Arnold, 1960). Action tendencies aim to establish or maintain the relationship to a specific target, as for instance in anger and fear, or with objects in general, as in the action tendency to assimilate unfamiliar information that characterizes curiosity, or the action tendency of joy that aims at broadening and building novel contacts and competences (Fredrickson & Branigan, 2005).

Other states of action readiness, however, do not involve an articulate aim. States of action readiness distinguished as *activation states* represent variants of readiness for action that is not directed at or away from a particular target. Examples are being upset and diffuse excitement. These labels refer to an urge to act and to modify one's current relationship to the world, or to remove some imbalance in that relationship that cannot be identified or localized, or to towards which access is blocked. It leads to being tense or move erratically and without direction, as in the activity of a dog or child that expects to go out but is as yet prevented from doing so. Other activation states consist of decay of action readiness, and concomitant loss of motivation, as illustrated by apathy, discouragement, depression, and despair.

There are good reasons for giving action readiness pride of place in characterizing emotions. Action readiness corresponds to the main functional aspect of emotions. Emotions are generally held to serve adaptation.

They do so by establishing and modifying subject-object relationships in the service of the individual's needs, goals, and other concerns (Frijda, 2007). It is what they achieve or seek to achieve: holding off offenders, diminishing threat, promoting proximity to mates, and protecting conspecifics. States of action readiness do so by means of any action that seems fit under the circumstances. Diminishing threat, for instance, is achieved by freezing, running away, hiding under the table, jumping up, or seeking help from someone more powerful. States of action readiness also activate further response components that support overt action, for instance autonomic arousal, modifying kind and direction of attention, enhancing specific stimulus sensitivity such as for threats, alerting expectancies. State of action readiness engages the "entire person", in a multi-componential and flexible way.

Emotions presumably developed because they promoted adaptation during evolution, but they not only did so then. They still do so now in actual emotional encounters, at least in principle. States of action readiness are functional provisions here and now, to promote particular kinds of subject-object contingencies. Self-protecting serves to meet threat (we usually call that *fear*), hostile action to discourage social threats (usually called anger), receptiveness and approach to establish close contact (called *affection* or *love*). Dominant mode of action readiness is one of the major cues for distinguishing one emotion category from another, - a hypothesis confirmed by the close correlations found between emotion self-ascriptions and self-reported states of action readiness in questionnaire studies (e.g., Davitz, 1969; Frijda, Kuipers, & Terschure, 1989; Frijda, Markam, Sato, & Wiers, 1995; Roseman et al., 1994). Elementary forms of emotional behavior, such as facial expressions, also represent modes of action readiness. In experiments, facial expressions can be rated in terms of states of action readiness as readily and easily as they can be identified in terms of emotion labels (Frijda & Tcherkassof, 1997).

However, the utility and perhaps origin of emotions in adaptation should not obscure the fact that their function goes beyond adaptation. Action readiness not merely serves adaptation to one's extant niche. It also serves exaptation: expanding that niche, to the extent that it may influence evolutionary change. States of action readiness bring actions that bring novel experiences that bring novel challenges and opportunities and emotions that bring novel experiences, and so on. Emotions serve exaptation by acquisition of novel functions of existing provision that expand the niche and then becomes a determinant of morphological or functional change, as well as a motive for using that change (Gottlieb, 2002; Gould, 1991; Varela, Thompson, & Rosch, 1991).

The main illustrations of the role of emotions in exaptation are found in the cognitive emotions: curiosity, interest, fascination. Exploring a novel situation yields novel aspects that yield exploration that yields novel aspects, and so forth. Joy and desire to play act likewise. Play brings unasked-for challenges; joy has been linked to openness to gratuitous interactions (Isen, 1999), and to broadening and building novel repertoires (Fredrickson & Branigan, 2001). Sex does likewise. Sexual interaction can bring the satisfactions of body warmth and intimacy, as chimpanzees discovered when discovering consortships (Goodall, 1986). And so does fear, in which coping makes one discover the thrills of being able to cope with danger, and become a mountain climber or stunt rider (Piët, 1987).

Processes of action readiness

The notions of action readiness and action tendency have not been introduced in emotion analysis for a priori reasons. They were introduced to account for prominent emotional phenomena. A major one is behavioral equifinality.

Equifinality refers to the observation that many different emotional behaviors share the same relational function (Heider, 1958). They appear to serve the same end, and may alternate under the same conditions. "Approach" and "avoidance" are examples. A desired target is approached by following a straight line or by a detour, by pressing a pedal or by taking a bus. One can avoid by walking away, by running, by swimming, or by hiding under the table. Approach and avoidance are modes of action readiness characterized by aims.

Equifinality of sets of behavior has led to recognizing *behavior systems* in animal species. For example, Van Hooff (1972) distinguished an affinitive, a hostile, and a play system in chimpanzee social behavior. It formed the rationale for the "hierarchical/heterarchical" model of the organization of motivation, as proposed by Kortlandt (1955), Tinbergen (1957) and Gallistel (1980): aims generate instrumental subordinate aims that in turn generates actions; each action in turn may serve several different aims and thus occur in different hierarchies.

Overall aims form one of the rationales for distinguishing emotion categories like "anger" and "fear". Emotion distinctions are not merely linguistic conventions or conceptual representations (Barrett, 2006). What characterizes kinds of emotions are not specific behaviors but kinds of relational aims or intents.

Another source for inferring states of action readiness is expressive behavior. Facial expressions, for instance, are not primarily communication signals. They implement emotion-driven relational action tendencies. They have relational functions. Looking intently establishes cognitive contact. Mutual looking implements interpersonal contact. Eyebrow rising is part of withdrawal action, muscularly equivalent to a dog's ear flattening. Closing one's eyes closes off from visual information intake, as well as that it protects the eyes. The hypothesis that facial expressions are relational actions is supported by experimental findings. As indicated before, ratings of Ekman's facial expressions in terms of modes of action readiness are almost as consistent among raters as are ratings in terms of basic emotion labels (Frijda & Tcherkassof, 1997). The relational content of facial expression, together with their activation content, explains how facial expressions can form cues to other people's emotional state.

Feelings to a large extent consist of felt action readiness, and of felt urge or loss of urge. Emotion self-reports generally include references to them (Davitz, 1969; Frijda, Kuipers & Terschure, 1989). Body awareness in emotions largely consists, not of felt gut reactions, but of felt action tendency. Action tendency can be felt even before motor engagement sets in, as shown by experiments on movement imagery (Jeannerod, 1997). It explains how mirror neuron engagement may contribute to empathy (Gallese, 2005).

Action readiness also appears from the phenomena of *behavioral prosody,* the dynamics of emotional behavior over time. Actions can be smooth or halting, rapid or slow, with abrupt or smooth transitions of direction or amplitude, with variations in the synchrony of their various aspects. The course of feeling shows similar temporal variation. Emotional behavior also shows different degrees of fullness: picking up with fingers outstretched, grabbing with palm and hand, or arm and shoulder also moving forwards. Behavioral prosody more than anything else suggests "passion": action being driven by urge or impulse, being carried by desire, or being restrained by inhibition or contrary desire.

States of action readiness present major theoretical problems that they share with other forms of unreflected or "impulsive" behavior (Strack & Deutsch (2004). Both unreflected and impulsive behavior, even if unpremeditated, are purposive. They have an aim. They possess a certain intentionality, even if not guided by the representation of a state to come. They merely are guided by "intention-in-action", as Searle called it. They are guided by a "satisfaction condition" that represents the action's intended and expected termination point (Searle, 1983). But how?

Intention-in-action and its satisfaction condition can be understood from processes of unpremeditated instrumental actions in general. Their major aspects stem from links between the representation of events and the actions that the events invite or allow. The two representations closely fit and, in fact, may be held to form a unitary, coherent, or shared representation (Hommel et al., 2001; Jeannerod, 1997). The "affordances" of visually perceived objects (Gibson, 1979) provide examples. A pot looks like an object that enables putting things into, and a chair looks like enabling to sit upon. In affordances the fit is provided by visual features that match requirements for executing particular actions. In other instances, sometimes called "demand characteristics", the fit comes from experience with interacting with the objects. In other instances again it may come from the perceptions that define the termination points of action representations, such as seeing or sensing one's hand closure around an object that touches the palm of one's hand, in reaching and grasping. All this is handled by "efferent copy theory" of directed action (Von Holst & Mittelstaedt, 1950; Jeannerod, 1997): initiating a given action generates a representation of the sensory feedback expected at the end of the action, or serving as starting points for subsequent segments of the action program, and that represents the action's satisfaction condition.

The source of efferent copies for emotional actions is fairly clear. Emotional action readiness is triggered by an event as perceived and appraised (Scherer, 2000). Appraisal processes result in an event representation that includes reference to a desired state, which latter generates an efferent copy: sensing an object in one's hand when setting out to grasp an object, or perceiving a threat as distant or receding. The efferent copy is congruent or discongruent with the event as appraised: the object to be grasped is over there, or the threat is close by. This forms the setting for a negative feedback control process guiding the action readiness and subsequent action. The feedback control process is driven by the object being appraised as desirable, or the threat being aversive, - it should not be there. The analysis can be made to apply to a variety of constellations. For instance: action readiness like that implied in the desire to play or the state of joy may be assumed to aim for exerting actions that establish enhanced contact and interaction with the environment, that is discongruent with proximity of conditions that enable such exertion.

The notion of action readiness as a central representation establishing an efferent copy, an implicit expectancy with only very partial specification, may not be an appealing notion. It is, however, a notion for which appreciable support exists. In the preparation of instrumental actions motor plans are formed in the striatum, but are first held in check by concurrent inhibitory impulses from the globus pallidus. Motor commands and action only follow by selectively lifting that latter inhibition (Gazzaniga, Ivry & Mangun, 2002). Before that, mere readiness was there. Similar conceptions arise from the analysis of motor imagery, from which representations of intent appear to be there, which reflect activity in the neural dispositions involved, again without much of motor involvement (Jeannerod, 1997). Similar conceptions arise from the activity of mirror neurons: they reflect action preparation and execution, but may also reflect witnessed actions by others (e.g., Rizzolatti, Fogassi, & Gallese, 2001), or by hearing such actions described (Tettamanti et al., 2005). The reflections have the abstract character of intents without motor details filled in. In all these cases, states of readiness do entertain relationships to overt action, such as potentiating the neural representations of actions that might serve the readiness's aim. It may put them on edge. It may facilitate their actual execution when situational cues select or favor them. Specific emotional actions depend on situational cues at hand: a rat frightened by a signal for shock runs when on a runway, jumps upon prior footshock, and freezes when no cues are there (Bolles, 1970).

How states of action readiness are actually engendered remains to be understood, the mirror neuron evidence for states of action readiness is cortical. Generation of action readiness, however, is probably due to subcortical mechanisms. Evidence for relevant subcortical mechanisms is growing. Emotional imagery leads to subcortical activation in fMRI studies, with evidence of differentation between the activations for different emotional states such as fear, joy, sadness, and anger (Damasio et al., 2003). Lesion to certain subcortical circuits sometimes modifies emotion; lesions in the amygdala, for instance, reduce conditioned fear (LeDoux, 1996), and may also reduce the emotional impact of other kinds of emotion. These sorts of evidence led Panksepp (1998), Gray (1990) and Depue and Collins (1999) to hypothesize distinctly different subcortical circuits that are best interpreted as motivational circuits for particular modes of action readiness: for anger, anxiety, care-giving, desire, fear, joy or play, and sorrow or panic, in Panksepp's (1998) analyisis. But activation of such circuits under acute emotional conditions remains to be convincingly demonstrated.

The circuits are probably best understood as circuits that are sensitive to relevant appraisal information, that integrate that information, shape efferent copies, activate associated basal ganglia action dispositions, tunings of attention, and autonomic changes. But it may well be that the subcortical circuits are less specific. They may perhaps differentially interact with present or stored information from the actual situation and about actions in the subject's repertoire of habits and available cultural models.

DISCURSO DO REPRESENTANTE DA CÂMARA MUNICIPAL DO PORTO

Vladimiro Feliz

Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Senhor Dr. Luís Portela, Presidente da Fundação Bial, Magnífico Reitor, Senhor Bastonário da Ordem dos Médicos, Presidente da Comissão Organizadora, Senhor Professor Nuno Grande.

Antes de mais dou-vos conta de que é a primeira vez que eu chego antes do tempo a um evento e chego atrasado. Aqui temos algo de novo neste evento, mas pelo qual eu queria pedir desculpa, que mostra a eficácia de como são geridos os trabalhos. É com muito gosto que estou aqui hoje na sessão de encerramento do 7º Simpósio "Aquém e Além do Cérebro", evento que se realiza desde 1996 em torno de um tema que particularmente me fascina e onde tudo se sustenta, o cérebro.

O Dr. Luís Portela é alguém que fui conhecendo ao longo do exercício das minhas actuais funções e que é um exemplo de entrega e dedicação à cidade, à região e ao país, seja na promoção da ciência, no forte sentido de responsabilidade social ou na dinamização da economia da região. Por essa razão, no âmbito do projecto do município, escolhemos apresentar à nova geração uma nova referência para aqueles que frequentam as escolas básicas do Porto, num projecto que será lançado brevemente e que consiste na apresentação de histórias de vida através de pequenos vídeos de personalidades que, apostando na formação e na qualificação, atingiram patamares de notoriedade e conforto social, mais sustentados do que muitas das referências actuais da nossa juventude. Não podia deixar passar este momento sem deixar este agradecimento ao Senhor Dr. Luís Portela e à Fundação Bial pelo trabalho desenvolvido em prol da ciência, inovação e conhecimento em geral, e pela organização deste evento em particular.

Eventos como este enriquecem todos aqueles em que nele participam mas enriquecem também toda uma cidade e região, que a cada dia que passa reforça a imagem de cidade da ciência. Uma cidade que acolhe a maior Universidade Pública do país, o maior Instituto Politécnico e um conjunto de estabelecimentos de ensino superior privados com reconhecido valor nacional e internacional, numa comunidade que representa cerca de 250.000 alunos, é uma cidade com futuro, uma cidade que produz o bem mais valioso da sociedade actual, o capital humano. Mas não basta produzir esse capital humano, é preciso encontrar mecanismos para o fixar, para o qual são essenciais eventos como este, são essenciais empresas como a Bial e as infra-estruturas e incentivos que tornem o território mais competitivo.

Para terminar, e uma vez que estamos a reflectir em torno da temática do cérebro que está intrinsecamente ligado à memória, digo-vos que o Porto e os portuenses têm memória e não esquecem aqueles que nascem e passam na cidade. Nesse sentido, gostava de vos transmitir hoje aqui, com imenso orgulho, que a cidade do Porto, por proposta do Senhor Presidente da Câmara Municipal do Porto e com aprovação unânime do Executivo e da Assembleia Municipal, atribuirá, no próximo dia 24 de Abril, a Medalha Municipal de Mérito Grau Ouro ao Senhor Professor Nuno Grande, hoje também aqui homenageado por merecida coincidência.

Uma personalidade que, embora não seja originalmente da cidade, tem, orgulhosamente, vincadas as suas raízes transmontanas e durienses e fez grande parte da sua vida académica e profissional no Porto. Extremamente culto e curioso, não se confinou à sua esfera profissional, disseminando o seu saber e energia por um conjunto de actividades em instituições.

Senhor Professor Nuno Grande, em nome do Senhor Presidente da Câmara e em nome da cidade, o meu muito obrigado por tudo o que fez em prol da cidade e do país.

Muito obrigado.

DISCURSO DO MINISTRO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

José Mariano Gago

Senhor Professor Nuno Grande, Dr. Luís Portela - muito obrigado por esta iniciativa, por esta organização, a si e ao Professor Fernando Lopes da Silva -, Senhor Bastonário da Ordem dos Médicos, Senhor Reitor da Universidade do Porto e meu querido amigo, Senhor Vereador da Câmara Municipal do Porto, Ana Maria e demais família, caros colegas da universidade, de investigação e amigos.

Eu não vou fazer nenhum discurso formal, a amizade pessoal que me liga ao Professor Nuno Grande há muitos anos impede-me de o fazer e, portanto, a minha intervenção final nesta cerimónia que os organizadores entenderam ter é, naturalmente, de agradecimento e também de testemunho, porque acho que convém testemunhar esse agradecimento. Cada um de nós presente nesta sala teria com certeza muitas histórias para contar, mas aqueles que sobem aqui à tribuna têm uma forma de as contar em nome dos outros.

Histórias pessoais. Primeiro eu conheço o Nuno Grande há várias décadas, somos amigos há várias décadas, mas devo-lhe agradecer pessoalmente uma certa reconciliação pessoal não só com a medicina, como com Portugal. Eu regressei a Portugal para presidir à JNICT em 1996, com pouca vontade de ficar, devo dizer, e com a ideia em 1989, quando voltei para a Suíça, de não voltar. E a certa altura, no meio de uma macacoa que me atingiu com uma febre alta aqui no Porto, o Nuno Grande levou-me a sua casa à Foz, eu tenho família aqui, e depois foi comigo à farmácia. Lembro-me perfeitamente; parou o carro à porta da minha casa e disse assim: - Olha lá, tu não tens nenhum médico cá em Portugal? Importavas-te que eu fosse teu médico? Este simples gesto julgo que foi, e se eu tenho de escolher um, a reconciliação não apenas com a medicina mas com o país, e devo agradecer-te para sempre.

Em segundo lugar, desde essa altura, desde meados dos anos 80, temos, com altos e baixos mas de uma forma muito constante, um diálogo sobre o futuro da ciência em Portugal; um diálogo sobre a universidade, sobre o desenvolvimento científico, sobre aquilo que há 20 ou 30 anos acreditávamos que fosse possível criar em Portugal, ou seja, aquilo que de todo não existia. Não tenhamos ilusões; se hoje Portugal tem alguma actividade científica de nível internacional - e tem -, há 20 anos atrás pouquíssima era a actividade científica digna desse nome que existia no nosso país em qualquer área científica. Éramos muito poucos, eram poucas as instituições científicas, sem as quais não há ciência, as instituições científicas eram fragilíssimas. O mundo português mudou completamente nestes últimos 20 anos, no diálogo que algumas pessoas travaram ao longo destes 20 anos para que isto fosse possível, e felizmente há muitas pessoas aqui no Porto, em Lisboa, em Coimbra, no estrangeiro - o Professor Lopes da Silva que aqui está e que eu conheci na Suíça é parte desse diálogo antigo. O Nuno Grande foi o elemento central, aglutinador de pessoas no diálogo do futuro da política científica em Portugal e pela construção do desenvolvimento científico. Diálogo que é de amizade e de confiança entre pessoas de diferentes especialidades, de diferentes gerações e que, em última análise, foi provavelmente o principal ingrediente para que tenha sido possível esse desenvolvimento em Portugal e para que muitas pessoas tenham querido fazer vida científica e vida organizacional no nosso país.

Depois, cada vez mais te encontro Nuno na memória dos outros. Nos cursos do ICBAS soube de várias fontes como é que eles se iam construindo e todos me contam histórias inacreditáveis tuas. Contam-me histórias de discussões sobre os cursos do ICBAS de pé, no vidro da carruagem do comboio entre Lisboa e o Porto porque não havia lugar sentado. Ainda há pessoas que guardam religiosamente cópias desses papéis.

Por outro lado, há uma actividade cívica, política e de intervenção tua, quer de intervenção escrita, quer de intervenção pela voz, quer de intervenção pela organização e pela reunião, e essa intervenção em África, mas também aqui em Portugal, tem-nos acompanhado ao longo destas décadas. Uma actividade de juntar pessoas com objectivos comuns, uma actividade organizativa muito determinada, que tem na Faculdade de Medicina de Luanda e na Faculdade de Ciências Biomédicas Abel Salazar a sua expressão talvez mais alta do ponto de vista organizativo, e a tua capacidade de juntar os amigos e de os fazer sentir parte de um país. Em última análise, um país é talvez isto, um sítio onde queremos ter amigos.

O acaso das circunstâncias faz com que eu hoje possa, neste dia, por acaso, dirigir-me a ti publicamente como Ministro, e isto é um privilégio que eu gostaria de utilizar, porque os Ministros têm ocasionalmente esta capacidade de serem institucionais, de saudar e de agradecer em nome do país, e é isso que gostaria formalmente de fazer.

Gostaria naturalmente de terminar agradecendo-te como teu amigo e terminar dizendo-te que esta é uma amizade antiga, cheia de admiração, acrescentada de gratidão muito profunda e muito sentida.

Muito obrigado.

LISTA DE POSTERS
POSTERS

Lista de posters com resultados finais apresentados pelos bolseiros da Fundação Bial e/ou que estiveram disponíveis em www.bial.com

Posters with final results presented by Bial Foundation researchers and/or that were available at www.bial.com

Resumos dos posters disponíveis em / *Posters' abstracts available at www.bial.com*

2000

19/00 - "The Go/No Go Contingent Negative Variation (CNV): Relationships with alcohol abuse and criminal recidivism"
Instituição/*Institution*: Broadmoor Hospital, Crowthorne - UK
Duração prevista/*Estimated duration*: 2001/06 - 2008/03
Investigadores/*Researchers*: Dr. Richard Charles Howard, Dr. John Lumsden, Dr. P. J. McCullagh, Dr. Peter Fenwick e Dr. H. G. McAllister

2002

03/02 - "The neural structures involved in procedural memory"
Instituição/*Institution*: Centro de Estudos Egas Moniz - Lisboa
Duração/*Duration*: 2003/11 - 2006/11
Investigadores/*Researchers*: Dra. Sara Cavaco, Prof. Alexandre Castro-Caldas, Prof. Steven Anderson

11/02 - ”Os efeitos dos jogos electrónicos com equipamento de Realidade Virtual na activação psicofisiológica, estruturas cognitivas, estado emocional e comportamento agressivo” - *“The effects of violent computer games with virtual reality on physiological arousal, cognitions, affect and behaviour”*
Instituição/*Institution*: Centro de Estudos de Psicologia Cognitiva e da Aprendizagem - Lisboa
Duração/*Duration*: 2003/09 - 2006/11
Investigadores/*Researchers*: Dra. Patrícia Paula Lourenço e Arriaga Ferreira, Prof. Francisco Esteves, Dra. Mara Paula Carneiro

25/02 - “Vinculação e regulação autonómica: desenvolvimento da versão 2.0 do BioDreAMS e aplicação a um grupo não-clínico” - *“Attachment and autonomic regulation: Development of BioDReAMS 2.0 and application to a non-clinical group”*
Instituição/*Institution*: Centro de Investigação em Psicologia, Universidade do Minho - Braga
Duração/*Duration*: 2003/05 - 2006/09
Investigadores/*Researchers*: Prof. Isabel Maria Costa Soares, Prof. João Paulo Silva Cunha, Prof. Carlos da Silva Fernandes, Prof. Paulo Manuel Machado, Prof. Ovídio Costa, Prof. Maria Carolina Costa e Silva

35/02 - “Near-Death Experiences During Induced Cardiac Arrest” - only abstract available
Instituição/*Institution*: Division of Personality Studies, University of Virgínia - USA
Duração/*Duration*: 2003/06 - 2007/03
Investigadores/*Researchers*: Dr. Bruce Greyson, Prof. J. Paul Mounsey, Dra. Martha Mercier, Dra. Janet Holden

55/02 - "Mapping the time course of emotional information processing in anxious and repressive/defensive individuals"
Instituição/*Institution*: University of Leeds - UK - and University of Queensland - Australia
Duração prevista/*Estimated duration*: 2003/04 - 2008/03
Investigadores/*Researchers*: Dr. Nazanin Derakshan, Prof. Ottmar Lipp

58/02 - "Vinculação materna: dimensões hormonais envolvidas no processo inicial de vinculação da mãe ao bebé" - *"Pregnancy and postpartum mood and hormones: Effects on mother-to-infant initial emotional involvement"*
Instituição/*Institution*: Centro de Investigação em Psicologia, Universidade do Minho - Braga
Duração/*Duration*: 2003/01 - 2007/06
Investigadores/*Researchers*: Prof. Bárbara Fernandes Figueiredo, Dra. Raquel Costa, Dra. Alexandra Pacheco, Dr. Álvaro Ferreira Pais

107/02 - "Sonhos em Surdos: alterações oníricas por défice sensorial" - *"Dreams in Deaf subjects: oneiric alterations by sensitive deficits"*
Instituição/*Institution*: Núcleo de Lisboa do ISTEL - Instituto do Sono, Cronobiologia e Telemedicina - Lisboa
Duração/*Duration*: 2003/03 - 2007/01
Investigadores/*Researchers*: Prof. Maria Teresa Aguiar dos Santos Paiva, Dr. Helder Manuel Bértolo, Prof. Mário Andrea, Prof. Oscar Dias, Dra. Isabel Galhardo, Dra. Alexandra Medeiros, Dr. Tiago Mestre, Dr. Pedro Miguel Rocha, Dra. Lara Pessoa, Sra. D. Rosa Santos, Sra. D. Mónica Andrea, Sra. D. Raquel Aires, Dra. Graça Caldeira, Dra. Cristina Ramos

117/02 - "Psiconeurofisiologia comparativa entre as memórias traumáticas de vida actual e as memórias traumáticas de supostas vidas passadas: SPECT cerebral em 20 pacientes submetidos à Terapia Regressiva Vivencial Peres" – *"The Psychoneuralphysiology of traumatic memories"*
Instituição/*Institution*: Instituto Nacional de Pesquisa e Terapia Regressiva Vivencial Peres, São Paulo - Brasil
Duração prevista/*Estimated duration*: 2003/01 - 2008/03
Investigadores/*Researchers*: Dra. Maria Júlia Prieto Peres, Dr. Júlio Prieto Peres, Dr. Regis Cavini Ferreira, Dra. Vivian Pires de Albuquerque

126/02 - "Servindo dois lados: As características do trabalho como preditores de respostas psicossociais e psicofisiológicas ao stress em médicos e enfermeiros em posições de gestão" - *"Serving two masters: Job characteristics as predictors of psychosocial and psychophysiological responses to stress in physicians and nurses in managerial positions"*
Instituição/*Institution*: Centro de Investigação, de Formação e Intervenção em Saúde - Maia
Duração/*Duration*: 2003/05 - 2007/09
Investigadores/*Researchers*: Prof. Scott Elmes McIntyre, Prof. Maria Teresa McIntyre, Prof. João Manuel Salgado, Dr. João Paulo Pereira, Dr. José da Costa Dantas, Prof. Derek Johnston, Prof. Martyn Jones

2004

01/04 - "Mystical experience, thin boundaries, and transhumanation as predictors of psychokinetic performance with a Random Number Generator" - only abstract available
Instituição/*Institution*: Anomalistic Psychology Research Unit, University of Adelaide - Australia
Duração/*Duration*: 2006/02 - 2006/10
Investigador/*Researcher*: Dr. Michael Thalbourne

07/04 - "Prestimulus Response in the Sympathetic/Parasympathetic Nervous System" - only abstract available
Instituição/*Institution*: Laboratories for Fundamental Research, Palo Alto - USA
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigador/*Researcher*: Prof. Edwin C. May

09/04 - "Structural biology of human brain CNP, a protein essential for axonal survival" - only abstract available
Instituição/*Institution*: Institute of Cell & Molecular Biology, The University of Edinburgh - UK
Duração/*Duration*: 2005/02 - 2007/04
Investigador/*Researcher*: Dr. Andreas Hofmann

21/04 - "Study of emotional perception and affective memory in a sample of normal subjects. Comparison with different clinical populations"
Instituição/*Institution*: Laboratório de Estudos da Linguagem, Faculdade de Medicina de Lisboa - Lisboa
Duração/*Duration*: 2005/05 - 2007/06
Investigadores/*Researchers*: Prof. Isabel Pavão Martins, Dra. Sílvia Fernandes, Prof. Alexandre Mendonça, Prof. Manuela Guerreiro

33/04 - "Dynamic brain patterns in neocortical areas during interpersonal transactions" - only abstract available
Instituição/*Institution*: Krembil Neuroscience Centre, Toronto Western Hospital and The Hospital for Sick Children, University of Toronto - Canada
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Prof. Richard Wennberg, Prof. Jose Luis Perez Velazquez

34/04 - "fMRI and photo emission study of presentiment: The role of "coherence" in retrocausal processes"
Instituição/*Institution*: Parapsychologist Institute, Utrecht - Netherlands
Duração/*Duration*: 2005/05 - 2007/11
Investigadores/*Researchers*: Prof. Dick Bierman, Dr. Eduard van Wijk

37/04 - "The effect of conscious states of neural activity"
Instituição/*Institution*: The Weizmann Institute of Science, Rehovot - Israel
Duração/*Duration*: 2005/02 - 2007/07
Investigadores/*Researchers*: Prof. Shimon Ullman, Prof. Elisha Moses, Engº Shimshon Jacobi

42/04 - "Exploring Psychomanteum as a psi-conducive state of consciousness (Phase 2): Adding new perceptual, personality, abnormal thinking, and phenomenological variables of anomalous cognition using two favourable conditions: (1) visual/musical targets and (2) psychomanteum/non-psychomanteum sessions"
Instituição/*Institution*: Instituto de Psicologia Paranormal, Buenos Aires - Argentina
Duração/*Duration*: 2005/03 - 2007/01
Investigadores/*Researchers*: Dr. Alejandro Enrique Parra, Dr. Jorge Fernando Villanueva

47/04 - "A combined psychophysiological and electrophysiological approach to investigate low-level visual perception in autism" - only abstract available
Instituição/*Institution*: Department of Psychology, The University of Sheffield - UK
Duração/*Duration*: 2005/06 - 2006/10
Investigadores/*Researchers*: Prof. Olivier Pascalis, Prof. Elizabeth Milne, Prof. David Buckley, Dr. Laurence Vigon

57/04 - "Imagery and emotion production during hypnosis: an electrophysiological approach"
Instituição/*Institution*: Psychological Institute, Russian Academy of Education, Moscow - Russia
Duração/*Duration*: 2005/04 - 2007/05
Investigadores/*Researchers*: Prof. Zvonikov Vyacheslav Michailovich, Prof. Stroganova Tatiana Alexandrovna, Dr. Tsetlin Marina Mihailovna, Dr. Anna Kirenskaya, Dr. Vladimir Y. Novotosky-Vlasov, Ms. Anastasia V. Marushkina

58/04 - "Comparative study of brain processes related to microgravity-induced and clinical oculomotor disturbances in subjects with the right and left eye dominance"
Instituição/*Institution*: Institute of Biomedical Problems, Russian Academy of Sciences, Moscow - Russia
Duração/*Duration*: 2005/04 - 2007/04
Investigadores/*Researchers*: Prof. Inessa B. Kozlovskaya, Ms. Elena S. Tomilovskaya, Dr. Anna Kirenskaya, Dr. Vladimir Y. Novotosky-Vlasov, Dr. Vadim V. Myamlin, Ms. Nelly R. Gallyamova

61/04 - "A neuropsychological examination of specific and global frontal lobe functions in siblings with and without eating disorders"
Instituição/*Institution*: Institute of Psychiatry, King's College London - UK
Duração/*Duration*: 2005/08 - 2006/11
Investigadores/*Researchers*: Dr. Ulrike Schmidt, Dr. Kate Tchanturia, Dr. Pei-Chi (Thomas) Liao

62/04 - "Developing a "Recipe" for success in ESP experimental research (Phase II): Testing and Improving a Protocol"
Instituição/*Institution*: Department of Psychology and Counselling, University of Greenwich, London - UK
Duração/*Duration*: 2005/01 - 2007/01
Investigador/*Researcher*: Dr. José M Pérez Navarro

63/04 - "Attentional modulation in neural responses to faces"
Instituição/*Institution*: Universidad Autónoma de Madrid, Facultad de Psicologia - Spain
Duração prevista/*Estimated duration*: 2005/02 - 2008/03
Investigador/*Researcher*: Prof. Jaime Iglesias Dorado

64/04 - "Degree of Meditation Attainment and Comparison of Type of Meditation in Relation to Awareness of Precognition Targets"
Instituição/*Institution*: Psi Research Centre, Glastonbury - UK
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Dr. Serena M. Roney-Dougal, Dr. Jerry Solfvin

65/04 - "An Investigation into the Possibility of a Stimulus-Response Causal Relationship in the Electronic Voice Phenomenon"
Instituição/*Institution*: Skylab, Portree, Scotland - UK
Duração/*Duration*: 2005/02 - 2007/03
Investigadores/*Researchers*: Dr. Alexander MacRae, Prof. Charl Vorster

66/04 - "Extrasensory Perception and Implicit Sequence Learning in a Computer Guessing Task"
Instituição/*Institution*: Neurology Clinic, University Hospital Zurich - Switzerland
Duração/*Duration*: 2005/04 - 2006/10
Investigadores/*Researchers*: Prof. John Palmer, Prof. Peter Brugger, Dr. Enrique Wintsch

68/04 - "The emotional Stroop effect: Cognitive, emotional, and physiological aspects"
Instituição/*Institution*: University of Manchester and Birkbeck College, University of London - UK
Duração/*Duration*: 2005/05 - 2007/07
Investigadores/*Researchers*: Dr. Isabelle Blanchette, Dr. Anne Richards

73/04 - "Spontaneous Brain Blood Flow During Guess - research with near infrared spectroscopy"
Instituição/*Institution*: Institute for Body Measurements, IRI, Schiba-shi - Japan
Duração/*Duration*: 2005/01 - 2006/07
Investigadores/*Researchers*: Dr. Mikio Yamamoto, Dr. Hideyuki Kokubo, Dr. Hideo Yoichi

75/04 - "Measurement of Event-related EEG correlations between two human subjects over a large distance"
Instituição/*Institution*: The University of Northampton - UK
Duração/*Duration*: 2006/01 - 2007/09
Investigadores/*Researchers*: Prof. Harald Walach, Dr. Christian Seiter, Dr. Thilo Hinterberger

76/04 - “Remote staring detected by conscious and Psychophysiological variables - Combining and improving two successful paradigms”
Instituição/*Institution*: Department for Evaluation of Complementary and Alternative Medicine, Hospital Epidemiology, Freiburg - Germany
Duração/*Duration*: 2005/01 - 2006/12
Investigadores/*Researchers*: Dr. Stefan Schmidt, Dr. Susanne Müller, Prof. Harald Walach

77/04 - "Stress and the psyche: methodological innovations in psychoneuroimmunology"
Instituição/*Institution*: Department of Psychology, APU, Cambridge - UK
Duração/*Duration*: 2005/03 - 2007/06
Investigadores/*Researchers*: Dr. Matt Bristow, Dr. Rachel Cook

81/04 - "Photon emission of living witness in human healing and cognitive experiences"
Instituição/*Institution*: International Institute of Biophysics, Neuss - Germany
Duração/*Duration*: 2005/01 - 2006/12
Investigadores/*Researchers*: Prof. Roeland Van Wijk, Prof. G. L. R. Godaert, Dr. E. P. A. Van Wijk, Prof. R. Bajpai

82/04 - "Detecção de informação emocional e sua interferência no processamento neurocognitivo: um estudo em criminosos reincidentes" - *"Detection of emotional information and interference in neurocognitive processing: a study of recidivist offenders"*
Instituição/*Institution*: Centro de Ciências do Comportamento Desviante - Porto
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Prof. João Eduardo Marques Teixeira, Prof. Manuel Fernando Santos Barbosa, Sr. Pedro Manuel Rocha Almeida

87/04 - "Early neurophysiological correlates of autism: visual attention and EEG rhythms"
Instituição/*Institution*: Moscow University for Psychology and Education, Faculty of Abnormal Psychology, Moscow - Russia
Duração/*Duration*: 2005/01 - 2007/04
Investigadores/*Researchers*: Prof. Stroganova Tatiana Alexandrovna, Prof. Elam Mikael, Dr. Orekhova Elena, Dr. Tsetlin Mariana Mihailovna, Dr. Morozov Alexei Alexandrovich

88/04 - "A influência social na memória: Estilo conformista, falsas memórias e alterações psicofisiológicas periféricas" - *"Social influence on memory: Conformist styles, false memories and peripheral psychophysiological changes"*
Instituição/*Institution*: Centro de Investigação em Psicologia da Universidade do Minho - Braga
Duração/*Duration*: 2005/01 - 2007/04
Investigadores/*Researchers*: Prof. Emanuel Pedro Viana Barbas de Albuquerque, Prof. Teresa Margarida Moreira Freire

93/04 - "An investigation of effects of dreams on physiological measures of stress"
Instituição/*Institution*: Psychopharmacology Unit, Bristol - UK
Duração/*Duration*: 2005/06 - 2007/09
Investigadores/*Researchers*: Dr. Sue Wilson, Prof. David Nutt, Prof. S. Lightman

102/04 - "Interspecies communication and telepathy with a language-using Parrot" - only abstract available
Instituição/*Institution*: The N'Kisi Partnership for Interspecies Communication, New York - USA
Duração/*Duration*: 2005/05 - 2007/07
Investigadores/*Researchers*: Dr. Aimee Morgana, Prof. Ruppert Sheldrake, Prof. Jane Goodall

104/04 - "Is psi a type of knowledge?"
Instituição/*Institution*: Institute of Noetic Sciences, California - USA
Duração/*Duration*: 2005/01 - 2006/11
Investigadores/*Researchers*: Prof. Dean Radin, Prof. Edwin May

112/04 - "Improvement of transcranial magnetic stimulation (TMS) coils for psychiatric applications"

Instituição/*Institution*: Instituto de Biofísica e Engenharia Biomédica, Faculdade de Ciências da Universidade de Lisboa - Lisboa
Duração/*Duration*: 2005/01 - 2007/11
Investigadores/*Researchers*: Prof. Pedro Cavaleiro Miranda, Mr. Yiftach Roth, Mr. Ludovic Correia, Mr. Ricardo Salvador

116/04 - "Comparing Conscious and Physiological Measurements in a Cogntive DMILS Study in Bali" - only abstract available

Instituição/*Institution*: College of Arts and Sciences, Rollins College, Florida - USA
Duração/*Duration*: 2005/03 - 2006/12
Investigadores/*Researchers*: Prof. Hoyt Edge, Prof. Luh Ketut Suryani, Dr. Niko Tiliopoulos, Dr. Annemieka Bikker

119/04 - "Event-related potentials of temperament traits in ADHD and conduct disorder"

Instituição/*Institution*: Dept. Child Adolescent Psychiatry, Institute of Psychiatry, London - UK
Duração/*Duration*: 2005/06 - 2007/11
Investigadores/*Researchers*: Dr. Katya Rubia, Dr. Alex Sumich, Dr. Philip Asherson, Prof. Eric Taylor

128/04 - “Telepathic behaviour associated with biochemical and neuroendocrine parameters” - only abstract available

Instituição/*Institution*: Unidade de Biopatologia Vascular, Instituto de Medicina Molecular, Faculdade de Medicina de Lisboa - Lisboa
Duração prevista/Estimated duration: 2005/02 - 2008/03
Investigadores/*Researchers*: Prof. Maria Carlota Lopes Saldanha, Prof. Doutor Alberto Albino Granado Escalda, Dra. Teresa Raquel Duarte Pacheco, Dra. Ana Rosa Miranda dos Santos Silva

135/04 - "Telepresence and telepathy in immersive virtual reality"
Instituição/*Institution*: Manchester University - UK
Duração/*Duration*: 2005/11 - 2007/04
Investigadores/*Researchers*: Dr. Craig Murray, Dr. Christine Simmonds, Dr. Jezz Fox

140/04 - "The CinEgg project: Assessing the relationship between group consciousness and Random Event Generators"
Instituição/*Institution*: Institut Métapsychique International, Paris - France
Duração/*Duration*: 2005/02 - 2006/10
Investigadores/*Researchers*: Prof. Mario Varvoglis, Prof. Jean-Philipe Basuyaux, Dr. Pierre Macias

150/04 - "Electrocortical activity during deep hypnosis experiences"
Instituição/*Institution*: Department of Psychology, University of Lund - Sweden
Duração/*Duration*: 2005/11 - 2007/02
Investigadores/*Researchers*: Prof. Etzel Cardeña, Prof. Dietrich Lehmann, Prof. Mark Winkel

152/04- "Relating psi to a theory of intuition: using precognition habituation to improve ganzfeld scores"
Instituição/*Institution*: Psychology Department, Gothenburg University - Sweden
Duração prevista/Estimated duration: 2006/09 - 2008/03
Investigadores/*Researchers*: Prof. Adrian Parker, Dr. Torbjorn Fagerberg

155/04 - “Creativity, schizotypy, paranormal experiences and mental health: developing a new cognitive-parapsychological paradigm for the assessment of PSI performance in the laboratory”
Instituição/*Institution*: University College Northampton - UK
Duração prevista/*Estimated duration*: 2006/06 - 2008/03
Investigadores/*Researchers*: Dr. Christine Anne Simmonds, Dr. Nicola J. Holt

168/04 - "Electrocortical studies of the hippocampal-parahippocampal (HP) structures in humans: Foramen ovale (FO) electrodes, as a research tool in human cognition and epilepsy"
Instituição/*Institution*: National Institute of Psychiatry and Neurology, Department of Neurology, Epilepsy Center, Budapest - Hungary
Duração/*Duration*: 2005/02 - 2007/07
Investigadores/*Researchers*: Prof. Péter Halász, Dr. Zsófia Clemens, Dr. Csaba Borbély, Dr. Dániel Fabó

2006

71/06 - "Ultra-weak photon emission and EEG in a study on color perception in the dark"
Instituição/*Institution*: International Institute of Biophysics, Neus - Germany
Duração prevista/*Estimated Duration*: 2007/03 - 2008/02
Investigadores/*Researchers*: Prof. Roeland Van Wijk, Prof. R. Bajpai, Dr. E.P.A. Van Wijk, Dr. S. Bosman, Dr. J.M. Acherman

181/06 - "Brain Activity During Psychokinetic Task - Research with Near Infrared Spectroscopy"
Instituição/*Institution*: Institute for Living Body Measurements, International Research Institute, Chiba - Japan
Duração prevista/*Estimated duration*: 2007/02 - 2008/03
Investigadores/*Researchers*: Dr. Mikio Yamamoto, Dr. Hideyuki Kokubo

PALESTRANTES E MODERADORES
SPEAKERS AND MODERATORS

ALEXANDRE CASTRO-CALDAS Professor de Neurologia, Director do Instituto de Ciências da Saúde da Universidade Católica Portuguesa, Lisboa. Foi Presidente da *International Neuropsychological Society*. Interesses científicos: literacia/iliteracia e ortografia e substratos neurobiológicos cerebrais, afasia e doença de Parkinson.

Professor of Neurology, Director of the Health Sciences Institute of the Catholic University of Portugal, Lisbon, Portugal. Past President of the International Neuropsychological Society. Research interests: literacy/illiteracy and orthography and brain neurobiological substrates, aphasia and Parkinson's disease.

CAROLINE WATT Investigadora Sénior, Departamento de Psicologia, Universidade de Edimburgo, Escócia. *Past President da Parapsychological Association* e autora de artigos em livros e revistas científicas na área da parapsicologia e de crenças paranormais. Interesses científicos: efeitos da expectativa do experimentador e do participante, aspectos psicológicos de experiências e crenças paranormais evidentes e intensificação do desempenho remoto em tarefas cognitivas e comportamentais.

Senior Lecturer, Psychology Department, University of Edinburgh, Scotland. Past President, Parapsychological Association, and author of book and journal articles on parapsychology and paranormal beliefs. Research interests: experimenter and participant expectancy effects, psychological aspects of ostensible paranormal experiences and beliefs and remote performance enhancement with cognitive and behavioural tasks.

CHRISTIAN KEYSERS Director Científico e Professor de Neurobiologia, BCN Neuroimaging Center, Universidade de Groningen, Holanda. Professor Visitante do California Institute of Technology (Caltech). Interesses científicos: emoções e sua relação com o sistema de neurónios-espelho, teoria neuronal da cognição social e neurobiologia da empatia.

Scientific Director and Professor of Neurobiology, BCN Neuroimaging Center, University of Groningen, the Netherlands. Visiting Professor, California Institute of Technology (Caltech). Research interests: emotions and its relation in the mirror neurons system, neural theory of social cognition and neurobiology of empathy.

DARYL BEM Professor de Psicologia, Cornell University, New York, EUA. Interesses científicos: teorias da personalidade, crenças, atitudes e ideologias, orientação sexual e discriminação, fenómenos psi (ESP), juízos sociais, inferência humana e auto-percepção.

Professor of Psychology, Cornell University, New York, USA. Research interests: personality theories, beliefs, attitudes and ideologies, sexual orientation and discrimination, psi phenomena (ESP), social judgements, human inference and self-perception.

DEAN RADIN Investigador Sénior e Director, Institute of Noetic Sciences, Petaluma, Califórnia (CA), EUA. Docente Adjunto, Department of Psychology, Sonoma State University, Rohnert Park, CA, EUA. Docente Consultor Distinto, Saybrook Graduate School, San Francisco, CA, EUA. Premiado com o Outstanding Contributions Award, Parapsychological Association. Interesses científicos: meta-análise, interacções mente-matéria, causalidade e retrocausalidade, respostas precognitivas inconscientes, técnicas exploratórias de análise de dados e respostas psicofisiológicas a intenções e emoções de sujeitos distantes.

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Control precedence

The other major phenomenon that I think led to a notion of passion or emotion is control precedence.

Control precedence of emotions is a major fact of behavior and experience. Emotions are reaction patterns that tend to take priority over other, concurrent, claims for attention and action, such as ongoing task fulfillment and everyday duties. They involve claims of attention to the event or object at hand, at the cost of attention for other issues. They manifest persistence over time, regardless of interruptions and obstacles: a quarrel resumes after interruption by the visit of the postman or a telephone call, and one goes into trouble and costs to meet one's beloved. Emotional strivings tend to neglect risks such as venereal infection, liver damage, or harming one's marriage. They tend to block considerations of propriety, social norms, and other possible unwanted consequences of one's emotional actions and feelings.

Emotions *claim* priority. That is, they do not always get it. There exist processes of emotion regulation: processes by means of which emotions are suppressed or attenuated, or changed in character (Gross, 2007).

Control precedence appears also from the impact of emotion on ongoing action and thought: from degree of emotion interference with ongoing behavior, thoughts, and concentration; from task performance decrement; from the strength parameters of emotional behavior itself, such as running speed, strength of felt action tendency and drasticness of action undertaken (such as outright attack rather than merely making a sour remark), facilitated detection of relevant stimuli, and decrease of attention for other things ("restriction of range of cue utilization"; Easterbrook, 1959; Niedenthal, Halberstadt, & Setterlund, 1997; Eysenck, 1997; MacLeod, Mathews, & Tata, 1986), re-experiencing the emotion in thought, belief changes about the people involved.

Control precedence phenomena index the strength, power, or intensity of emotion. That not only provides a definition of the intensity of emotions: it is also felt that way. In a study by Sonnemans (Sonnemans & Frijda, 1994), student subjects were asked to report on several recent emotions, and for each to rate overall felt emotion intensity, as well as to rate various of the just-mentioned aspects of control precedence. The ratings of the just mentioned aspects predicted about half of the variance of the subjects' felt intensity ratings (see Table 1). Ratings of emotion intensity also correlate with felt intensity of autonomic responses such as heart rate. It should be noted, however, that these latter correlations are largely independent of the control precedence ones. Bodily upset and an emotion's influence on behavior, thought, and the conduct of life are quite different things. Bodily arousal only measures momentary emotional impact.

What determines emotion intensity, and thus control precedence? One may surmise the main determinant to be is the importance of the emotional event to the individual's concerns: his or her major interests, motives, goals, attachments, and sensitivities, that together may be considered the dispositional sources of emotions. Emotions can be expected to be a joint product of events (as appraised) and the individual's concerns, and emotion intensity the joint product of event magnitude and the strength of one's concerns.

We sought to verify this hypothesis by asking the participants in the just mentioned experiment to indicate the concerns affected by each of the reported events, and their prominence. Indeed, felt emotion intensity strength sizably correlated with measures of the prominence and number of the individual's concerns implicated in the event. They accounted for between one fifth and one fourth of the variance of felt intensity (Sonnemans, 1991) (Table 2). Some rating of emotion regulation by the subject was included in the just mentioned study. When it was subtracted from the mentioned control precedence variables, multiple correlation with intensity ratings was increased.

The processes that produce control precedence are as yet far from clear, however. How does appraised event importance translate into the persistence of striving and the control over the various processes such as action planning, attention, and so forth. The main mechanisms involved in control precedence are, however, becoming known. One set of these are the pleasure and pain processes, often referred to as expectancies of positive and negative reward. Pleasure and pain, or experiences of positive and negative reward themselves partly result from innate or learned sensitivities for particular stimuli and the effect of homeostatic need states on these sensitivities, More generally, pleasure and pain result from appraised congruence and discongruence between events and the individual's concerns that include competences and attachments (Frijda, 2007, in press). Pleasure processes depend on the opiate system (Berridge & Robinson, 1998; Panksepp, 1998).

The main and most direct influence on control precedence appears to come from the strength of desire that comes from innate incentive properties of stimuli, such as sexual pheromones, and from learned incentive properties due to previous experiences of pleasure and pain with distal cues and with response outcomes (Dickinson and Balleine, 2002; Everitt and Robbins (2005). Those incentive properties then appear to enable activation of the midbrain dopamine system to activate approach action tendency, or the emotion of desire.

The literature calls that midbrain dopamine system by various names: the Reward System (e.g., Shizgal, 1999); the "Behavioral Activation System" (Gray, 1982); the Behavior Facilitation System (Depue & Collins, 1999); the "Seeking System" (Panksepp, 1998); or the "Wanting System" (Berridge, 1999). Other interpretations are also current, such as the Reward Prediction Error system (Schultz, 1998). I call it "the System named Desire". Experiences of craving and urge tend to correlate with activation of the system and dopamine release (Panksepp, 2005).

In the interpretations by Berridge (2007), Dickinson and Balleine (2002), and Depue and Collins (1999), that system confers the capacity of the stimulus or event to call up and strengthen motivation to obtain that target; it confers the stimulus what they call "incentive salience". In that of Everitt and Robbins (2005) it affects habit strength initiated by strong reinforcement in compulsive fashion. Disablement of either the opiate system or the desire system allows processes of liking and of wanting or desire to be uncoupled (Berridge, 2007). This work represents major and much needed advances in the psychobiology of emotional motivation.

Appraisal

Emotions are triggered by events, but shaped by the events in the way that the individual has appraised them. "Appraisal" means the processing of incoming information by the individual over and beyond its simple registration. The processing can be simple, for instance by the stimulus impinging upon a sensitivity that "recognizes" the stimulus and links it to a process of liking or dislike. It allows pictures of babies to elicit liking and a feeling of endearment or erotic stimuli to elicit interest, even when perceived for a split second. Processing usually is more complex, and includes information on the spatio-temporal context in which the stimulus arrives, or on the full event by which the emotion is triggered. A sudden noise startles because it is sudden and unexpected, and not only because it is noise. Appraisal can become still more complex when engaging stored information that relates the incoming stimulus event to possible harmful event effects. The simple forms of appraisal are often referred to as "elementary appraisals"; the more complex one's as "cognitive appraisals".

Appraisal is part and parcel of the processes involved in emotion arousal. Blocking those intra-individual processes tends to abolish emotion. Upon lesions of the amygdala, threatening faces or warning signals do not evoke fear (LeDoux, 1996). Lesions to the hippocampus abolish emotional effects of spatial event context (Bouton, 2005). Damage to the orbito-frontal cortex abolishes more remote emotional event implications (Damasio, 1994). Use of the notion of "appraisal" does not imply conscious evaluation or even conscious awareness. In its simplest manifestations, it is one of the most basic processes constituting what we call emotions. Appraisal processes are no conscious and largely automatic. Their outcomes may become conscious and result in events perceived as pleasant or unpleasant and meaningful. However, they also may remain nonconscious and still unwittingly elicit states of action readiness and other aspects of emotional response. This is a consistent and major finding from studying the effects of subliminal stimuli, in the work of researchers like Zajonc (1980), Bargh (1999), and Moors and DeHouwer (2006). It does not imply absence of "cognitive" processes from emotions. Even non-consciously, stimulus identification and access to stored information are implied (Clore et al., 2005). Without conscious awareness, complex information evidently can still be processed and influence later processing (Storbeck & Robinson (2004), and even after very brief or backwardly masked information presentations (Moors, 2007). Preferences need inferences, albeit often simple, automatic and nonconscious ones.

In fact, the distinction between elementary and cognitive appraisals is far from clear-cut. Even many apparently elementary appraisals are not really so elementary. Viewing a mutilated face generally and immediately elicits aversion or disgust (Bradley et al., 2001a); yet, it involves a rather complex process that affects the perceiver's own body, probably by impacting his or her mirror neurons. Affective value generally depends on conditions of the perceiving subject. Sex scenes are exciting to 16 year olds but indifferent to babies. Pictures of babies are maximally endearing to young mothers (Bradley et al., 2001b).

The appraisal processes have their puzzling aspects. Not all emotionally relevant information actually evokes emotional responses in a perceiver. There exists an information effectiveness problem. That problem is: emotionally highly pertinent information sometimes fails to evoke emotion. Warnings leave most people cold most of the time; the dangers of smoking, unsafe sex, and disastrous politics, for instance, are generally known and rarely influence behavior or feeling. Conversely, anger or fear may be elicited by events that one perfectly knows to be harmless. Showing a spider phobic that a spider is harmless does not remove her fear.

Such persistence of emotion regardless of relevant information has been given evolutionary explanations (e.g., Öhman & Mineka, 2001), but such explanation is most likely wrong. Learned fears such as evoked by a green light that had signaled electric shock also do not readily extinguish (e.g., Bridger & Mandel, 1965; LeDoux, 1996). Emotional memory still harbors considerable puzzles, as studies in phobia therapies demonstrate: extinction procedures often fail to extinguish fear.

Research is making important progress in understanding what renders information emotionally effective. It probably is its format. Abstract, verbal information as such appears ineffective. Only modality-specific information is - information in pictures, body feelings, and sounds (Barsalou, 1999) and, in particular, embodied information (Varela, Thompson, & Rosch, 1991). This not primarily means information that brings autonomic arousal or gut feeling. It primarily means information that affects one affectively or effectively.

Affective embodiment results when events directly elicit pleasure, pain, or desire, as through the mentioned elementary appraisals or through stimuli strongly associated to those. Effective embodiment results from events that enable or block action, action planning, or action progress. Action enabling and obstruction are among the major elicitors of elementary appraisal: appearance of a meaningful target object, unexpected action progress, having one's hand stopped when writing. Emotion, then, results, not from knowing that an event frustrates but from the frustration itself. One bumps into an obstacle or enters a gate that swings open or meets an eager response.

These are the base lines of appraisal. In all interesting cases, appraisal extends further than processing incoming information, and other information directly linked to it. Memory evocation and thought can vastly add experienced meaning, and augment the domain of event meaning, and the emotional facets that are aroused in response. Loss of a partner not only leaves absence but also confrontation with the fickleness of life, lost friends that cannot be replaced, and so on. Every single event is embedded in cultural narratives that provide different appraisals for the same events in different cultural surroundings, and different emotions in response. Emotion appraisal can be expanded at libitum, if only because appraisals are not one-shot events. They often spread out over time, and are revised by novel thoughts and novel encounters.

Feelings

The foregoing analyses provide a theory of what emotional feelings consist of. Their nature does not represent a major theoretical problem. James was right: they result from processes going on anyway; in my analysis primarily the processes of appraisal, action readiness, affect and arousal. But the followers of James were wrong: they are not just of the body. They are not merely "body feelings", as Damasio (1994; 2003) held they are. They are feelings of the body acting *in situ*: in a world, in encounters with the world - bumping into it, bumped into by it -, and in a temporal continuity.

Feelings reflect the outcomes of all the processes discussed. They include sense of engagement, of being gripped. They include pleasure and pain, which, I think, reflect how well or ill the sum total of processes appears to function, below or beyond functioning optimally (Frijda, 2007). Feelings prominently include felt action readiness, which includes the intentional aspects of being set for action to relate or not to relate, and its mode of flow over time. They include some inkling of what the action readiness expects to achieve, and how well action corresponds with that. And feelings reflect representation of one's body in action and in relation to the world beyond.

Feelings integrate all that, and monitor what is going on between oneself and the world (Scherer, 2004), except when reductive attention reduces integration and singles out particular aspects of all that available body-in-action information (Lambie and Marcel, 2003).

Concluding remarks

I think that these theoretical reflections contain the backbone of a coherent story of emotions.

The story is coherent: it seeks to articulate an account stretching from elementary perceptual, representational, affective, and action-organizing processes to the phenomena of experienced emotion: to merely-felt emotions in sophisticated humans that utilize reflexive awareness, self-awareness, voluntary action instigation and imagination.

The surmised elementary processes are plausible in more elementary animals - say, vertebrates -, had predecessors before that, and have plausibly developed from there. There is evidence for efferent copies in houseflies, directed motivated search in butterflies, control precedence and persistence in action completion in dragonflies, appraisals and the flexibility of action readiness in rats.

Giving passion with its two main aspects - coordinated or "synchronized" response of the entire organism, and control precedence - the central place in describing and analyzing emotions provides a meaningful functional view of emotions, broader than the barren talk of "adaptive usefulness" and "reproductive fitness". Emotions, the closest by, are guardians of concern satisfaction. In addition, the sketch matches a meaningful view of human nature, and of the nature of other animals beyond jellyfish or so: emotions develop around whatever concerns the species or individual has in his or her repertoire.

Humans, as well as at least all other vertebrates, are autonomous systems. They are seeking, striving, and acting systems. In addition, humans and some other vertebrates are systems that strive for intraspecies interaction. They are restlessly in quest, except when they achieved their quest or fell asleep, - and even then...! Restless action and interaction: that is what they *do*. It is not what made them come into being. That was the fact that many of those actions happen to serve adaptation. But adaptation was never a purpose or a strategy. It just came out so, or it did not, and the species disappeared.

And once again: emotions develop in context of action. They are manifestations of creatures whose nature it is to act in and on a physical world, and in and on a mental world, in which one may grinningly triumph over one's rival or tenderly stroke one's friend's fingers.

But perhaps the main conclusion of the preceding considerations should be the following.

Defining “emotion” by something better than a working definition may be an impossible task. In any way it has done so, so far. It may be in the nature of things, in that it might imply seeking a substance category for what are variably interrelated bundles of functions.

Those functions do exist, however, independently of how variants are combined and categorized. The functions include those of action readiness and action tendency. They also include the various kinds of processes of appraisal, that may or may not functionally belong together. There are processes of activating action provisions that pre-empt indefinite collections of other functions like attention, memory activation and resource allocation.

The task of affective science is to carefully explore those processes, their underlying dispositional provisions, and their neuroscientific underpinnings, rather than seeking to arrive at a definition of discrete categories.

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STRENGHT MEASURES	r	R^2
Strength of re-experiencing the emotion during first 24-hours	.53	.28
Strength of action tendency	.49	.39
Strength of bodily changes	.50	.43
Belief changes about people	.36	.46
Drasticness of envisaged action	.33	.48

r = correlation; R^2 = cumulative explained variance (squared multiple correlation)

Table 1. Correlations of strength variables with overall felt intensity (from Sonnemans & Frijda, 1994).

	(N=219)	
	r	R^2
Number of concerns affected	.42*	.18
Summed products of relevance and concern strength,	.47*	.22
maximum product of relevance and strength	.49*	.24

*p<.05.

Table 2. Correlations of concern measures with overall felt intensity of different emotions. (from Sonnemans & Frijda, 1995).

PALESTRAS
LECTURES

NEUROBIOLOGY OF EMOTIONS
Meeting Report

***Marta Moita*[1], *Ray Dolan*[2], *Tania Singer*[3], *Ralph Adolphs*[4], *Fernando Lopes da Silva*[5]**

What are the neurobiological underpinnings of emotions? What can findings from neuroscience tell us about the nature of emotions and feelings, and what can they tell us about how emotions influence cognition and behaviour? These are timely questions because the tools of neurobiology can now be used to probe topics that have historically been the purview of psychology and philosophy. As such, the topic of emotions is highly interdisciplinary.

The 7th meeting of the BIAL Foundation in Porto, Portugal, in the spring of 2008 brought together psychologists, neurobiologists, and parapsychologists to present their latest findings and discuss the topic of "Emotions" from a multidisciplinary perspective. The meeting was very well attended by students and other scientists, and there was lively discussion following the presentations. This section summarizes the proceedings of the first session of the meeting, held on the morning of March 27, with the topic of "Neurobiology of Emotions", co-organized by Fernando Lopes da Silva and Ralph Adolphs.

Neurobiological mechanisms of fear - Marta Moita

Marta Moita opened the session by presenting her research on fear processing in the amygdala, a topic she has investigated at the single-neuron level. Investigating the neural underpinnings of behaviour is predicated on the fact that the brain is organized into distinct modules or maps.

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Different regions of the brain are, to an extent, specialized to carry out particular functions. Because of this architecture, it is possible to uncover what a particular structure or region contributes to behaviour by recording from neurons within it, or by selectively lesioning or inactivating it. Of course, it is important to keep in mind that a full account of the structure's function will eventually need to incorporate its connectivity with other structures, since it is such a network, not a single structure in isolation, that mediates behaviour.

With respect to the study of fear, it is fortuitous that fear learning is quite conserved across species. This makes it possible to study this emotion in animals models, such as rats (something that would be difficult for some other emotions, such as guilt, shame, or pride, which may be more unique to humans). Fear conditioning has been studied in detail by a number of investigators. In this type of emotional learning, a tone is paired with an electric shock, and after a few such pairings, the animal learns that the tone predicts the shock (Fig. 1). One can measure this learning by the animal's freezing behaviour: whereas untrained animals will not freeze when they hear a tone, those that have learned to associate the tone with

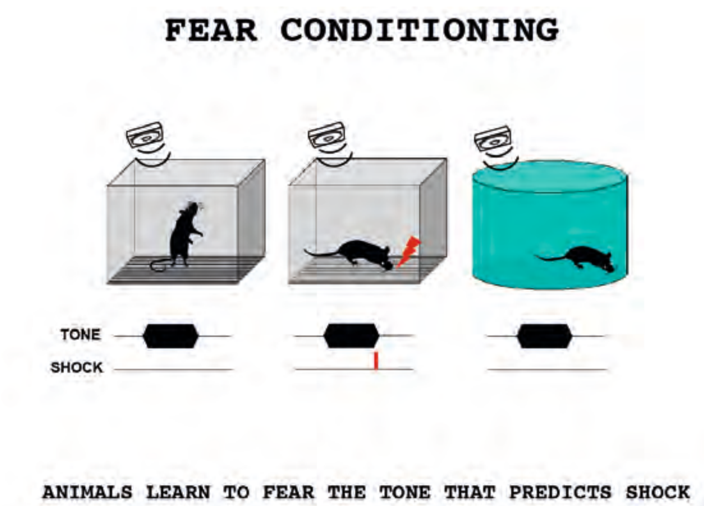

Figure 1. Paradigm for Fear conditioning.

shock will freeze when they hear the tone, even in the absence of the shock. In short, the rats will behave as though they are afraid of the tone.

The neural circuitry that underlies fear conditioning involves the auditory cortex and the amygdala. The pathways whereby auditory information about the tone and somatosensory information about the shock converge have been worked out in considerable detail, by investigators such as Joseph LeDoux and others (LeDoux 1996). These two signals converge in the lateral amygdala, a subcortical nucleus that is essential for the acquisition of conditioned fear in animals and in humans, and the amygdala is known to process the value of both the conditioned (the tone) and unconditioned (shock) stimuli (Blair et al., 2005). There are two routes of auditory input to the amygdala: one via the auditory cortex that can encode more specific information about more complex auditory stimuli, and a more basic and rapid one that comes directly from the auditory thalamus (Figure 2). Neurons in the auditory cortex sharpen their responses to different sound frequencies when one frequency has been paired with shock; that is, the auditory map in cortex comes to focus on those frequencies that are biologically the most significant for the animal.

These two pathways can be dissociated by selectively lesioning one of them. Lesioning either component results in reduced discriminatory fear conditioning: the animal's ability to differentially associate one tone with shock, and a second tone not with shock, is impaired. This finding shows how the two routes cooperate and facilitate one another as they converge on the amygdala. This cooperation achieves both the initial rapid acquisition of fear conditioning to an auditory stimulus, and also permits the learning of discriminatory conditioning between two tones. These effects can modelled as well.

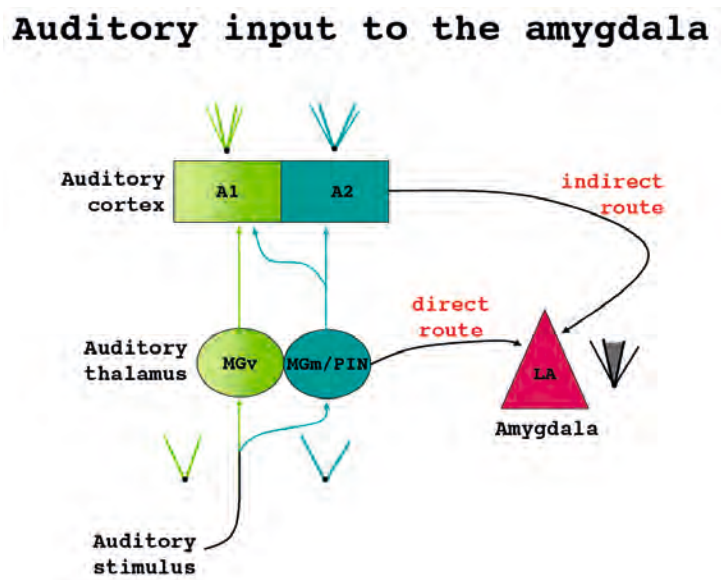

Figure 2. Auditory inputs to the amygdala.

Future directions in Marta Moita's laboratory are to examine in more detail the activation of excitatory and inhibitory neurons in the amygdala during fear conditioning, and to investigate the auditory receptive fields of neurons in the amygdala during different stages of learning. This will give us additional information about how, over time, these neurons encode information that allows the animal to predict potentially dangerous events in its environment.

Emotion and decision-making - Ray Dolan

Ray Dolan showed results from functional neuroimaging in humans that address the issue of how emotion and cognition interact when we make decisions. This is a question that has a long history in cognitive psychology, where Don Broadbent was one of the first to propose so-called "dual-process" models. In Broadbent's case, the model was a dual-process model of attention, but such models have now been applied to many cognitive domains, notably including decision-making. The basic idea is that there are two sets of processes that may often be in opposition, and that interactions or conflict between them results in a cognitive or behavioral output. The two processes typically envisioned are "automatic" versus "controlled", and each of these have been assigned many attributes. For example, automatic processing is also thought to be fast, to operate in parallel, to be inaccessible to conscious awareness, and to involve emotion. Conversely, controlled processing is typically thought to be slow, serial, involve willful and conscious cognition, and to regulate and control emotion. These dual process theories have recently been used also to explain economic decisions. While the classical expected utility theory that von Neumann and Morgenstern had articulated thought of all rational decisions as maximizing expected utility, findings accumulated showing that people actually deviate significantly and systematically from this.

Neuroimaging experiments using fMRI have investigated the different processes that guide decisions. It has become clear that there are multiple control systems for guiding instrumental behaviour, and they may conflict. In one set of experiments, which has now been done both in lesion patients and using fMRI in healthy subjects, the role of counterfactual thinking was investigated. In this study, subjects could either choose to bet on a wheel that had a 50% chance of giving them \$50, or a 50% chance of them losing \$50; or they could bet on a wheel that had a 20% chance of them winning \$200, and an 80% chance of them losing \$50 (Figure 3). The overall expected utility of these two wheels should be identical (both should result in zero net gain or loss in the long run). When subjects chose one wheel and lost, this generated a "disappointment" signal ("partial feedback" panel in Figure 3). However, when they also found out that they would have won, had they gambled on the other wheel ("complete feedback" panel in Figure 3), this generated an additional signal, analogous to "regret". This regret signal correlated with activation of the orbitofrontal cortex, and fails to influence behaviour normally in patients with lesions of the orbitofrontal cortex (Camille et al., 2004) consistent with the idea that this region of the brain computes the potential future outcomes of one's actions and considers hypothetical outcomes in order to guide current choice.

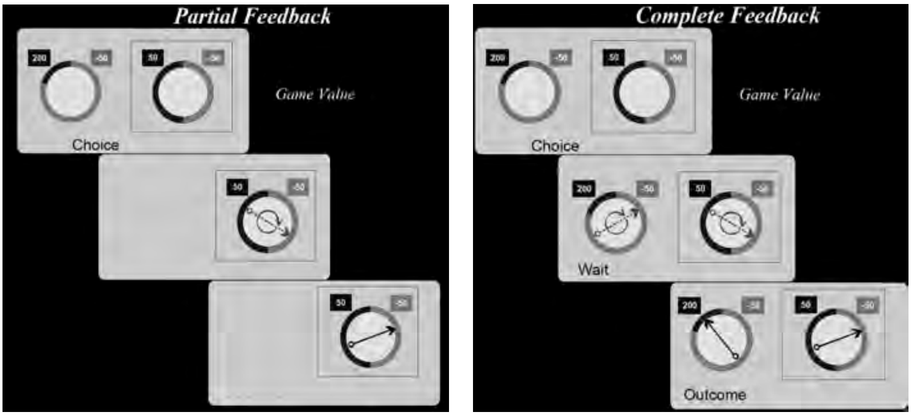

Figure 3. The experimental design of the Camille et al study.

Another experiment took its lead from one of the formulations that was originally designed to explain people's deviations from rational choice theory. This was articulated by Kahneman and Tversky in their "prospect theory", which argues that choices depend on how the options are framed. In the imaging task (de Martino et al. 2006), subjects were given an initial endowment of $50, and then asked to choose between two options: (1) keeping $20 for sure, or (2) betting on a wheel that had a 2/5 chance of winning all $50, and a 3/5 chance of losing all $50. In this experiment, subject chose the gamble about 40% of the time. In a second experiment, the conditions were exactly the same, except that the two options were now (1) losing $30 for sure, or (2) betting exactly as before. In this case, subjects chose to gamble about 60% of the time. This result is quite contrary to rational choice theory, since the expected utilities should be identical in the two experiments. It shows that subjects are influenced by the way the options are framed, and have an aversion to emphasis on "loss". Given this behavioral finding, the study examined neural correlates. They found that activation in the amygdala tracked the frame in which the choices were presented - that is, there was an interaction between the subject's choice (whether to gamble or take the sure amount) and the way that the choice was framed (Figure 4).

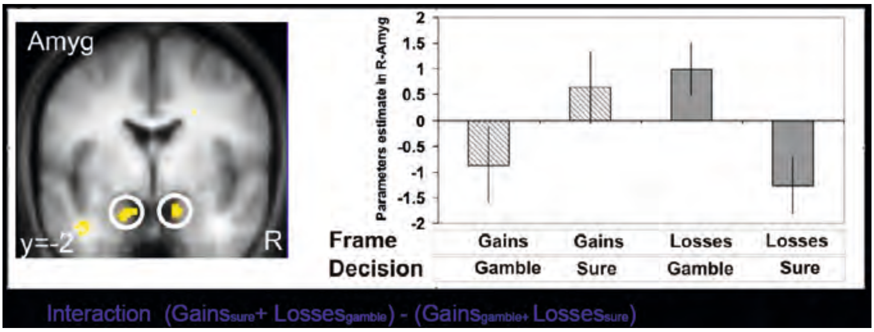

Figure 4. Interaction between the choice to gamble or not with the frame (gain or loss frame) in which that choice is presented activates the amygdala.

Even more intriguing was an examination of individual subjects in this experiment. Some subjects were highly influenced by the framing of the options, whereas others behaved more "rationally" and were relatively immune to the framing. These individual differences in susceptibility to the framing effect correlated with activation of regions in prefrontal cortex. The less influenced subjects were by the framing effect, the large the signal in prefrontal cortex, consistent with a model whereby the prefrontal cortex can regulate and inhibit the amygdala. A further investigation tied these individual differences also to differences in serotonin genetics. Subjects were screened for a genetic polymorphism for the promoter region of the serotonin reuptake transporter. This gene has two common alleles, dubbed "short" and "long", and the short allele has been linked to risk of psychopathology, increased amygdala activation, and reduced regulation of amygdala activation by prefrontal cortex. Subjects with the short allele showed a much larger framing effect than subjects with the long allele, and correspondingly greater interaction of frame with choice in the amygdala. Subjects with autism spectrum disorder have now also been tested on the framing task, and they show, on average, a lower degree of framing effect.

Taken together, these studies illustrate the power of combining computational models of decision-making with neuroimaging, and the effects of emotional signals that can influence choice. They also highlight the fact that everybody is different, and that there are large individual differences in decision-making, and in the degree to which individuals are influenced by emotional signals.

Understanding others: empathy and cognitive perspective taking from the lens of social neuroscience - Tania Singer

A big part of understanding other people is the ability to estimate what they feel, think, and believe. Two key processes that have been investigated here are “cognitive perspective taking”, which allows us to understand another person’s mental states (such as intentions, desires, beliefs), and “empathy”, which allows us to understand another’s feelings (either emotional feelings, such as sadness, or sensory feelings, such as pain).

One study (Singer et al., 2004) investigated empathy for pain by measuring the neural (fMRI) responses evoked when a subject observed his or her spouse experience pain. In this experiment, subjects in the scanner visually observed their spouse receive painful electric shock to the hand, and the evoked brain activations during this condition was compared to the brain activations seen when the subject in the scanner were given shock themselves. Consistent with prior studies, a subject’s own experience of pain correlated with activation in the so-called “pain matrix”, a set of structures involving anterior cingulate and insular cortex that encode the unpleasant affective properties of pain. The new finding in this study was that a largely overlapping set of activations was seen also when subjects observed their spouse experience pain (Figure 5). This finding is consistent with the hypothesis that empathy engages some of the same structures in one's own brain that would be engaged if one were in the state of the other subject with whom one is empathizing.

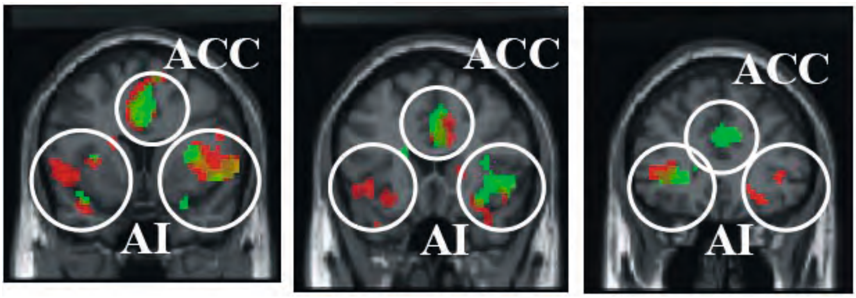

Figure 5. Regions activated when subjects experience pain themselves (GREEN) and watch their spouse experience pain (RED) overlap in the anterior cingulate cortex (ACC) and anterior insula (AI). From Singer et al. 2004.

Just as in the presentation by Ray Dolan, it is also notable that in the case of empathy there are large individual differences- some people are very empathic, whereas others are not, and this is reflected in their brain activation. Tania Singer has also studied individuals with autism, and individuals with alexithymia (an impaired ability to describe one's own feelings). Both of these clinical populations appear to be impaired in their ability to empathize and show correspondingly reduced activation. For example, in an experiment testing interoception of emotions (evoked by emotional visual stimuli), it was found that the degree of alexithymia (from a questionnaire) was negatively correlated with the degree of activation of the insula, an effect that was even greater in autistic subjects who also had alexithymia. These results suggest that autism as such may not necessarily be associated with a lack of empathy, but rather depends on the degree of alexithymia as well.

The degree of empathy we have for another person also depends on our evaluation of that person- we do not empathize equally with everybody. To investigate this experimentally, empathy for painful electric shock was measured again, but this time unfamiliar people were used rather than one's spouse. The critical manipulation in this experiment was that the pain empathy experiment was preceded by a monetary trust game, in which the subject in the fMRI experiment played a trust game against the person they would subsequently see given electric shock. The other person was an actor who behaved in one of two ways on this trust game: either very fairly, or very unfairly. As one might predict, the degree of empathy was influenced by this. There was much empathy for those people who had acted fairly in the prior trust game, and less empathy for those who had acted unfairly (Singer et al., 2006). This was reflected in the degree of insula activation. There was also an interesting effect of gender: in men, watching people receive shock who had been unfair in the trust game resulted both in much less insula activation (correlating with less empathy for the other's pain), as well as increased activation in the nucleus accumbens, which may reflect actual joy at seeing the other's pain (something akin to "Schadenfreude" in German).

One big and important question raised by this work is the degree to which empathy can be acquired and learned. Tania Singer has been studying people who meditate, and who have spent many hours of their lives actively training to feel empathy for others. This form of compassion meditation has a profound influence on the degree of activation of the insula. Some of this work is now being extended also to naive subjects, who can be trained in the course of the experiment, allowing a longitudinal within-subjects design.

These studies are now also being extended to looking at whether individual differences in empathy correlate with cooperative behaviour on economic games. Some such correlations are being found specifically for feelings directed towards oneself rather than empathy for another person, and they seem to rely on effects in the amygdala during fMRI. Another direction is to examine some of the neuropeptides that may influence empathic and prosocial behaviour, notably oxytocin. Oxytocin is a small peptide found in all animals and linked to prosocial behaviours. It can be administered intranasally in humans, modulates activation of various brain structures, and has been shown behaviourally to increase the trusting behaviour of people playing a sequential trust game (Kosfeld et al., Nature 2005).

The human amygdala in emotion and social behavior - Ralph Adolphs

The amygdala has become a hot topic relating to emotion processing and also to social behaviour more generally. These two themes are reflected in the history of research on the amygdala: there are the classic studies by Kluver and Bucy from the 1930s arguing for the amygdala's role in social behaviour (now partially confirmed with more selective lesions), and there are the studies in rats by Joseph LeDoux, Michael Davis, and others (LeDoux 1996), showing the amygdala's role in fear learning. This second aspect was also the focus of the work and presentation by Marta Moita earlier in the symposium. Tying these two themes together has been difficult, but there are now hypotheses that the amygdala serves a more general and abstract function that may link the two. This hypothesis is that the amygdala processes any biologically salient event, which could be social, fear-related, or in fact related to ambiguous, unpredictable, and potentially important events in the environment.

This hypothesis has been tested in a number of studies. Ralph Adolphs' group has carried out experiments in neurological patients who have focal lesions of the amygdala. It was found some time ago that selective amygdala lesions impair recognition of emotions from other people's facial expressions, especially fear. One interpretation of this finding is that it is somehow related to the impaired Pavlovian fear conditioning that is also found in such patients, just as it is in rats with amygdala lesions. However, the amygdala has also been shown to be involved in appetitive conditioning, and also involved in processing positive emotions. So it does not appear to be the case that the amygdala's role somehow is restricted just to stimuli that are related to fear.

A recent study (Adolphs et al., Nature 2005) found that bilateral lesions of the amygdala impair recognition of fear in facial expressions because the patients do not look normally at the face stimuli. In particular, they fail to look at the eye region of faces, and therefore fail to make use of important facial information about wide eyes that can signal fear. When instructed to look directly at the eyes in faces, a patient with amygdala lesions became normal in her ability to recognize fear in faces (Figure 6). This finding fits with a growing consensus that the amygdala does something considerably more abstract than just fear processing, related to allocating processing resources to any stimuli that are important in some sense- for instance those that are unpredictable or ambiguous. One recent study that was done in both rats and people found that the amygdala responds more to unpredictable tones than to predictable tones, even when these tones are not signalling anything emotional as such (Herry et al. 2007).

The amygdala has also been hypothesized to play a role in the social disabilities of people with autism. Ralph Adolphs' lab has therefore tested people with autism, and also their first-degree relatives, on some of the same tasks as used in the patients with amygdala lesions. It was found that people with autism also fail to look normally at the eye region in faces, and fail to make normal use of the eyes. This impairment is also found, albeit to a lesser degree, in the parents of people with autism. Thus, abnormal strategies in how information about facial features is fixated and used may be a diagnostic "endophenotype" in autism, and may relate to abnormalities within the amygdala and its circuitry (Adolphs et al, in press).

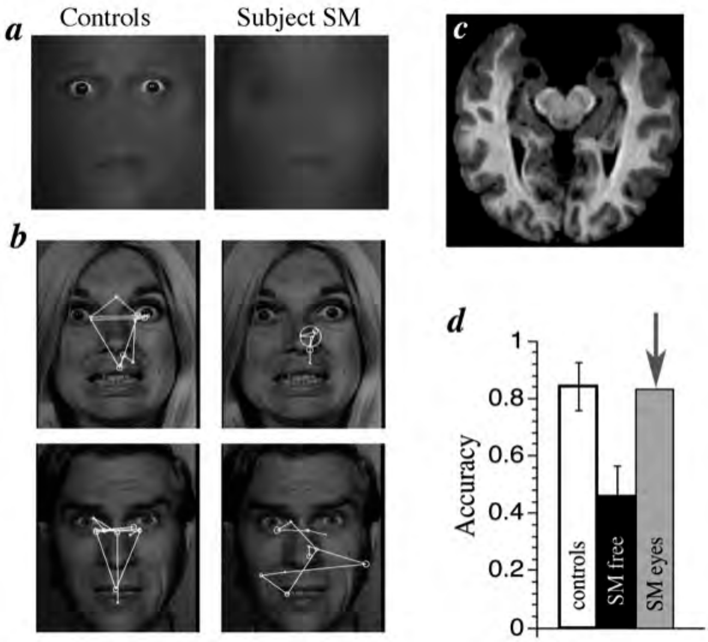

Figure 6. Abstract Functions of the Amygdala Contribute to Social Perception. Bilateral amygdala lesions impair the use of the eyes and gaze to the eyes during emotion judgment. (a) A patient with bilateral damage to the amygdala made significantly less use of information from the eye region of faces when judging emotion. (b) While looking at whole faces, the patient (right column of images) exhibited abnormal face gaze, making far fewer fixations to the eyes than did controls (left column of images). This was observed across emotions (free viewing, emotion judgment, gender discrimination). (c) MRI scan of the patient's brain, whose lesion was relatively restricted to the entire amygdala, a very rare lesion in humans. The two round black regions near the top middle of the image are the lesioned amygdalae. (d) When the subject was instructed to look at the eyes ("SM eyes") in a whole face, she could do this, resulting in a remarkable recovery in ability to recognize the facial expression of fear. The findings show that an apparent role for the amygdala in processing fearful facial expressions is in fact more abstract, and involves the detection and attentional direction onto features that are socially informative. Modified from (Adolphs et al 2005).

Concluding Remarks

The lectures and discussions offered a glimpse of the state-of-the art of how neuroscience is contributing to our understanding of the nature of emotions and feelings, and how emotions influence cognition and behaviour.

In this respect the study of fear is particularly interesting since this behaviour is conserved across species what enables neuroscientists to study emotion experimentally in animals models, such as presented by Marta Moita. These studies led to pinpoint the amygdala as occupying an important place in brain circuits involved in fear conditioning to a sound stimulus and to unravel the pathways whereby auditory information converges in the amygdala.

Human studies, however, can give a wider scope of brain processes involved in emotions, in particular with respect to how emotions (satisfaction, relief, or regret) and cognition interact when we make decisions. Ray Dolan showed that there was a negative correlation between the subject's susceptibility to the influence of the contextual frame within which a given task is presented and the fMRI BOLD signal in prefrontal cortex, consistent with a model whereby the prefrontal cortex can regulate and inhibit the amygdala.

Neuroscience is not only revealing brain processes underlying emotional states within an individual, but also how an individual is able to understand another person's mental states (such as intentions, desires, beliefs), and "empathy", which allows us to understand another's feelings (either emotional feelings, such as sadness, or sensory feelings, such as pain). This was beautifully demonstrated by Tania Singer who using fMRI signals showed that the so-called "pain matrix",i.e. a set of brain structures involving anterior cingulate and insular cortex, is activated not only when one feels pain, but also when subjects observed their spouse experience pain. These studies were extended to people with autism, and individuals with alexithymia (an impaired ability to describe one's own feelings) and showed that the degree of alexithymia was negatively correlated with the degree of activation of the insula, an effect that was even greater in autistic subjects who also had alexithymia. Preliminary results point out that learning may affect these processes, such that training in compassion meditation may have a profound influence on the degree of activation of the insula.

Many of these studies point out that studies of the relation between emotions and brain processes have to take into account the context within which stimuli that trigger emotions are presented and perceived. This was clearly put in evidence by Ralph Adolphs studies that the amygdala's role is not restricted just to stimuli that are related to fear. Indeed selective amygdala lesions impair recognition of emotions from other people's facial expressions, such as fear, because the patients do not look normally at the face stimuli. In particular, they fail to look at the eye region of faces, and therefore fail to make use of important facial information about wide eyes that can signal fear. Further it was found that people with autism also fail to look normally at the eye region in faces, and fail to make normal use of the information conveyed by the expression of the eyes.

The different contributions of the morning session underscored the enactive and intersubjective nature of emotion processing. According to the views presented by the neuroscientists, this aspect can be explained by active perception and brain systems that are finely tuned to processing information about other people expressions and the emotions that they display.

Some lively discussion ensued also about the possibility that parapsychological phenomena could fit within these findings, and that anomalous mechanisms could account for the intersubjective findings reported. These issues were taken up in more detail in the subsequent session, which focused on emotions and psi.

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FEELING THE FUTURE: EXPERIMENTAL EVIDENCE FOR RETROACTIVE INFLUENCES ON EMOTIONAL PREFERENCES AND JUDGMENTS

Daryl J. Bem*

The term *precognition* is usually understood to mean conscious cognitive knowledge of some future event that could that could not be anticipated through normal inferential processes. Belief in precognition is common both historically and cross-culturally, going as far back as the Old Testament's story about Joseph's precognitive dreams concerning feast and famine in ancient Egypt. Similarly, the practice of consulting oracles for information about the future has parallel counterparts throughout history and across cultures.

Precognition is a special case of a more general phenomenon, the retroactive influence of a future event on an individual's current responses, whether those responses are cognitive or emotional, conscious or unconscious. In fact, it seems reasonable to suppose that the ability to unconsciously respond to an impending threat would be evolutionarily prior to having detailed conscious cognitive knowledge of that threat. Such an unconscious ability has been demonstrated experimentally in the recent "presentiment" experiments in which physiological responses to emotionally arousing stimuli are shown to occur a few seconds before the stimuli are presented (see Radin, this volume; and Radin, 2006, pp 161-180, for a review of these studies).

In investigating retroactive influences in our laboratory at Cornell, we have adopted the strategy of "time-reversing" well established psychological effects so that the stimulus procedures occur *after* rather than *before* the individual responds. In this report, I describe three such experiments: Time-Reversed Influence on Liking, Retroactive Habituation, and Retroactive Priming.

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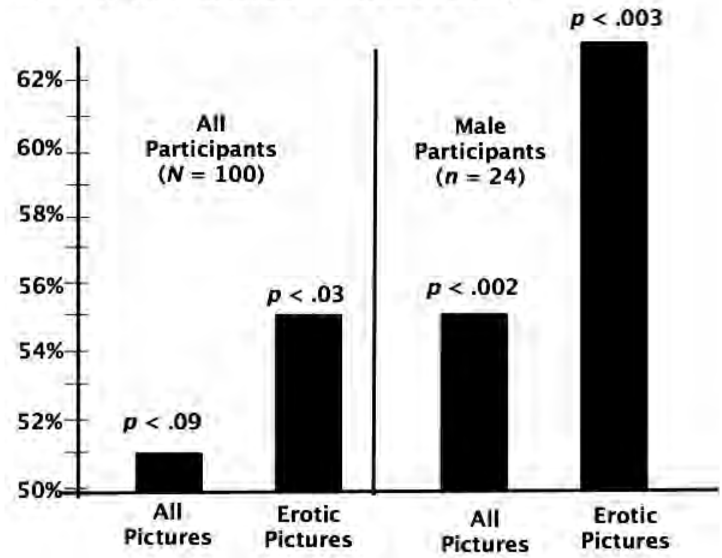
Time-Reversed Influence on Liking

Individuals typically prefer stimuli that have been associated with reward in the past. To test the possibility that individuals might prefer stimuli that will be associated with reward *in the future*, we showed participants in our experiment an emotionally neutral picture and its mirror image side by side on a computer screen and asked them to indicate which they preferred. The computer then randomly selected one of the two pictures to be the "target." When participants preferred the target-to-be, they were rewarded with a very pleasant picture flashed briefly on the screen; when they had preferred the non-target, they were shown a gray rectangle.

There were 36 trials and the experiment took approximately 15 minutes to complete. One hundred college undergraduates participated, 76 women and 24 men. The pictures were selected from the International Affective Picture System (IAPS; Lang & Greenwald, 1993), a set of 820 digitized photographs that have been rated on 9-point scales for valence and arousal by both male and female raters. Several of the pleasant "reward" pictures were mildly erotic; others showed happy family scenes, or exciting activities such as downhill skiing.

If there were no time-reversed influence and only chance were operating, then participants would be expected to select the target on 50% of the trials (because there are 2 alternatives). As can be seen in Figure 1, participants selected the target on 51% of the trials overall, which is not statistically different from chance, but they did show a significantly enhanced preference for the target when they would be rewarded by an erotic picture, 55%, $p < .03$. The right hand side of the figure reveals that the time-reversed influence was particularly strong for male participants: They selected the target picture on 55% of all trials, $p < .002$, and on 63% of the trials on which they would be rewarded by an erotic picture, $p < .003$.

Figure 1. Time–Reversed Influence on Liking



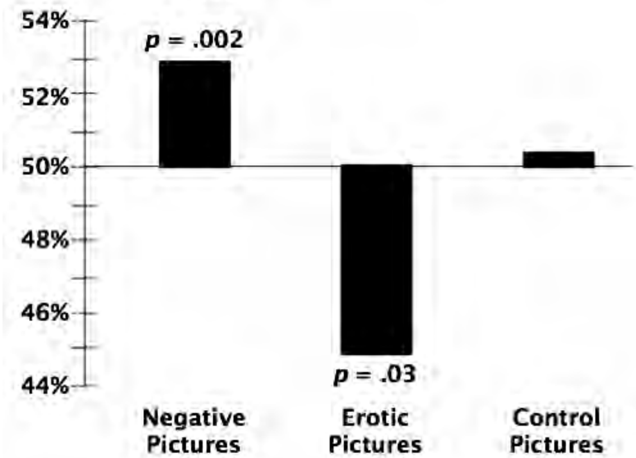
Retroactive Habituation

When individuals first encounter an emotionally arousing stimulus, they typically have a strong physiological response to it. But upon repeated exposures they habituate, showing diminishing arousal to it. If the stimulus is initially unpleasant, the stimulus becomes more neutral or less unpleasant; if the stimulus is initially pleasant, it becomes more boring and, hence, less pleasant (Dijksterhuis & Smith, 2002).

As in the time-reversed liking experiment reported above, we tested for retroactive habituation by presenting individuals with two matched pictures from the IAPS set and asking them to indicate which they preferred. In this experiment, however, one third of the picture pairs were very negative or unpleasant, one third were very erotic, and one third were emotionally neutral ("control" pictures). On each trial, the participant first indicated his or her preference. Then, the computer randomly selected one of the two pictures to be the "habituation target" and flashed it subliminally on the screen several times. The retroactive habituation hypothesis predicts that on trials with negative picture pairs, participants should prefer the target picture—the one that will be shown repeatedly—on more than 50% of the trials because habituation to the target picture will render it less negative than the matched non-target. But on trials with erotic picture pairs, participants should prefer the target picture on fewer than 50% of trials because habituation to the target will render it less positive than the matched non-target. No preference differences are expected on the control trials. In all, 160 college undergraduates participated in this experiment.

As shown in Figure 2, the retroactive habituation effect occurred as predicted: Participants preferred the target on significantly more than 50% of trials with negative pictures but on significantly fewer than 50% of trials with erotic pictures.

Figure 2. Retroactive Habituation (N = 160)



Retroactive Priming

In a typical priming experiment, participants are asked to judge as quickly as they can whether a picture is pleasant or unpleasant, and their reaction time is measured. But just before the picture appears, a positive or negative word (e.g., *Beautiful, Ugly*) is flashed briefly on the screen; this word is called the "prime." Participants typically respond more quickly when the emotional tone of the prime and the picture match (i.e., both are positive or both are negative) than when they do not match.

In our retroactive version of the procedure, the prime appeared *after* rather than *before* participants made their judgments, and we ran both the forward and retroactive variations in the same session. One hundred college undergraduates participated. (A similar experiment using both forward and retroactive priming was reported by deBoer and Bierman, 2006.) The priming hypothesis is that participants will respond more quickly (i.e., will have *shorter* reaction times) when the emotional tone of the prime and the picture match than when they do not, whether the prime is presented before or after participants make their judgment. As shown in Figures 3 and 4 below, this hypothesis was supported in both variations. In the forward variation, participants were 21 milliseconds faster on the matched trials than on the unmatched trials, p < .00004; in the retroactive variation, they were 13 milliseconds faster on matched trials than on unmatched trials, p < .007.

Figure 3. Forward Priming

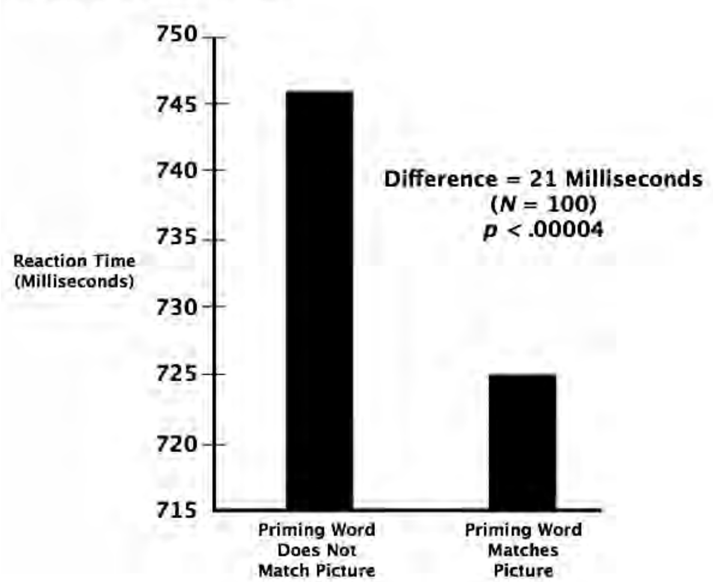
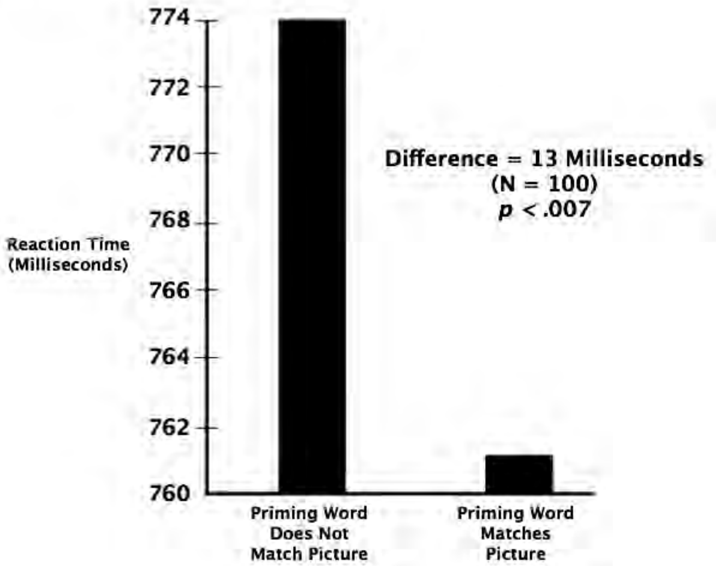


Figure 4. Retroactive Priming



Conclusion

Collectively, the three experiments reported here provide additional evidence for the existence of anomalous, retroactive influences on emotional preferences and judgments.

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Aristotle's Fly - Remarks on Anomaly Research and a Review on the Relationship between Meditation and Psi

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Abstract

In the first part of this contribution the assertion is made that the perception and objectification of facts in science is not only determined by empirical data but also by social processes. This is illustrated by the case of an obvious error by Aristotle which was not recognized for more than two thousand years. Such a social influence can be explained by theories put forward by Ludwig Fleck, Thomas Kuhn and Harry Collins. This analysis has also a large impact on research into the paranormal because it can explain why many true anomalies are regarded as error on the side of the investigator. Furthermore it becomes clear how social processes within science lead to a suppression of knowledge not fitting the central paradigm. As a remedy to this distortion a procedure called mindful science is suggested.

In the second part one area within anomaly research is extensively reviewed, i.e. the relationship between meditation and psi. It can be shown that meditation demonstrated psi-conducive properties in many different experiments within the last 35 years but only one experimental paradigm followed up on such effects systematically. In this paradigm one meditator tries from a distance to assist another meditator in keeping his or her attention. A meta-analysis over these studies revealed a small but highly significant effect of $d = 0.11$ ($p = .009$). Finally a group of studies assessing the effects of group meditation on societal markers such as crime rates and quality of life are shortly reviewed.

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Aristotle's Fly – the longest lasting error in the history of science

Aristotle (384-322 BC) is often considered as the father of the modern natural sciences. He was the first philosopher to develop his ideas in a systematic and logical fashion and also the first to investigate all those phenomena which are transient and perishable such as plants, animals and the human species (Walach, 2005). His prominent role for the development of modern science lies in his rediscovery in the medieval age in central Europe.

When Europe at the beginning of the second millennium settled again after a long period of migration most of the antique writings were lost. A new science slowly developed out of monasteries and prospering towns. Scholars got in contact with the Arabic world through Spain, which was at that time occupied by the Islamic Moors, and through the crusades where besides the main battle fields also writings from the Antique were exchanged. By 1253 most of Aristotle's texts were translated from the Arabic into Latin and available to scholars. After some lively debate the predominant university in Paris declared these writings as the foundation of any study of philosophy and theology, and thus as the groundwork of modern science (Walach, 2005). From this time on Aristotle's writings were the indebatable authority for any scientific dispute.

Unfortunately Aristotle erred in a minor issue (Benz, 1986). In the description of the mayfly in the historia animalium he wrote: "….the day-fly as it is called uses four feet and four wings" (Aristotle, 1979, p. 31). The error was a simple one and every fly alive could display with its six legs Aristotle as wrong. Interestingly this did not happen for more than 2000 years. It was only in 1675 that the famous Dutch scholar Jan Swammerdam (1637-1680) wrote a detailed monograph about the mayfly where the six legs are correctly mentioned and also drawn in a copperplate engraving. But it lasted another 63 years until in 1738 this book was published which is now considered as the first scientific account of a fly with six legs. This date marks the end a period of 2060 years after the death of Aristotle where his error was not corrected but continuously copied from one text to another (Benz, 1986).

This is quite a surprising fact. Flies are not hard to observe, no microscopes or telescopes are needed. They are ubiquitous present and also stop regularly moving so it is not difficult to count the legs. But obviously this simple observation did not take place in the presence of a strong and authoritative statement telling that the fly has four legs. What we can observe here is that a dominating belief by a scientific community can for some time suppress divergent empirical facts observed by single individuals.

I would like to make the point that this is no process limited to the Antique or the Medieval but also present in todays since. The German Ludwig Fleck was a medical doctor and researcher into pathogens in the 1930s. But he was also a philosopher of science and published in 1935 a book entitled "Genesis and Development of a Scientific Fact" (Fleck, 1980) were he described the social processes within scientific communities. According to Fleck scientists have first to be trained to perceive in a particular way before they could start conducting empirical science. In his case this was how to look through a microscope, how to colour pathogens, or how to detect and classify them. An untrained person could not see and identify the same germs than a trained scientist. But what exactly was regarded as a proper observation and what was considered just as an erroneous perception was defined by group of dominant researchers in the field who had to power to decide and thus to define the phenomena to be observed (or not to be observed). Fleck called these implicit rules of observation and reasoning "thought styles" and the group dominating these styles a "thought collective".

Thomas Kuhn continued with this observation in his famous book "The Structure of Scientific Revolutions" (Kuhn, 2004) which was first published in 1962. According to Kuhn science can be broken up in three different stages, 'prescience', 'normal science' and after a period of crisis 'revolutionary science'. In 'prescience' no central paradigm is available yet and different theoretical models run in parallel. In the next stage, called 'normal science' a dominant paradigm has evolved. This notion could be compared with Fleck's 'thought collective'. If many anomalies are building up which are in contradiction with such a central paradigm then the paradigm will be skipped. This results in a 'crisis' followed by a period of 'revolutionary science' in which new frameworks are developed. The interesting point in this model is how science deals within the stage 'normal science' with anomalies or results which contradict the central paradigm. According to Kuhn these are considered as an error on the side of the researcher. If everybody knows that the Earth is at the centre of the Universe and Galileo's observations of alleged Jupiter moons with some dubious new tool are in contradiction with this widely accepted knowledge than something must be wrong with either this fellow from Pisa or the instrument he is using. But of course as can be seen from this example not all anomalies are errors on the side of the researcher, both options 'true anomaly' to the central paradigm or 'artifactual results' are always possible.

One possible solution to the puzzle of Aristotle's fly could be demonstrated here with the social processes outlined by Fleck and Kuhn. Nevertheless the picture is not complete yet. According to Kuhn the anomaly will be detected but considered an error. According to the work by the English sociologist of science H. Collins (Collins & Pinch, 1993; Collins, 1985; Collins & Pinch, 1982) the anomaly might not be even perceived. Collins extends the social processes described by Kuhn und Fleck also to the perceptual system of the individual. He assumes that there is less stability and regularity in the world than we perceive. According to Collins our perceptual system is designed in a way which ascribes actively regularity and order to the world. What we perceive is also influenced by social factors "…because any perception of irregularity in an institutionalized rule is translated by ourselves and others as fault in the perceiver or in some other part of the train of perception" (Collins, 1985, p. 147). Most of the time we are not aware of these processes and Collins compares them with ships in bottles:

Our common perceptions, ..., are like ships in bottles. The ships, our pieces of knowledge about the world, seems so firmly lodged in their bottles of validity, that it is hard to conceive that they could ever get out, or that an artful trick was required to get them in"(Collins, 1985, p. 5f)

So the four legged fly may be considered as such a ship in a bottle and it can be assumed that at that time people only did not dare to mention the six legs but they actually did not perceive them.

The impact of this analysis for the research into the anomalies is enormous. If we according to Collins suppress anomalies in order to find a world of stability and order than we do not have to be surprised that many results of research into the anomalies are not even considered by the mainstream. But if we change the perspective and *explicitly* look for anomalies (rather than to block them out), then, according to the model proposed by Collins, they should pop up much more often than expected.

Empirical Sciences - A Mindful Perspective

If these ideas are thought through consequently than every scientist has to take a careful look at the way s/he perceives his or her phenomena of investigation. The same is true for the dominant paradigm within the area of science she or he is working in. Even more fruitful would be also a reflection on the general presupposition of our modern science (see e.g. Walach & Schmidt, 2005).

In order to arrive at such an undistorted perception and observation of phenomena it will be necessary to step back from all learned and acquired concepts and just to *observe* as unbiased as possible. In terms of cognitive science this would read as an enforcement of data-driven bottom-up processes and a reduction of concept driven top-down processes. Philosophically this comes close to Husserl's concept of phenomenology. But there is also an approach from the East which points into the same direction. It is the Buddhist concept of *mindfulness* as it is described in the Satipatthána--Sutta (Analayo, 2004). 'Mindfulness' is a notion with multiple meanings. It can be a special form of meditation, a personality characteristic or a psychological concept. Here the concept is used as a special way to pay attention as it is described by Jon Kabat-Zinn (2005, p. 108):

Mindfulness can be thought of as moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is in the present moment, and as non-reactively and as non-judgmentally and openheartedly as possible.

Often this way of paying attention is also characterized as *pre-conceptual* in order to emphasize the non-intellectual, not-elaborative, i.e. data-driven mode of observation. Another term within the Buddhist teachings is called *beginner's mind*. It is described as 'perceiving things for the first time' which is a good guideline on how to arrive at such an unbiased mode of observation. What is expressed here can be characterized as 'empirical' in the true sense of the word. But mindfulness can not only be applied to external phenomena but also to the own internal mental processes when practicing science. If these mental activities are considered in a mindful way then there is also a chance to identify at least some aspects of the own inner 'thought styles'. It is the merit of the Buddhist teachings that they stress repeatedly that such a specific way of paying attention, of turning towards a sensual and experience-based mode can be learned in a systematic fashion. In this case the according practice would be mindfulness meditation often also called *Vipassana* (see e.g. Goldstein, 1994; Hart, 1987; Kabat-Zinn, 1990; 1994; Schmidt, 2004; Solé-Leris, 1986).

I would like to propose such a practice of a mindful science as an integral part of conducting high-quality empirical research. I am quite sure that if this method is applied regularly and repeatedly more anomalies will be seen and more six-legged flies will be detected.

Meditation and Psi

After these initial comments on the process of anomaly research in general, I would now like to proceed to a specific topic. The question to be considered in the next sections is whether there is a relationship between *meditation* practice and psi effects. In order to understand the role of meditation for the research into the paranormal at first a closer look at the history of empirical parapsychology is necessary. Next I will outline a couple of typical experimental designs where different forms of meditation were applied followed by a closer look with meta-analytical techniques at one specific experimental protocol. Finally a group of studies assessing the effects of group meditation on societal markers such as crime rates and quality of life (Maharishi Effect) are shortly reviewed.

Historical Aspects

Parapsychological research as we understand it today started with the foundation of the Society for Psychical Research in England in the year 1882. From the 1930s on the research was dominated by what was called later the *Rhine's paradigm*. J.B. Rhine established at Duke University a tradition of looking for psi mainly in card and dice experiments (Pratt, Rhine, Smith, Stuart & Greenwood, 1966; Rhine, 1964). Characteristic features of these studies were that they (i) used forced-choice methods (i.e. the subject had to chose a target from a fixed set as e.g. in the Zener cards), (ii) had many identical trials (iii) applied statistical methods to look for deviations from the mean chance expectation within these data. For the participants this meant that they had repeatedly to guess the right target in many consecutive trials (guessing paradigm). Often they were bored by these procedures and lost their interest in the experiments. The 1960s brought many changes to the society with a lot of people searching for a new orientation, especially with new approaches towards consciousness (Alvarado, 1998). The new field of transpersonal psychology and also parapsychology gave important incentives to this movement. In 1964 Rhea White published a seminal paper which was the precursor to a radical change of the predominant experimental paradigm within the field (White, 1964). In sharp contrast to Rhine, White laid an explicit focus on introspection as a method to understand psi effects:

If we could be conscious of our inner states while producing significant results in an ESP test, this would indeed seen to be a step toward gaining control over the elusiveness of psi (White, 1964, p. 47).

She presented many subjective reports from participants in earlier studies from the literature and outlined a system with four mental steps involved in an extra-sensory perception, with *relaxation* and *attending to the inner processes* being important parts. This was the starting signal for many experimental protocols which assessed psi within what was then termed *altered states of consciousness* (Tart, 1976) or *internal attention* states (Honorton, 1977). In these experiments participants were in hypnosis, deep relaxation or their dreams were assessed. The idea was not only to enforce introspective techniques but also to reduce external 'noise' in order to better focus on internal processes. This turn was backed up by the many spontaneous cases reporting of psi events while e.g. dreaming (Rhine, 1962) or being close to sleep (hypnagogic experiences). Target and calls were not matched anymore by forced-choice methods but by free-response techniques where protocols or sketches were ranked by independent judges according to their similarity with the target. The most prominent experimental paradigm emerging from this period was the *Ganzfeld experiment* (Honorton & Harper, 1974; Storm & Ertel, 2002).

Studies on Meditation and Psi

But of course also meditation is such an internal attention state and the first experimental study on meditation and psi was published in 1970 by Gertrud Schmeidler. The design of this study was simple and straightforward. During a class six students performed a standard ESP test with Zener cards and then a Swami by the name of Madhavananda came to give a short lecture on meditation and relaxation before they performed a breathing exercise. Next the ESP test was repeated and this time students scored significant (p = .01) while the first test was at chance (Schmeidler, 1970).

What followed until today is large set of different studies with great variations in design. Out of these approaches only one experimental paradigm evolved which was repeatedly conducted by different researcher. This is the attention focusing facilitation experiment first published by Braud, Shafer, McNeill & Guerra in 1995, which will be subject to a meta-analysis in one of the following sections. Most of the studies on meditation and psi were conducted in the 1970s with a decline in 1980s and almost no publication besides the one by Braud et al. in the 1990s. In the 2000s meditation research gained a growing popularity within mainstream research due to two circumstances. One is the increasing body of evidence for the relationship between mindfulness meditation and mental and physical health (Grossman, Niemann, Schmidt & Walach, 2004), the other is the growing interest in imaging studies of experienced meditators within neuroscience (e.g. Brefczynski-Lewis, Lutz, Schaefer, Levinson &

Davidson, 2007; Lutz, Brefczynski-Lewis, Johnstone & Davidson, 2008; Lutz, Greischar, Rawlings, Ricard & Davidson, 2004). Here especially the capacity of meditators to reproduce and maintain reliably certain states of consciousness over time is of interest (Lutz, Dunne & Davidson, 2007). This second move towards meditation research after the 1970s is also reflected in parapsychology with several new studies on meditation and psi appearing in the last 5 years.

Experimental Designs in Studies on Meditation and Psi

In this section I would like to outline some designs in Parapsychological research involving meditation and I will describe a representative study for these designs. The most important distinction is whether meditation is treated as a state or a trait. In an experiment applying meditation as a state usually the ESP performance during or immediately after a period of meditation is assessed. If on the other hand meditation is treated as a trait then no meditation has to take place during the experiment. Here either experienced meditators are compared with non-meditators or novices (cross-sectional) or the changes associated with long-term meditation training are assessed over time (longitudinal).

An example of a *state study* can be found in Rao, Dukhan & Rao (1978). They conducted three experiments where they tested meditators immediately before and after a meditation session in an ESP Zener card test. All participants were students of an ashram in Bangalore, South India. The study took place during a period when they had intensive training in meditation. Students were classified as either 'juniors' or 'seniors' depending on their level of expertise in yoga and meditation and data were analyzed separately for each group. With two groups and three experiments six comparisons were made. In 5 out of 6 comparisons there was a significant improvement in hit rate from the pre-meditation to the post-meditation test ($p = .001 - .05$). Interestingly five of the six pre-meditation tests showed significant psi-missing while four of the six post-tests had significant psi-hitting results. They furthermore conducted a free-response test with the same participants. Here a sealed target had to be described in a written protocol before and after meditation. Protocols were rated against the targets by independent judges. Again the participants scored significantly better (p = .05) after the meditation compared to before. There was no consistent pattern of the senior students scoring better than the junior students. Similar designs operationalizing meditation as a state were used by Roney-Dougal & Solfvin (2006; 2008) for a precognition task, by Palmer, Khamashta & Israelson (1979) in a Ganzfeld experiment, and by Osis & Bokert (1971), Rao & Puri (1978), and also Nash (1982) in an ESP tests.

A typical *trait study* was conducted by Schmidt & Schlitz (1989). They did a Psychokinesis (PK) study on pre-recorded targets. Based on a true random process melodic tones of different lengths were mixed with noise of different length and recorded on tape. 568 participants received these tapes with the task to extend the tones and to shorten the noise. Overall the experiment showed a significant PK effect of $p = .049$ or $p = .022$ depending on the method of analysis. Participants were asked in a questionnaire "…whether they had at some time practiced meditation" (p. 9). Meditators showed a significant PK effect ($p = .0005$) while non-meditators reached only chance results. The difference between the two groups was also significant ($p = .0007$). Later on many studies followed a similar approach when they asked their participants whether they practiced a mental discipline (e.g. meditation, martial arts, Tai Chi, hypnosis, relaxation exercises) and then analyzed the results for these two groups (yes/no) separately. But this approach is of course not specific enough to conclude anything regarding the effects of being a regular meditator on psi performance. Interestingly this procedure was initiated by a comment in Bem & Honorton (1994, p. 13) stating that involvement with meditation or mental disciplines in novices was a significant predictor for success in the autoganzfeld studies. But this is only true when this particular predictor was combined with other predictors (reported personal psi experience, prior psi testing). The classification according to "practicing a mental discipline" alone did not yield any significant differences (Honorton, 1997).

A mix of these two approaches, state and trait studies, can be seen in the experiment by Braud & Hartgrove (1976). They recruited ten experienced meditators practicing Transcendental Meditation™ and a matched control group of non-meditators. Participants had to influence a random number generator (PK-test) and to get impressions about a target in a sealed envelope (clairvoyance test) while meditating (meditators) or being at rest (control group). None of the two groups reached any significant result in any of the tests. But meditators scored significantly better ($p = .02$) than non-meditators in the clairvoyance experiment.

Other designs used in research on psi and meditation have operationalized whether the EEG characteristics of a meditation session immediately before an ESP test can be related to the outcome in the ESP test (Stanford & Palmer, 1973); or whether participants trained in a special Tibetan meditation technique for taking-up the suffering and sending-out positive feelings can influence the electrodermal activity of a remote person (Radin et al., 2006).

A narrative review regarding meditation and psi up to 1976 can be found in Honorton (1977), Schmeidler (1994) shortly summarizes the research from 1978-1992, an overview on studies applying meditation in PK-research is available from Braud (1990) and from Gissurarson (1992). More recent studies besides the ones already mentioned above, are by Kozak et al. (2003), Radin (2008) and Bierman (2008). In Kozak et al. (2003) participants were trained for 30 days in Primordial Sound Meditation before EEG correlations between them were measured. In the study by Radin (2008) trained meditators performed better than non-meditators in a psi-task that requested continuous attention. Dick Bierman conducted an fMRI study on a presentiment effects (see e.g. May, Paulinyi & Vassy, 2005) where he also compared in mixed design trained meditators with non-mediators, with meditators tested twice, once while meditating and once while resting (Bierman, 2008).

Overall it can be concluded that although meditation was often applied and yielded many significant results in psi research it did for some reason not have the same success than the Ganzfeld, dream telepathy (Ullman, Krippner & Vaughan, 1989) or *remote viewing* (Utts, 1996) experiments. None of the experiments mentioned here were replicated by another researcher, no standard paradigm evolved. Although meditation in many state-based experiments demonstrated psi-conducive properties this effect was not followed up systematically. From the results of these single studies described here it is difficult to draw a general conclusion, especially if the claim is controversial. It can be concluded that the field was so far studied systemically enough. Current and future studies may close this gap and provide deeper insight on the relationship between meditative states or meditation as a trait and psi effects.

The attention focusing facilitation paradigm

The attention focusing facilitation experiment was first conducted in 1993 by Braud, Shafer, McNeill & Guerra and published in 1995. It was created within a larger program on so called DMILS studies which stands for direct mental interaction in living systems. In these experiments one participants tries to activate or calm another participant from a distance (Braud & Schlitz, 1989; 1991; Schmidt, 2003; Schmidt, Schneider, Utts & Walach, 2004) and usually a physiological parameter was applied as a dependent variable. But when William Braud and colleagues designed this specific study they were in search for a behavioral measure. In this design one participant had to focus his or her attention on a candle. Whenever s/he noticed that his or her mind was wandering s/he returned with his or her attention to the candle and pressed a button. Thus the frequency of button presses within a certain time interval is an indicator of mental distraction from the focus. A second participant was located in a distant and isolated room. No normal means of communication were possible between the two participants. This second person acted as a 'remote helper'. The helper had a monitor which displayed either one of the two experimental conditions, 'Control' or 'Help'. During 'Help' periods "the helper focused her own attention on a similar object and concurrently maintained an intention for the distant participant to focus well on his or her object and remain free from mental distractions and thus be better equipped to succeed in the attentional task" (Braud, Shafer, McNeill & Guerra, 1995, p. 104). During control periods the helper occupied her mind with other matters and tried not to think about the experiment. Overall 16 1-minute periods (8 Help and 8 Control) took place in random and balanced sequence (Schlitz et al., 2003). Sixty participants had on average 13.6 button presses during Control and 12.4 during Help periods respectively and the difference was just significant (p = .049).

In the description of this experiment the word meditation was not mentioned. But the task to maintain the attention on one object and to return to it whenever the mind wandered away is one of the most basic processes practiced in many different types of meditation. Learning to maintain attention for some time to a focus is a necessary condition for many other meditation techniques such e.g. for mindfulness meditation. Narrowing the attention to a single pointed focus and to keep it there is known to result in inner calm and quiescence after so me period of regular practice. Braud et al. conclude in their study:

If the attention-focusing or concentration exercises of the present study are viewed as protomeditational in nature, then the present findings suggest that one person's meditation process may be directly influenced by the concurrent meditation of another person (p. 114).

The question if meditators can support each other through their practice has often been raised. Many people experienced with meditation report that it is much easier to maintain a specific way of paying attention in group with other meditators compared to their single practice at home. Such an effect could be described as a *sangha effect*. Sangha is in the Buddhist tradition the word for the disciples following the teachings of the Buddha, thus a group of meditators are often termed sangha. Although the experiment described above had a somewhat different intention its results may be also interpreted as a support for a paranormal mediated *sangha effect*.

Meta-analysis of Attention Focus Facilitation Studies

From all experiments reported so far this is the only one which was subject to direct replication. Altogether eleven replications were conducted with more or less the same design (Brady & Morris, 1997; Edge, Suryani & Morris, 2007; Edge, Suryani, Tiliopoulos, Bikker & James, 2008; Edge, Suryani, Tiliopoulos & Morris, 2004; Watt & Baker, 2002; Watt & Brady, 2002; Watt & Ramakers, 2003), four of these studies are not published yet.

	Year	*N sessions*	*p*
Braud et al.	1995	60	.05
Brady & Morris	1997	40	.08
Watt & Brady	2002/1	60	-
Watt & Brady	2002/2	60	.41
Watt & Baker	2002	80	.30
Watt & Ramakers	2003	36	.04
Edge et al.	2001	35	.04
Edge et al.	2002	53	.03
Edge et al.*	2003	40	.66
Edge et al.*	2004	69	.54
Edge et al.*	2005	60	.21
Edge et al.*	2006	43	.27

Table 1. Attention focusing facilitation experiments, with year of publication or year the experiment took place if unpublished. All p-values are two-tailed and may thus be different from the original report. * Not published.

Table 1 lists the number of sessions and p-values of these 12 studies. The essential experimental features are the same for all these studies. In every study the task was operationalized in keeping the attention to a candle for a helpee and a helper. The dependent variable was also the same for all experiments. Helpees had to press a button whenever they noticed that their minds wandered away from the candle. All sessions consisted out of 16 one-minute periods in a randomized sequence of 8 control and 8 help periods each, only the 2004 and the 2006 study by Hoyt Edge and colleagues applied 8 2-min periods (4 control and 4 help). Furthermore all investigators applied the same statistics. Thus the studies are similar enough to assume that they test the same effects and they can now be combined using meta-analytical techniques.

Eligible are only k = 11 of the 12 studies with overall N = 576 session as in one of the two studies published in Watt and Brady (2002) an artifact prevented the evaluation of the experiment. For each study an effect-size d was calculated by the formula

$$ES(d) = \frac{t}{\sqrt{df}} \text{ with } df = N\text{-}1 \text{ (Rosenthal, 1994, p. 233).}$$

This is a d-type effect size which means that d = 1.0 stands for a difference of one standard deviation between experimental and control condition. For each effect size an according variance has to be estimated in order to calculate a standard error for the effect size. This variance is here estimated by $\sigma_i^2 = \frac{1}{N}$

In order to combine studies they have to be weighted according to the inverse of their variance which is in this case just N. Next it has to be determined whether it is likely that the database forms a homogeneous data set where all single studies are an estimate of the same true effect size. This can be determined by comparing the variance expected to be found as a consequence of the sampling error with the empirical variance found in the dataset. Homogeneity can be determined by the Q-statistic. For the dataset of the eleven attention focus facilitation studies Q = 15.6 is obtained. Q is χ^2 distributed with $df = k\text{-}1 = 10$ resulting in p = .11. With $\sigma^2 = 0.01$ there remains some variance unexplained by sampling error. But the database is still homogenous enough in order to combine effect sizes by a fixed effect model. Effect sizes are thus integrated according to the formula provided by Shadish & Haddock . For the attention focus facilitation dataset this results in an overall d = 0.11 which is significant at p = .009 (two-tailed).

Thus it can be clearly demonstrated that there is a small but significant overall effect in all these 11 studies. The small effect size may explain why some of the single studies reached significance and others not. This is a question of statistical power with small effects needing large samples in order to find significant effects.

In two earlier meta-analyses we have combined studies from two experimental paradigms . These are DMILS studies with electrodermal activity (EDA) as dependent variable and so called Remote Staring studies also with EDA as physiological outcome measure. These studies were similar in design to the experiments meta-analyzed here and all three designs are testing the effects of a distant intention, operationalized either as helping (attention focus facilitation) gazing (remote staring) or activating and calming (EDA-DMILS). All three meta-analyses yield almost the same effect size as can be seen in table 2:

Experiment	*k*	*N*	*d*	*p*	*95% CI*
DMILS	36	1015	0.106	.001	0.043 — 0.169
Remote Staring	15	379	0.128	.013	0.027 — 0.229
Attention focus facilitation	11	576	0.109	.009	0.027 — 0.191

Table 2. Results from three meta-analyses on distant intention effects, k = number of studies, N = number of sessions, d = mean effect size, p = according p-value, 95% CI = 95% confidence interval of mean effect size.

The close similarity of these results can be regarded as mutual independent confirmation of each of the single meta-analyses. Therefore it can be concluded that the three experimental designs are likely to test the same effect. As in two datasets the dependent variable is a physiological one and in the third a behavioural one it can be furthermore assumed that the effect is independent of the measures applied.

Overall it can be concluded from this meta-analysis that there is a small but very significant effect of distant intentionality or to put it more specifically of remote support in keeping focused during meditation which cannot be explained in conventional terms.

The Maharishi Effect

Finally to complete this review I would like to mention a group of studies from a special context which is also relevant to the relationship between meditation and psi. These are studies which are assessing the so called *Maharishi Effect*, named after Maharishi Mahesh Yogi (1917-2008) the founder of the Transcendental Meditation ™ movement. TM is based on the Vedic traditions of India and promotes an idealistic philosophy where consciousness is primary (Orme-Johnson, Zimmerman & Hawkins, 1997). According to this philosophy the basic field of our universe is a cosmic psyche which is eternal and unbounded. It can be accessed by the individual (transcendence aspect) through practicing transcendental meditation. Maharishi also promoted a theory of collective consciousness existing at different levels (family, community, nation etc.). He predicted based on the so called 'coherence principle' that 1% of a population practicing TM would result in a reduction of crime and other negative tendencies in the respective society (Orme-Johnson, Zimmerman & Hawkins, 1997).

This hypothesis has been tested in many empirical studies on meditators trying to reduce crime rates, to improve quality of life indicators or to lower armed conflicts and wars. A comprehensive overview including critics and rebuttal can be found at *http://www.truthabouttm.org/truth/Societal Effects/Rationale-Research/index.cfm.* I would like to report two examples from this collection, both published in Dillbeck, Banus, Polanzi & Landrith (1988).

The first example is a time series analysis with the two time series "weekly totals of violent crimes for the District of Columbia" and "weekly averages of participants in the group practice of the Transcendental Meditation … program" (p. 475) for 105 consecutive weeks. Analysis were performed for lag -7 to lag +7 and only lag +1 reached a significant effect (p = .02). The according transfer function states that for each increase of one more meditator the crime rate decreases by 0.13 in the following week. One has to take into account that this statement is only correlational but not causal in its nature.

In order to overcome this limitation the authors applied in a second study a *cross legged panel correlation* (CLPC) design which is able to draw also causal conclusions. In this design correlations are followed up in a longitudinal design in order to determine their causal direction. The authors collected crime rates from 160 randomly chosen cities in the US for the years 1964-1978. They also had figures on the percentage of TM trained population in these cities from 1972 to 1978. Crime rate changes were calculated and the data were controlled for social variables which had a significant influence on crime rate. Out of 7 years assessed (1972-1978) five showed a significant negative correlation in the range from $r = -.143$ to $r = -.216$ between crime rate change and population practicing TM. Even more interesting is the causal CLPC analysis where the data from 1972 were contrasted with those of later years. Out of six analyses two showed a significant effect ($p < .05$) supporting the Maharishi effect. These are interesting and challenging reports with sound methodology and they deserve similar like the results of the meta-analysis reported above a critical discussion and of course independent replications.

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THE EMOTIONAL NATURE OF GLOBAL CONSCIOUSNES

Roger Nelson*

Abstract

Over the past 10 years, the Global Consciousness Project has repeated a basic hypothesis test about 250 times. The hypothesis is that data collected from a globally distributed network of physical random sources during major world events will show non-random structure. The research derives from laboratory work with individuals, exploring possible interactions of human consciousness and emotions with physical systems. A technology using Random Event Generators (REG) for assessing such interactions was extended to field work with groups, and ultimately to a world-spanning network collecting random data continuously to allow assessment of globally shared cognitive and emotional states.

The composite result (equivalent to a meta-analysis of replications) across all formal tests confirms the general hypothesis with a 5 sigma departure from expectation. The chance probability is less than 1 in 10^6, but the average effect size is small, equivalent to about 0.3 sigma. This means we cannot expect individual events or hypothesis tests to provide answers to specific queries about what factors are important contributors to the effect. However, by sorting the events into a limited set of categories, we gain sufficient statistical power to ask such questions.

Several emotions are identifiable at various levels in the world events, and subjective ratings can be made with good reliability. While not all events can be assigned to such categories as William James' four basic emotions, or the modern set used by Klaus Scherer's Geneva group (Scherer, 2005), categories such as "fear/anxiety", "positive feeling", and "compassion/love", all yield adequate samples to assess the presence of

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these emotions in an operationally defined "global consciousness". Events with either strong positive or strong negative valence produce significant effects, while neutral events do not. The level of emotion regardless of valence is a highly significant predictor ($p < 0.005$). The largest effect sizes in the database are produced by events characterized by fear (4.5 sigma), or compassion and love (3.6 sigma).

Our findings suggest that:

1) an unknown mechanism links consciousness with physical systems, yielding detectable changes in their behavior,

2) there is a non-local interconnection of human consciousness at an unconscious level, and

3) an operationally defined "global consciousness" is emotionally responsive in ways familiar from studies of individuals and groups, giving the construct face validity.

Introduction

In 1995, when Israeli Prime Minister Yitzhak Rabin was assassinated, a continuously running random event generator (REG) in the School of Engineering at Princeton University showed a strong departure from its expected behavior. While this might have been a coincidence, albeit against 100 to 1 odds, another possibility is that the correlation between the terrible and saddening world-changing event and the REG's deviation from random behavior might be meaningful, not accidental. We had, in the Princeton Engineering Anomalies Research (PEAR) program, already found that an REG in a social context conducive to deeply shared emotions or coherent states of mind often showed persistent deviations from expectation. This research paradigm, started in early 1993, was called "FieldREG", in a double entendre referring to field studies looking for evidence of consciousness fields (Nelson, et al., 1996, 1998b). The overall results of this program over several years and about 90 applications (independent hypothesis tests) were highly significant, with odds against chance on the order of a million to one.

The work was replicated in other labs (Radin, et al., 1996; Bierman, 1996), and variations examined effects of differing venues, types of events, and factors such as geographical separation and the use of multiple REG devices. Although the FieldREG paradigm is in principle a "natural experiment" in the sense that no manipulation of conditions is feasible, it is possible to do comparative assessments by selecting the occasions and venues for data collection in well-defined categories, and by prospectively identifying periods of time and hence data subsets corresponding to particular moods or levels of emotion (Radin, et al., 1996; Nelson & Mayer, 1997; Nelson, et al., 1998b; Blasband, 2000).

In 1997, these explorations matured to a prototype for the network approach used by the Global Consciousness Project (GCP). In January, data were collected from 14 REGs in Europe and the US before, during, and after an event called Gaiamind, which was a widely advertised and promoted meditation event. The composite data during the synchronized meditation showed a significant departure from expectation (Nelson, 1997). In September 1997, the same ad hoc arrangement was made to collect data during the funeral ceremonies for Princess Diana, and a week later, for Mother Teresa. The nominally random data from a dozen REGs showed statistically significant structure during the former, but not the latter event (Nelson, et al., 1998a). These results and those from the earlier FieldREG research motivated a decision to create a long-term experiment that would enable us to ask the same kind of question about other great events on the world stage.

A group of colleagues designed a conceptually simple, though technically sophisticated long-term experiment. Skilled programmers created software to collect data continuously at nodes in a synchronized, globally distributed network and transfer the data over the Internet to a central archive using secure communication protocols. The GCP network began operation in late 1998 with a few nodes and grew to its present scope of about 65 nodes over the next few years (Nelson, 2002). Each node consists of a research grade physical REG and custom software to collect and sum 200 bits per second, store these "trial" values locally, and transmit them automatically to a server in Princeton for archiving and later analysis.

Procedure

The general hypothesis of the GCP is that there will be correlated structure found in the nominally random data during major events in the world that engage the attention of large numbers of people. This proposition is tested in a series of replications formally specified in a registry prior to examination of the data. The beginning and end of the event are defined, and the corresponding data are extracted for analysis using the pre-specified statistical procedure (Nelson, et al., 2002; Nelson & Bancel, 2006; Bancel & Nelson, 2008). The selection of events is determined by what is happening in the world and is largely dependent on media interest. A variety of types of events have been assessed, including wars, terror attacks, major accidents, and natural disasters on the negative side, and celebrations, religious gatherings, organized meditations, and peace demonstrations on the positive side. The criteria for selection are not algorithmic but focus on events that generate deep engagement and widespread, potentially global interest. The selection has been designed to explore a range of types of events that might yield informative results, including comparisons of factors such as emotional categories and levels, and contrasts of emotional vs. intellectual content.

It is important to note that while the events are not chosen according to algorithmic or fixed criteria, the hypothesis testing in the formal GCP experiment is statistically and scientifically valid. All parameters are specified in advance of analysis for each of the individual events, and results for all the analyses are reported and included in summary statistics. Thus, although we are not attempting to falsify a theory, each of the events in the replication series is a fully qualified hypothesis test with an interpretable outcome expressed in a statistic that can be evaluated against a theoretical or empirically derived distribution. The experiment as a whole can be described as testing a composite hypothesis that generalizes the separate event-based hypotheses, addressing the question whether there is evidence for structure in the GCP data correlated with major events.

Most events are assessed with a standard analysis called the “network variance” (netvar), which produces a Chisquare distributed quantity with 1 degree of freedom for each second during the event. The netvar is the squared Stouffer Z, or Chisquare across the *n* REGs, $\chi^2 = \sum_i^n z_i / \sqrt{n}$. Chisquare is additive, allowing calculation of a figure of merit for the event as the sum of second-by-second Chisquares over the duration of the event, with degrees of freedom equal to the number of seconds. This is reported as an equivalent normal Z-score (sigma) for the event. A few events are assessed with a device variance (devvar) measure, which is simply the variance across the trial scores for the *n* REGs per second. With appropriate normalization, these can be aggregated with the rest of the series since they ask the same basic question whether there are anomalous deviations during the specified events. Some 247 formal replications of the simple experiment have been made over the lifetime of the GCP, and they can be combined to yield an overall statistic representing the general hypothesis that the random data may show structure correlated with major events.

Results

The bottom line result for the 9-year database of formal replications is a roughly 5 sigma departure from expectation (Z = 5.121 as of March 2008), which translates to odds against chance of somewhat more than a million to one. That is, chance fluctuation is a very unlikely explanation for the accumulated evidence across 247 tests of the hypothesis that there will be *structure in the GCP data correlated with major events* in the world. Figure 1 shows this result graphically as a cumulative sum of departures from expectation over the series of tests. There is a tendency for the individual outcomes to have a positive deviation in accord with the prediction, and this accumulates fairly steadily over the long sequence of replications. Such a graph should show an unbiased random walk with a generally level trend if there is no anomalous correlation, and this is indeed what we see when we create control “trials” by resampling from the full database using the same trial structure. But the actual data corresponding to the registered events of the formal experiment show a trend of accumulated positive deviations. Although the individual hypothesis tests yield small and variable effects, the composite yield is highly significant evidence for the hypothesized correlation.

Figure 1. Cumulative total deviation of results for 247 formal hypothesis tests. The dotted smooth curves show the 5% and 0.1% significance criteria. A truly random trace would fluctuate around a level trend at zero on the ordinate.

We thus have persuasive statistical evidence of non-random behavior in a network of research quality physical REGs, apparently driven by shared emotions or broadly synchronized attention of humans. It is important to re-emphasize, however, one aspect of the finding that is not immediately apparent: While the 5-sigma result is impressive, it is a concatenation of small effects accumulated over a large database. For an individual event the best estimate is the average Z-score, which is $\overline{Z}$= 0.313 calculated over the 247 events. This means that we cannot expect individual events to reliably show significant deviations. On the other hand, it may be the case that certain kinds or categories of events will have larger (or smaller) effects on average, a question we will consider in some detail.

Emotional Categories

The name "global consciousness" may seem to imply a theory that we hope to test but our intent is more modest. The term is actually an operational definition. We propose that when very large numbers of people are deeply engaged by shared thoughts and emotions, a condition is created where we will find anomalous structure in data from the REG network. This is what we call global consciousness. Going a step further to study this operationally defined condition, we can look for recognizable or familiar qualities, asking whether it exhibits properties that are similar to ordinary individual consciousness. For example, is there any evidence that the effects we see relate to emotional categories in a systematic way?

Although ratings and assignments are necessarily subjective and have intrinsic variability, it is possible to sort the 240-plus events into categories that represent various questions. For example, we can estimate the numbers of people engaged by the events and sort them into small, medium, and large categories with sufficient reliability to make useful comparisons. Simple t-tests of differences in effect size reveal that large events contribute most of the anomalous effect in the database; the difference between large and small is significant ($p = 0.017$, two-tailed). We might interpret this as showing that a more complete or intense focus of our communal consciousness produces a stronger effect. This accords with most observers' intuitions; it makes sense and acts like comparisons of a similar nature in psychology and sociology.

It is yet more interesting to look at emotions represented in the events, as shown in Figure 2, which shows the formal events with high, medium, and low levels of emotional content.

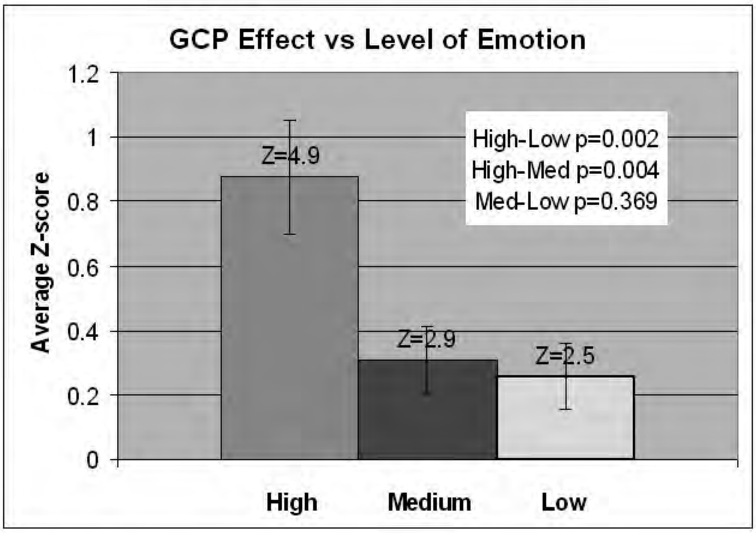

Figure 2. Formal events sorted into levels of emotion show significant differences between those with high levels or intense emotions and either low or medium levels. Error bars are 1 sigma.

When we examine this question statistically, we find that events categorized as having a high level of emotional impact are much more likely to affect the GCP network than those rated as medium or low in their emotional content (two-tailed p = 0.004 and 0.002, respectively).

Again these accords with reasonable expectations derived from personal experience. If we are powerfully engaged by an emotional state, it will absorb our attention and resources, and will have relatively strong effects if we take actions. High emotions are easy to detect or, conversely, hard to escape or obscure. They gather us into a singular and sharply focused mode that is functional, preparing us, for example, to "fight or flee". While the GCP data can't be interpreted so richly, they show clearly that stronger emotional content in our formal events corresponds to greater correlated deviations.

When we ask about different qualities or kinds of emotions, we find that both negative and positive feelings (e.g., fear and love) are associated with strong effects in the GCP data at roughly the same level, as shown in Figure 3. Events that evoke neither of the extremes show apparently less powerful effects, but none of the differences in valence are statistically significant.

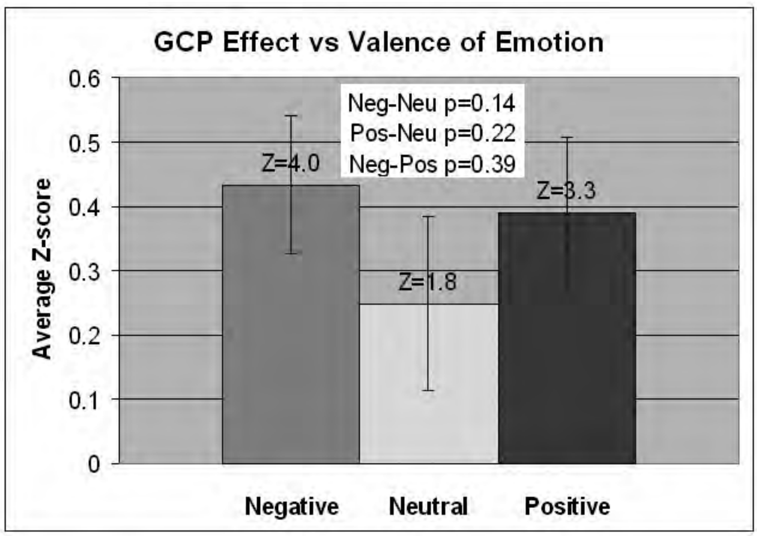

Figure 3. Formal events sorted into negative vs positive emotions show little difference between the categories, while both have significant effect sizes relative to expectation. One sigma error bars.

Looking at specific emotions, we find that some stand out. For example, those events that evoke or embody a high level of compassion have a much larger effect size than those with a low rating (two-tailed $p = 0.025$). Figure 4 displays the average Z-scores for three groupings representing high, medium, and low estimates of the degree to which love and compassion are found in the events. Those with a high level have an effect size almost twice the average in the full database.

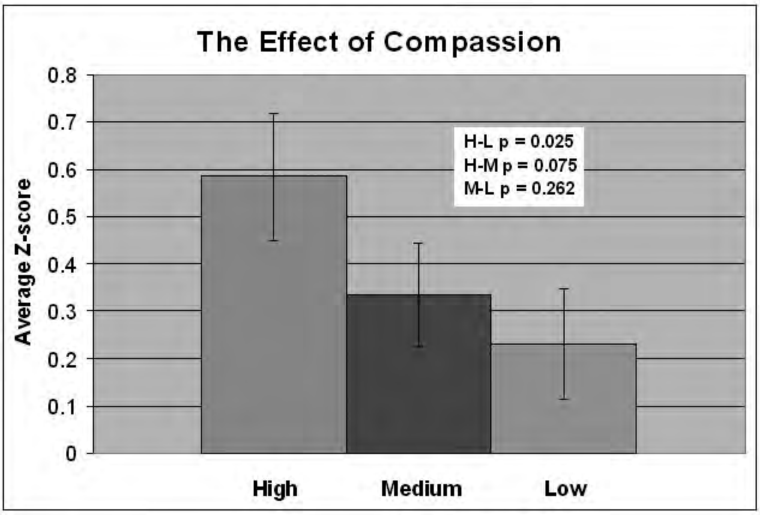

Figure 4. Formal events sorted by the estimated degree of compassion evoked or embodied by the events. Effect sizes are proportional to the strength or depth of the emotion. One sigma error bars.

To summarize the findings across a number of such investigations of the GCP data, it appears that our hypothesized global consciousness responds to events in ways that are recognizable, indeed quite familiar to us as individuals. In the 19th century, William James wrote about emotions, attempting in his inimitable prose to say what emotions really are. His idea, at first very difficult to understand or believe for most people, was that emotions *follow* physical responses to situations – we run because we are afraid, not the other way around (James, 1884). The idea has been discussed and disputed over the decades, and it seems contrary to the "fight or flee" proposition cited earlier. Nevertheless, it is fair to say that his simple categorization of emotions is still worth considering. He suggested that most emotions could be allocated to just four categories, fear, love, grief, and rage. Figure 5 shows the GCP results assigned to this simple scheme, which also reflects in a general way more contemporary work on emotions attempting to define and clarify their role (Ekman, 1999; Scherer, 2003). We see that most of the events can be accounted for in this very basic set of emotions, with a small number that don't fit. The result is interesting, and suggests that by far the largest contributions to our bottom line come from the two general emotional domains signified by fear and love. Only relatively few events in our database can be identified with the emotions of grief and rage (see the large error bars), but in the sample we have, neither category produces a significant deviation from expectation.

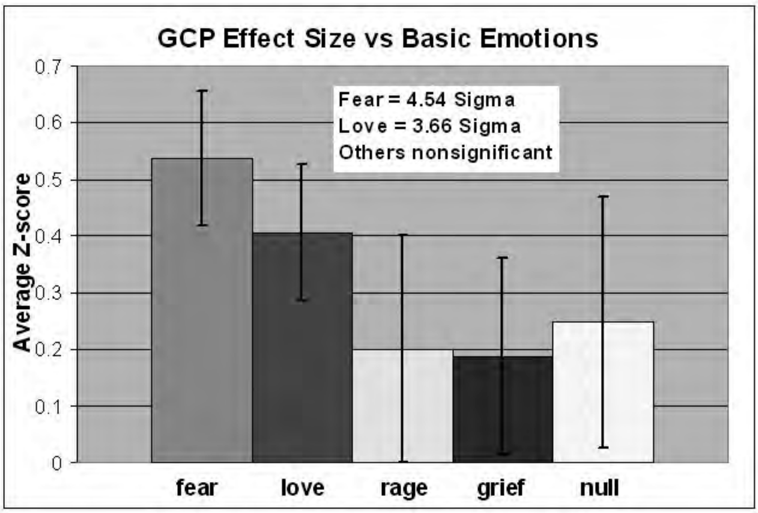

Figure 5. A general model of basic emotions described by William James in the 19th century is fitted to the formal GCP event scores. The result shows fear and love significantly impact the REG data, but rage and grief do not. One sigma error bars.

Multiple Perspectives

The search for explanations and for causal relationships remains ahead of us, but work toward that end already yields interesting results. Over the past several years, the GCP analysis has benefited from applying an array of sophisticated and powerful statistical tools (Bancel & Nelson, 2008). This work includes description of independent perspectives and measures that confirm the original analyses. It begins with a rigorous normalization using empirical estimates for the mean and variance for each of the s (this ensures that the results are not affected by the slight variations expected from real-world devices relative to theoretical randomness). Given the normalized data, it is possible to create a number of informative pictures in addition to the event-based analysis, for example, visualizing long-term changes and structure. This allows us to look at overall trends and at correlations of the data with external variables representing social issues and conditions.

In an earlier analysis, we found that average daily correlations among the REGs are slightly stronger when an independent measure of "news intensity" is high (Radin, 2002). This is a similar perspective to that provided by categorizing the events according to the level of emotion evoked, but with a broader, more general purview. When we look at the database as a whole (that is, all the data, not just the segments that constitute the formal event experiment), it becomes evident that there may be some general structure – the data are not a simple random sequence. A long and steady trend begins late in 2001 and persists for several years, and it can be established through analysis of statistical models that this trend is significant, with a likelihood on the order of 1 in 100 that it is chance fluctuation. This is an indication that our long-running database of physical random numbers is affected by external factors which, if we can identify them, will richly inform our understanding.

It seems especially appropriate to consider psychological or social measures with a global reach. There are numerous possibilities in principle, but useful comparisons require a long term database of repeated measures on the variable in question. For example, public opinion polls often ask similar questions to allow comparisons of ratings over time, and some questions are essentially constant. An interesting candidate measure for our purposes is presidential approval ratings drawn from repeated polls over the years. In the event-based experiment we have seen that the network variance statistic correlates with short periods of collective, emotive behavior. Here we ask whether emotive behavior which fluctuates on a time scale of weeks and months can also be seen to correlate with our measure of global random data. When we compare the polling data sequence with the GCP network variance, there is some similarity in the overall trends and suggestive matching of details. Figure 6 shows the long-term GCP data sequence, which should be a level random walk, together with the sequence of poll ratings of presidential approval drawn from the repeated instances of the question in several different polls. The data are rescaled for plotting at the same level, allowing a visual comparison of trends. A simple 2-parameter model (current value and 14-day slope) of the polling data attempting to simulate the GCP data yields parallel structure that is even more striking than the raw data comparison, and the parametric correlation is significant.

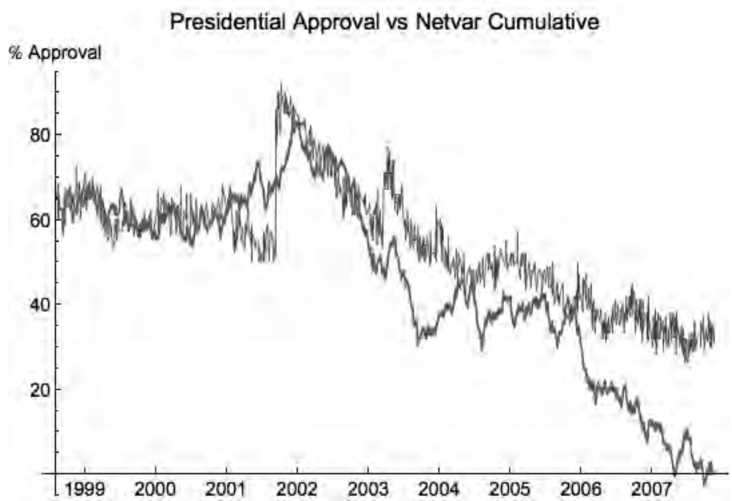

Figure 6. Cumulative deviation of the GCP network variance (smoother curve) compared with raw Presidential approval ratings from 14 US polling firms (sources:pollingreport.com,ropercenter.uconn.edu). Netvar scale is adjusted to plot the two curves in the same numerical range.

Thus, over the long term, GCP data appear to be correlated with a sociological measure, the presidential approval rating. This is largely a US-centric measure, but the powerful effects of decisions by the US president in the rest of the world make the polling data a useful window into the global state of consciousness. We do not claim or wish to suggest that there is a causal relationship with feelings of approval (or not) directly affecting the GCP data. Instead, we can think of this result as an interesting plausibility exercise, which encourages ongoing efforts to establish linkages of GCP data with other indicators of broadly shared perceptions and emotional states.

Discussion

The Global Consciousness Project is first and foremost an empirical exercise. It is a network of high-quality physical random event generators using software and the Internet to create parallel, synchronized sequences of numbers which are expected to meet the classical definitions of randomness. Calibrations and sophisticated analyses, including a detailed vetting to eliminate any bad data produced by the occasional malfunction, show that the data do in fact meet such standards. We find the devices are stable over years of operation, with infrequent instances of excluded data usually traced to hardware failure or electrical supply problems. The final normalizations produce approximately standard normal trial values which can be safely input to analyses; the parameters for the first four moments of the distribution of data from the formal events show expected values (Bancel and Nelson, 2008). Simply put, the continuous sequences of GCP data satisfy all standard criteria for randomness. This is the background for our experimental work.

The event experiment was designed to allow exploration of a number of questions beyond the attempt to determine whether there is non-random structure in the data that correspond to global events. For example, given the discovery of such structure, we ask what factors contribute to the effects we find. We can look for internal variations depending on distance, either from the nominal locus of the event, or between the REGs in the network. We can look for correlation with geophysical and cosmic variables, and assess time series characteristics such as diurnal variation. But for the purposes of this paper, we address the influence of event types, in particular, categories corresponding to ordinary human emotions.

This exploration reveals that there are very strong differences of effect size depending on emotive categories, and while the analysis depends on subjective estimates of levels and kinds of emotion, the agreement of independent raters or categorizers is good. Since the data and results are fully accessible to the public via the GCP website, we can invite independent assessment of the questions. Three such efforts have been made, albeit in an informal way. They all confirm our general findings, including the effects of emotional level and valence, and one of the independent assessments which specifically focused on love and compassion confirms our result for that question. We can conclude that although the "global consciousness" under discussion is simply an operationally defined concept, it gains some ecological or face validity based on the second-order structure discovered through the categorization analysis.

The GCP event experiment provides evidence for an anomalous effect on random event generators, apparently linked with human consciousness. The effect is too small to be clear for single events, with an average effect size of about 0.3 sigma. But in the long series of replications over almost 10 years, the composite result is statistically significant with probability less than 1 in a million that we are looking at chance fluctuation. Even more interesting, the data and the deviations from expectation have internal structure that makes the picture compelling. The findings suggest that whatever drives the data to deviate from randomness is responsive to or modulated by emotional characteristics of the events. We draw three primary conclusions:

1) subtle changes in the behavior of physical random processes are linked with identifiable special states of human consciousness,

2) the event correlations imply non-local interconnection of human consciousness at an unconscious level, and

3) the conceptual "global consciousness" thus produced is emotionally responsive in ways familiar from studies of individuals and groups.

This is far from saying that there is a real "global consciousness" that exists independently from our interactions and activities, but there is a clear implication that we should be looking for some way to understand the apparent functional interconnection of great numbers of people via their shared responses to events. Even on a global scale, it may be that emotions play the useful role described by Ekman: "the primary function of emotion is to mobilize the organism to deal quickly with important ... encounters, prepared to do so by what types of activity have been adaptive in the past." (Ekman, 1999)

The effects and the secondary structure in the data are not predictable from the standard models of physics and psychology, but they are significant and robust against efforts to find mundane explanations for them. We do not have a working explanatory model, but the focus of our continuing analytical work is to locate and define more sharply the anomalies in the data, looking for parameters and dimensions that will constrain the possible models. Some of these are in the physical realm, e. g., distance dependence, and some in social and psychological areas such as those discussed here, but also including more quantitative measures, e. g., news coverage statistics. These efforts should lead ultimately toward the ability to ask more formally whether there is a true global consciousness in the making, and if so, what that implies for us as individuals and societies.

Acknowledgements

The Global Consciousness Project would not exist except for the immense contributions of Greg Nelson and John Walker, who created the architecture and the sophisticated software. Paul Bethke ported the software to Windows, thus broadening the network. Dean Radin, Dick Bierman, and others in the planning group contributed ideas and experience. Rick Berger helped to create a comprehensive Web site to make the project available to the public. Peter Bancel has been a major contributor to the analytical program. The project also would not exist but for the commitment of time, resources, and good will from all the hosts of network nodes. Our financial support comes from individuals including Charles Overby, Tony Cohen, Reinhilde Nelson, Michael Heany, Alexander Imich, Richard Adams, Richard Wallace, Anna Capasso, Michael Breland, Joseph Giove, J. Z. Knight, Hans Wendt, Jim Warren, and major donations from an anonymous contributor. We also gratefully acknowledge online donations from many individuals. The Institute of Noetic Sciences provides logistical support as a non-profit home for the project, and the Lifebridge Foundation has provided generous support for documentation of the GCP. Finally, there are very many friends of the project whose good will, interest, and empathy open a necessary niche in consciousness space.

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PSYCHOPHYSIOLOGICAL STUDIES OF PSI AND EMOTIONS

Dean Radin*

Introduction

Psychic or "psi" phenomena refer to commonly reported experiences suggesting unknown forms of communication between people, or between people and objects, that are separated by space or time and are thus not mediated through the ordinary senses. Case studies of spontaneous psi experiences show that these experiences are often associated with emotional events. Consider the following example, one of thousands of such reports collected by Louisa Rhine and others[1-2]:

One Thursday morning about 4 a.m., I jumped out of bed, feeling as if I was dying. I felt as if blood or something was pouring down from my head choking me and I was trying desperately to get my breath. My husband got up to help me. He tried to get me to the bathroom for some water to drink to stop the terrible choking spasms I seemed to be having. They soon diminished and I grew very weak. I thought I must be really dying. My husband put me down on the bed where I rested but felt so "all gone". Then I thought my son had called, saying "Oh, Mama help me," in such anguish. Later in the day I went to the doctor for an X-ray of my chest. I thought with such acute pain that something must be wrong. But the doctor could find nothing. That was February 10th and on the 12th we received a telegram saying our son was killed by gunshot in the head at one o'clock on February 10th. There is a nine-hour difference in time. I feel he called me as it happened, and I heard his groan and felt his dying. [1, p. 138]

This type of experience has been dubbed a case of "crisis telepathy," usually involving an emotional episode amplified by deep emotional bonding between the individuals involved.[3,4] A second class of psi expe-

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rience associated with high emotion is the precognitive dream,[5] and a third is called recurrent spontaneous psychokinesis, also known as poltergeist activity.[6] The latter cases involve anomalous movement of objects associated with a prepubescent "agent" typically one whose hormones are raging but whose emotional expressions are suppressed.

While reports of such experiences are legion, and at face value the link to emotion seems plausible, to gain better confidence that these phenomena are what they appear to be, over the past few decades investigators have begun to conduct controlled laboratory investigations of the psi-emotion relationship. Many of these studies have focused on unconscious emotional responses as detected by changes in the autonomic or central nervous system. What follows is a brief review of three classes of such experiments.

Emotional Names

Douglas Dean was one of the first investigators to use a psychophysiological method of studying the effects of emotions in modulating psi perception.[7-8] Dean asked a percipient (acting the role of a telepathic "receiver") to write down emotionally meaningful names on cards, names known only to the percipient. These cards were later shuffled randomly into a deck containing an equal number of blank cards. The percipient was then asked to relax while his or her fingertip blood flow was continuously monitored using a photoplethsymograph. Meanwhile, a distant agent (acting the role of a telepathic "sender") was also asked to write down names on cards, names known only to him or her, and those cards were randomly shuffled into that deck as well. Now the agent was asked to look at and mentally "send" each card for 30 seconds, one at a time, to the percipient.

The telepathy hypothesis predicted that when the agent was sending names only known to him or her, or blank cards, that the percipient would remain calm. But when sending emotionally charged names known only to the percipient, then the percipient would experience an emotional response resulting in sympathetic arousal, which in turn would stimulate vasoconstriction in the periphery, and thus fingertip blood flow would decline. As shown in Figure 1, in repeated trials this is what Dean found.[6]

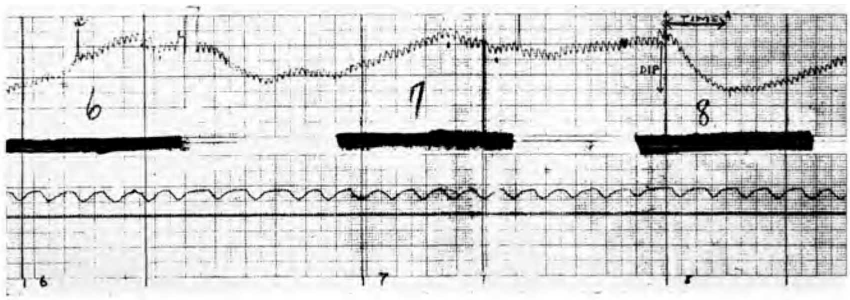

Figure 1. From Dean (1962). During stimulus period 6 the agent looked at a name known only to himself. Period 7 was a blank card control, and during period 8 the agent looked at a name known only to the distant percipient.

Two decades after Dean's publication, Haraldsson reviewed conceptually similar experiments, all using plethsymographic recordings as detectors of psi responses, and most using emotional stimuli (names, auditory or visual stimuli, electric shock, etc.).i He found 11 replications reported by 10 investigators, of which seven were reportedly significant at $p < 0.05$. An unweighted Stouffer Z of this group of studies results in $z = 4.99$, $p = 2.96 \times 10^{-7}$. The extent to which selective reporting may have biased this replication rate is unknown, but based on meta-analyses which have examined the "filedrawer" effect for other classes of psi experiments, it seems implausible that the entire result can be entirely attributed to selective reporting.[10] This suggests that emotions may indeed act as modulators, or perhaps as attentional amplifiers, of psi perceptions.

Gut Feelings

Over time, the emotional names experiments became subsumed into a larger class of psychophysiological studies known as Direct Mental Interactions with Living Systems (DMILS). Most DMILS studies have not explicitly involved modulation of emotions, but rather sending calming or activating intentions, or merely directing attention, towards another person. In an exception to this rule, Marilyn Schlitz and I studied the commonly reported experience of viscerally experienced intuitive hunches, or "gut feelings," about the emotional state of another person at a distance. This experiment specifically tested whether a percipient's gut, as measured with an electrogastrogram, would respond to a distant agent's emotions.[11]

In this study, 25 pairs of volunteers were recruited. Each pair mutually decided who would take the role of agent (or sender, S) and percipient (or receiver, R). R was invited to relax in a reclining chair in an electromagnetically and acoustically shielded room. Three Ag/AgCl electrodes were applied to R's abdomen. The resulting electrogastrogram (EGG) signals were amplified by a Biopac EGG amplifier and digitized by a Biopac MP150 physiological monitor. After confirming that R's EGG was recording properly, the experimenter (E) focused a video camera on R's face, and R was asked to relax while attempting to maintain a "mental connection" with S. R knew that S would be watching him or her periodically over closed circuit video, but R did not know the timing, length, or frequency of those periods. R listened to a meditative tone over headphones to encourage relaxation and to provide additional acoustic masking. To encourage a mutually shared state of mental connection, before S left for the sender's room, the two participants were asked to exchange a personal, meaningful item, like a watch or ring. They were each instructed to hold this item in their right hand during the remainder of the experimental session. Then S was led to a room about 15 meters away.

S was invited to sit in front of two video monitors and asked to wear a set of active noise-canceling headphones to block external sounds. One video monitor periodically displayed R's live image; the other displayed a sequence of pictures. The stimulus pictures were selected from the International Affective Picture System, a standardized pool of color digital photographs with pre-assessed ratings for emotional arousal and valence.[12] Music was selected from popular songs and movie soundtracks to evoke emotions, as described below.

Digitized signals from the R & S physiological monitors were transmitted over a local area network to two Windows-based personal computers (PCs). The experiment was controlled by a third PC which ran a program that randomly selected one of two counterbalanced sequences of emotional conditions. Each sequence consisted of a 30-second inter-epoch rest period, followed by a two-minute epoch presenting one of four emotions: positive, negative, calming, or neutral. After four epochs were presented, the same sequence was repeated using new pictures and sound for the positive and negative conditions, and the same pictures and sound for the calm and neutral conditions.

To avoid psychological and physiological habituation to the emotional stimuli, S viewed a series of 20 different pictures during each sending epoch. Each picture was displayed for 6 seconds, and each picture within a given sending epoch was selected to have approximately the same IAPS-standard valence and arousal level. At the beginning of each sending epoch, the computer switched R's video image to one monitor in S's room, sent electrical marker signals to the R and S Biopac systems to synchronize the two sets of physiological recordings, started playing music to S that was appropriate to the emotional condition, and also displayed the stimulus pictures to S on the second video monitor. During the inter-epoch rest periods, one monitor was black and the other presented the word "relax" in green on a black background.

Positive emotional stimuli included photos of smiling babies and kittens. Positive epoch 1 was accompanied by the Beatles' rendition of the song *Twist and Shout*, and positive epoch 2 by Little Richard's song, *Long Tall Sally*. The negative emotion epochs included a sad theme, which used pictures such as a graveyard accompanied by Samuel Barber's *Adagio for Strings,* and an angry theme, using pictures such as an atomic bomb explosion and accompanied by the song, *Feuer Frei*, by the German heavy metal rock band, Rammstein. The calming epoch consisted of low-arousal IAPS pictures transformed into gray-scale images, accompanied by the song, *May it Be*, by the New Age artist, Enya. The neutral epoch pictures were all gray-hued rectangles accompanied by pink noise. The inter-epoch rest periods were accompanied by the same pink noise.

The eight epochs presented in each session could appear in one of two orders: Order I consisted of calm, negative-sad, neutral, positive-2, calm, negative-angry, neutral, and positive-1. Order II was the reverse of Order I. The order assigned to a given session was determined randomly by the controlling program. Two orders were provided to keep both E and R blind to the emotional condition sequence during each recording session, and to allow an assessment of potential EGG baseline drifts. Each experimental session thus consisted of eight two-minute sending epochs, each separated by a 30-second rest period, plus a two-minute cool-down period before the session began, for a total of 22 minutes. R and S were allowed to relax with the electrodes in place for about 10 minutes before the session began. During sending epochs, S was instructed to periodically gaze at the video image of R with intention to send the emotions evoked by the stimuli. Between epochs, when the video screen went black, S was instructed to withdraw his or her attention from R and relax.

A total of 26 sessions were conducted, resulting in a total of 208 epochs, 52 in each of the four emotional conditions. Five of the 208 epochs were only partially recorded due to equipment failures, resulting in 52 positive, 51 negative, 51 neutral, and 49 calm usable epochs. Among Rs there were five males and 21 females (mean age 45), and among Ss there were 12 males and 14 females (mean age 44). Participants in all cases knew each other, some as friends and others as long-term partners. Two pairs were run twice with the S/R roles reversed, and two individuals participated in four sessions, each taking S and R roles twice.

Figure 2 shows the average maximum EGG values recorded during the different emotional epochs pooled across all participants, with one standard error bars. Comparison of the emotional and calm means with respect to the neutral mean revealed that overall the positive emotion was significantly larger ($z\_positive = 2.54$, $p < 0.006$), the negative emotion was larger (non-significantly), and the calm was smaller (non-significantly). When the negative emotion epochs were partitioned into their sad and angry components, the sad emotion was found to be significantly larger than the neutral ($z\_sad = 3.13$, $p < 0.0009$), and the angry emotion non-significantly larger. The significant effects withstand correction for multiple testing.

These findings are consistent with the spontaneous case studies, suggesting that the emotions of one person, whether positive or negative, can be viscerally "felt" by a distant partner, and thus that the commonly used phrase, "gut feelings," may reflect a genuine form of intuitive perception.

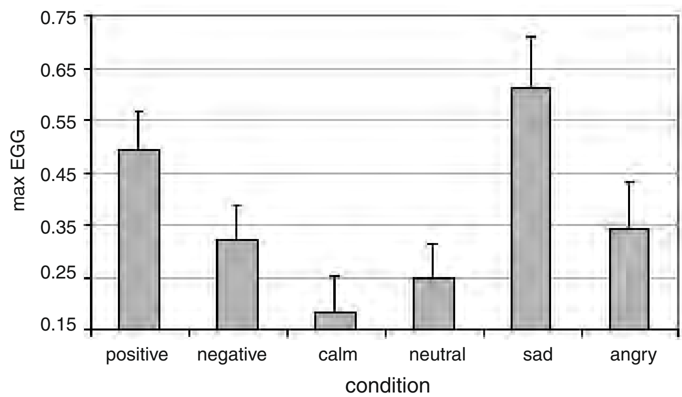

Figure 2. Average maximum electrogastrogram (EGG) values, with one standard error bars, pooled across all participants, for positive, negative, calm, and neutral epochs, and for the two components of the negative emotional epochs.

Presentiment

The two classes of experiments discussed so far explored interconnections occurring at the same time between two isolated people, as detected by a percipient's physiological response to a distant sender's emotions or to an activity like looking at cards with names meaningful to the percipient. A third class of phenomena also involves interconnections, and also associated with emotion, but occurring within a single person separated in time.

The experimental design is based on experiences often described as a foreboding that something meaningful is about to unfold. In the laboratory this effect is referred to as a presentiment experience. To detect such effects, one or more measurements of nervous system activity are collected before, during and after a participant is exposed to randomly selected stimuli of varying emotional affect. Presentiment predicts that the nervous system will respond differently before emotional vs. calm events under conditions that exclude sensory cues and anticipatory biases.

Presentiment experiments have been conducted while monitoring skin conductance level[13-21], non-specific skin conductance response[22-23], heart rate[26-27], brain electrical activity[24-27], and blood oxygenation levels in the brain as measured with fMRI.[28] Stimuli have included emotional vs. calm photographs, stylized happy vs. sad faces, auditory startle tones vs. silence, and electrical shock vs. no-shock. In some studies participants initiated trials of fixed lengths at will, in others stimuli appeared spontaneously at random times (called "non-aging foreperiods" in the psychophysiological literature[29]). As of mid-2008, at least 14 investigators have reported 19 experiments of this type, of which 17 were in the predicted direction and 10 were significantly positive.[30] Figure 3 shows the outcome of a presentiment experiment using skin conductance as the physiological measure.[ref]

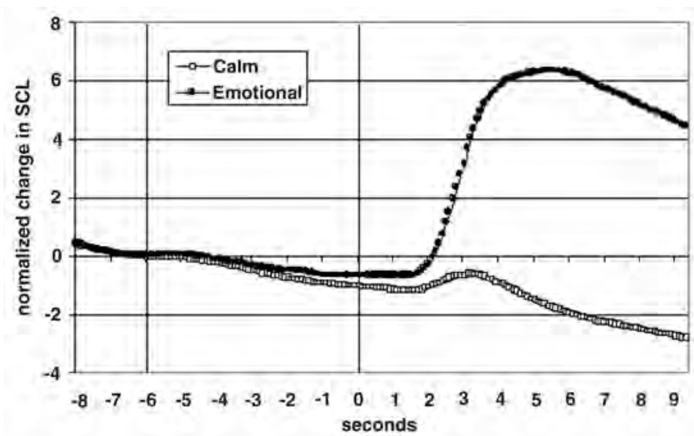

Figure 3. Presentiment experiment using skin conductance measures, showing normalized change in skin conductance level (SCL) from the moment (-6 seconds in this case) that the participants initiated a trial with a button press. This shows pooled results of 47 participants who together contributed 1,410 trials. A nonparametric test of the difference in SCL prior to the stimulus (at time 0) resulted in z = 3.34, p = 0.0004.

The principal critique of the presentiment studies to date is that the results might be explainable by anticipatory strategies developed through implicit learning. Simulations of idealized strategies suggest that outcomes resembling presentiment effects can be produced when the experiment involves asymmetric distributions of dichotomous stimuli, combined with the assumption that nervous system activity between successive emotional stimuli becomes progressively increased.[31] However, analyses of actual data collected in these experiments have put this idea to the test, and they have uniformly failed to support the anticipatory hypothesis. To date, no artifacts have been found that can adequately explain these effects by conventional means.

To illustrate the presentiment experiment in more detail, a recent design based on pupillary dilation is described. This measure provides a convenient psychophysiological measure that reflects attention, cognitive processing load, emotional response, anticipation, and the degree of balance between sympathetic and parasympathetic activation.[32-33] The experiment assumed that presentiment effects are largely mediated by the sympathetic nervous system, which if true, would cause the eye to dilate more before emotional events than before calm events.

Participants in this study were recruited by convenience among staff members and visitors to IONS, and among adult attendees at an IONS conference. Eye data were collected using a video eyetracking system that provided eye movement and pupil diameter measures at 60 samples per second (Applied Science Laboratories' model Eye-Trac 6000). A computer program controlled the random selection and display of emotional picture stimuli, and it coordinated two computers used to control the experiment. A program running on a "stimulus PC" responded to the participant's interactions, randomly selected and displayed the pictures, communicated with the Eye-Trac 6000 to inform it about the on-going experimental condition (between trials, prestimulus period, etc.), and retrieved random numbers as needed by a true random number generator. Another program running on an "eyetrack PC" continuously collected eye data from the Eye-Trac 6000. The experimental layout is illustrated in Figure 4.

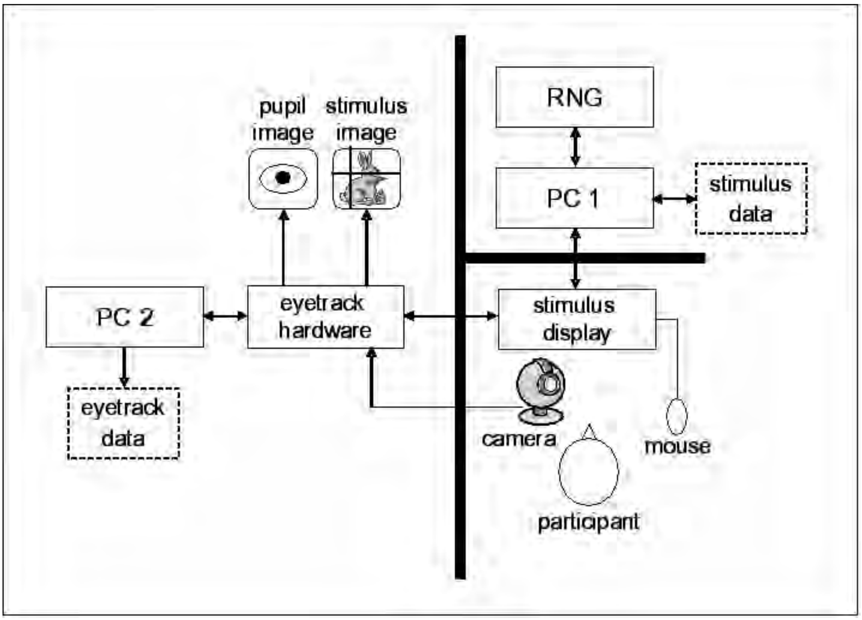

Figure 4. Participants in the eyetracking presentiment study contributed data in a cubicle containing the stimulus display, a mouse and keyboard, and a camera used to image the participant's eye. The other equipment included a computer (PC1) used to select, display and record the picture stimuli, a random number generator circuit used to select the stimuli, eyetracking hardware (Eye-Trac 6000 control unit), one video monitor displaying the pupil and a second displaying the stimulus overlaid with crosshairs indicating where the eye was looking, and a second computer (PC 2) used to collect the eyetracking data.

Emotional stimuli used in this study were a pool of 592 IAPS images, with standardized arousal scores ranging from 1.72 (low affect) to 7.35 (high affect), and standardized valence scores ranging from 1.31 (negative affect) to 8.34 (positive affect). The experimental procedure was as follows: When a participant (P) arrived at the lab, the experimenter (E) asked P to rest his or her chin on the Eye-Trac 6000's head and chin rest apparatus. After adjusting the apparatus and focusing the camera on P's left pupil, E dimmed the lights and ran an eye calibration procedure on P. Then E advanced the computer display to a screen showing a gray rectangle on a black background. The target area subtended visual angles of 21.5° wide x 17.8° high from the perspective of an eye positioned in the eyetracker.

E told P that when a gray screen appeared, that was a signal to click the mouse button at will to begin each trial. As shown in Figure 5, after the button press the screen remained dark for 3 seconds, then an image was randomly selected from the stimulus set, displayed for 3 seconds, and then the screen returned to dark for 3 seconds. At this point a message appeared on the screen alerting P to advance to the next trial at will. Before beginning the session, E asked P to attempt to feel the emotions evoked by each successive image, if any, and to allow his or her eyes to freely wander over the display screen both before and during stimulus exposure.

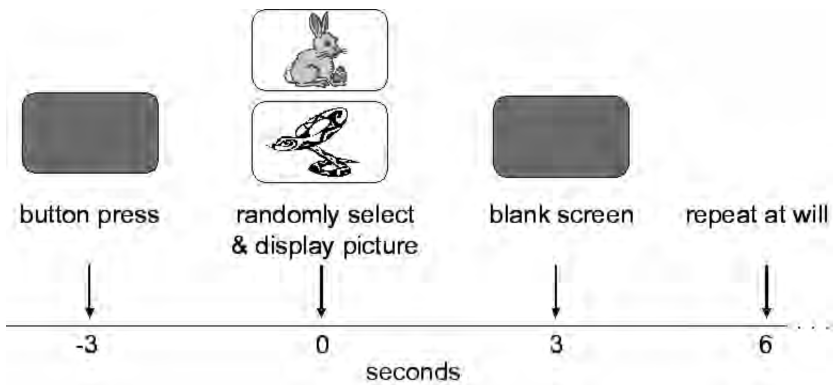

Figure 5. Each eyetracking trial began with a button press at will (at -3 seconds). Then the computer randomly selected an IAPS photo and showed it at stimulus onset (0 seconds). At +3 seconds the screen went black, and three seconds later the next trial could begin.

The eye data of interest per trial consisted of 1 second of baseline data, 3 seconds pre-stimulus, 3 seconds during stimulus display, and 3 seconds of post-display, for a total of 10 seconds x 60 samples per second or 600 samples (i.e., 60 samples per second). The stimulus pictures were selected uniformly at random, with replacement, from the 592 picture IAPS set. Eye data were collected on the left eye.

The presentiment hypothesis predicted that change in pupillary dilation would be larger before randomly selected emotional vs. calm pictures. For purposes of this test "emotional" was pre-specified as the 5% of contributed trials having the highest IAPS arousal scores, and "calm" as the 5% of trials with the lowest IAPS arousal scores. This ±5% emotional contrast threshold was selected based on results of previous presentiment experiments using IAPS targets.[29]

A total of 33 volunteers contributed 37 sessions and a total of 1,438 usable trials. Of the 33 participants, 31 were right handed and two were ambidextrous; their ages ranged from 20 – 83 (mean 47.5), 14 were male and 19 were female. At the planned 5% level of emotional contrast (72 calmest trials, average IAPS arousal of 2.43 vs. 72 most emotional trials, average IAPS arousal of 7.05), the differential change in pupillary dilation during the prestimulus period, as determined using nonparametric randomized permutation methods, was significantly positive as predicted by the presentiment hypothesis, z = 3.17, p = 0.0008 (one-tailed, see Figure 6).[34]

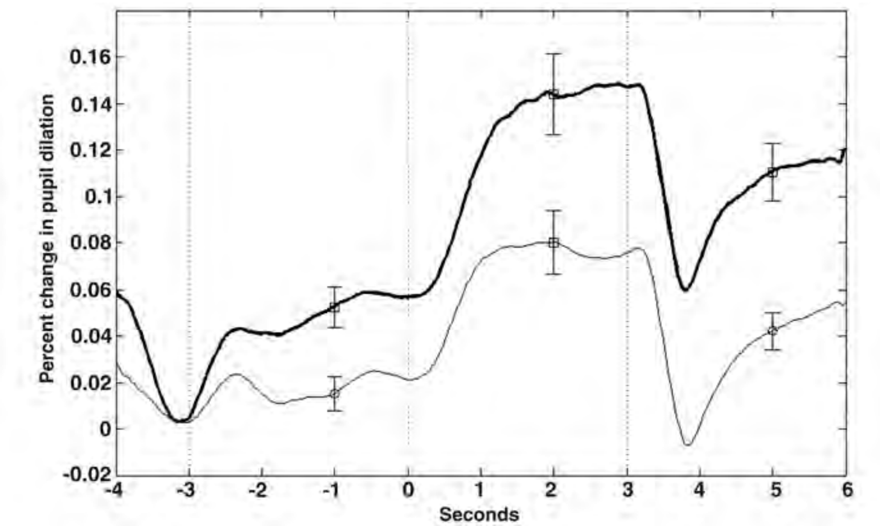

Figure 6. The bold (top) line shows average proportional change in pupillary dilation for the 5% most emotional targets across all 1,438 usable trials; the thin (bottom) line shows the same for the 5% most calm targets. Both lines are baseline adjusted to the average pupillary dilation value per trial during the 167 msec before the trial-initiating button press (at second -3). Stimulus onset is shown at second 0 and stimulus offset at second +3. Confidence intervals are plus and minus one standard error, and curves are smoothed 500 msec to clarify the figure. Analyses were conducted on raw data.

Discussion

The studies described here were examples of experiments conducted to explore the relationship between psi and emotions. Empirically they support the idea that strong emotions modulate psi perception, as suggested by the spontaneous case literature. It is clear, of course, from many other experiments as well as spontaneous experiences that emotions are not necessary for psi perception, but they do seem to play an important modulating role.

Why do emotions modulate psi perception? Perhaps for the same reason that emotions modulate ordinary attention. We are constantly negotiating a flood of sensory inputs, far more than the brain and nervous system can process. Something is required to direct how attention is allocated, and many studies indicate that emotion is a principal source of that modulation.[35] The amygdala plays a central role in this capacity, through both direct and indirect signals into the sensory pathways. These signals influence the representation of emotional events, especially threatening events.

From an evolutionary viewpoint, we are markedly sensitive to emotional events because our survival depends on fast allocation of attention towards dangerous or threatening circumstances. In the modern world we need not be wary of marauding tigers, but we are faced with the occasional drunk driver swerving on the highway. So we are fortunate that our hardwired emotional responses still prioritize our allocation of attention, which in turn provides privileged access to our awareness.

Using emotion to modulate attention seems pregnant with possibilities for future psi research. Douglas Dean's design using emotional names is ripe for replication because his method offered a way of distinguishing the nominal "source of psi" – the percipient or the agent.[36] His studies suggested a form of clairvoyance on the part of the percipient, in that the percipient's blood flow was modulated by emotional names that were not known to agent. Other studies, such as the "gut feelings" experiment, suggest a form of telepathy, in that the percipient appeared to be influenced by the agent's emotions. Would an experiment using emotional names known by both percipient and agent result in effects that are stronger than names known only to one party?

Experiments employing strongly arousing stimuli, including erotic pictures, stimulating music, and pleasant odors, would be interesting to explore in more detail. Most spontaneous psi cases do not involve pleasant events, but the "gut feelings" study did show that an agent's positive emotions evoked a significant change in the distant percipient, so this is a direction worth exploring. It is also much easier to recruit and retain human subjects in experiments using pleasant vs. unpleasant stimuli.

The search for the parapsychological Holy Grail – the easy to replicate experiment – is unlikely to be established in the domain of emotion-psi research without paying close attention to individual differences. Both personality and baseline anxiety influence the degree to which emotion modulates attention. Thus, if one intends to use emotion as a psi modulator, it would be useful to partition percipients on the basis of their affective responses.

It is not yet clear whether attention overrides emotional processing, or neither vice versa, nor to what extent these modes of processing may interfere or be additive. Indeed, the distinction might be more semantic than substantive. But if focused attention can override emotional responses, then it should be possible to devise a psi-emotion experiment in which the psi effect is "switched" on and off via modulation of voluntary attention. Emotional responses also modulate memory and learning, suggesting that psi effects using emotional stimuli might show improved learning vs. using the same design with neutral stimuli.

In conclusion, if one accepts the evidence from psi experiments and assumes that percipients can somehow sense distant emotions in time or space, then from a psychophysiological perspective the fluctuations observed in the autonomic and central nervous systems are not particularly surprising. What is surprising is that these emotions are perceived in the first place. How this occurs remains an open and intriguing question.

Acknowledgments

I am indebted to the Bial Foundation for generously supporting the electrogastrogram and pupil dilation experiments described in this paper, and for their continuing support of the field of parapsychology. I also thank Marilyn Schlitz, Dick Bierman, Edwin May, Russell Targ and Richard Shoup for many discussions about the design, analysis and interpretation of these experiments.

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MIRROR NEURONS AND EMPATHY

Christian Keysers and Valeria Gazzola*

Abstract

Humans have a surprising capacity: they can simply observe other conspecifics and get deep intuitive insights into their minds. Since the discovery of mirror neurons, this capacity seems a little less mysterious. Here, we will review evidence suggesting that when we witness the actions, sensations and emotions of other individuals, we activate our premotor, parietal, somatosensory and emotional structures as if we were performing similar actions or experiencing similar emotions and sensations. These activations are stronger in more empathic individual, supporting the idea that these activations represent an intuitive and spontaneous transformation of what we see in what we would have felt.

As humans, we have a surprising capacity: we can look at other people and guess what is going on in their minds. If we look at someone having a phone call, and see her face decompose, what we perceive is her sadness and inner turmoil. The way we describe such an event reflects a mentalistic stance: "I think Paula just got some bad news. She looked so sad during this phone call…". You would not say: "Paula picked up the phone, and her zigomatic muscles swiftly relaxed, causing the corner of her mouth to turn down". This is surprising as all that really meets the eyes of observers are the behaviors of the people around them: their inner lives are neural states that are hidden from the observers' sight. The obvious question thus is how our brain perceives the mental states of others despite their inaccessibility. In this chapter we would like to propose that an important element for our understanding of the inner states of others lies in the fact that while we witness the actions, emotions and sensations of other individuals, our brain spontaneously activates representations of our own actions, emotions and sensations that make us literally bath in a state that resembles the inner state of the people we observe. Understanding what

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goes on in their minds is then facilitated by the fact that we feel similar states inside of us. Additional processes that are still relatively poorly understood are then required to interpret these simulated inner states, in a way that may resemble the way in which we interpret our own inner states. Furthermore, we will venture an explanation of how our brain could learn to associate the state of other individuals with similar states inside of ourselves: by learning Hebbian associations between our own visible behaviors and inner states.

For this aim, we will first review evidence for the fact that we activate our own motor representations while perceiving other people's actions. Second, we will review evidence for the fact that we activate our own somatosensory and nociceptive representations while viewing the somatosensory and nociceptive experiences of others. Finally, we will review evidence for the fact that we activate representations of our own emotional states and emotional facial expressions while witnessing the emotions of other individuals. We will then address the problem of how we interpret these simulated inner states and how the link between visible behaviors and hidden inner states could be established. These proposals are further developments of earlier models [1, 2].

1. Shared representations for actions

1.1 Primates

In primates, three brain areas have been particularly associated with the perception of the actions of other individuals: the superior temporal sulcus (STS), area PF of the inferior parietal lobule and area F5 of the ventral premotor cortex (see Figure 1 left). Two of these areas, PF and F5, have been shown to contain neurons called 'mirror neurons' [3-6]. Mirror neurons (MN) are a subclass of visuo-motor neurons that have a peculiar combination of response properties. First, they respond during the execution of particular actions, even if the monkey cannot see himself perform the action, for instance because its eyes are closed. Second, they respond during the observation of another individual that performs similar actions. The third area, the STS, has so far not been shown to respond during motor execution without visual feedback and has therefore not been shown to contain mirror neurons. We will briefly report the key properties of these three areas.

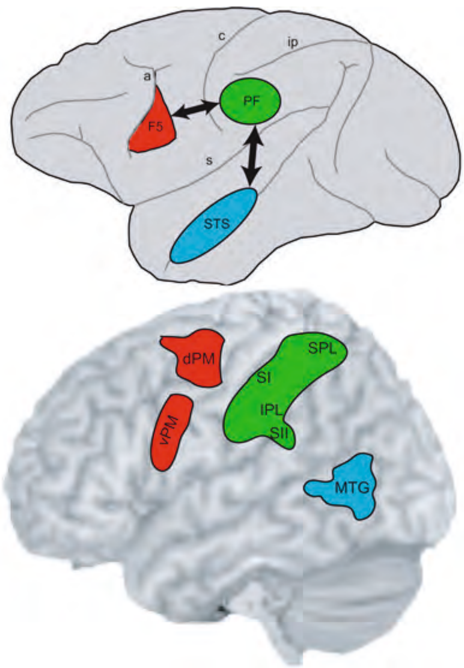

Figure 1. Top: Lateral view of the macaque brain with the location of F5, PF and STS together with their anatomical connections (arrows). The following sulci are shown: a=arcuate, c=central, ip=intraparietal, s=sylvian sulcus. Bottom: Corresponding view of the human brain with the brain areas involved both in action observation and execution, adapted from [24].

1.1.1 STS

The STS receives strong visual input from both the ventral and dorsal visual stream, and contains neurons responding to visual movement in general [7, 8], and biological movements in particular [9]. Different cells in this area show selectivity for particular biological actions: certain cells are selectively responding to faces [10, 11], including particular facial expressions, others to the sight of grasping or walking, or even the presence of other individuals in hidden locations [12]. This combination of selectivity could serve to describe the behavior of other individuals. A small number of studies have investigated the response of this area while the monkey itself executes actions [7, 8, 13]. In studies of Hietanen et al. [7, 8], half of the neurons responding to movements in a particular direction also responded if the movement was caused by the monkey's own actions. The other half greatly reduced their response if the movement was caused by the monkey itself. This reduction demonstrates the fact that information about the monkey's own actions reach the STS. It remains unclear whether this latter information is motor or proprioceptive in nature. In a pilot experiment (briefly reported in [13]) we tested cells in the STS while the monkey executed actions with its eyes closed, and failed to find cells that responded in these conditions. Information about the monkey's own actions has thus been shown to inhibit responses in the STS but so far not to cause increases in firing rate as would be expected for true mirror neurons.

The area STS has reciprocal connections with area PF also known to respond during the observation of the actions of other individuals. [3, 14, 15]

1.1.2 PF

Area PF contains a variety of neurons responding during the execution of hand and mouth actions, including grasping and placing [3]. Interestingly some of these neurons are MN, which also increase their firing rate while the monkey is immobile but observes another individual perform similar actions [3]. A good proportion of these parietal mirror neurons respond during a particular action (e.g. grasping), both when the monkey uses its right or left hand or even its mouth to grasp. The action of grasping is thus represented independently of the effector used, suggesting that the unit of representation in this area is truly an action (e.g. grasping) and not a particular motor plan to do so. Other parietal mirror neurons are more tied to a particular effector, and may thus represent a lower or more detailed level (i.e. closer to a particular motor plan) representations of particular actions. With single cell recordings, it is difficult to quantify precisely what proportion of neurons in area PF show mirror properties or what proportion of neurons show effector independence, because experimenters interested in mirror neurons will generally record more intensively from locations where mirror neurons were recorded, leading to a systematic overestimation of the proportion of mirror neurons. Interestingly, the response of some of the mirror neurons in PF also depends on the sequence of actions a particular action is embedded in: some grasping neurons for instance respond more strongly when the monkey grasps to place the object in a bowl than if the same object is grasped to be eaten[3]. This suggests that representations can extend beyond single actions into action sequences. Area PF is reciprocally connected both with STS [14, 15] and with area F5 of the ventral premotor cortex [16].

1.1.3 F5

Area F5 is the best studied of the brain areas involved in the observation of actions [4-6, 17]. About 10-20% of the recorded neurons in F5 respond both during the execution and the observation of actions. This subset of F5 neurons vary in their selectivity [4-6, 17], with the terms 'strictly' or 'broadly' congruent MN describing these differences [5]. Strictly congruent MN have a range of effective executed and observed actions that is extremely similar, while broadly congruent MN have both similarities and differences between effective observed and executed actions. A typical strictly congruent MN for instance only responds during the execution of a precision grasp with the hand, but not during the execution of the same action with the mouth or the execution of a whole hand prehension. The same neuron will also respond more strongly to the sight of precision grasping with the hand compared to whole hand prehension or grasping with the mouth. A broadly congruent mirror neuron may, on the other hand, show difference between visual and execution preferences. It might respond only during the execution of precision grasping but both to the observation of grasping with hand or mouth. Strictly congruent MN have received almost excessive attention because they are the most striking evidence of the idea that particular observed actions are mapped onto motor representations of the same action. Broadly congruent MNs though are about twice as frequent as strictly congruent mirror neurons, and they have the potentially important property of activating in the brain of the observer a number of alternative ways for achieving the observed actions. While observing someone catching a popcorn with his mouth for instance, through broadly congruent MN, the observer would activate both his hand and mouth motor programs to achieve the same goal. Combining these hand and mouth motor programs, the broadly congruent MNs transform the observation of a particular way of achieving a goal into an effector independent representation of how this goal could be achieved. We will come back to the functional importance of such effector independent representations later.

Some neurons in F5 respond both during the execution of actions and the sound of similar actions [6, 17]. Some of these auditory-motor neurons also respond to the vision of similar actions, and have been termed audio-visual MN [6, 17]. Typical examples respond while the monkey rips a sheet of paper apart, and while viewing or listening to another individual perform the same action. Responses to another action, such as opening the shell of a peanut, would be lower in all cases. These audio-visual MN are also effector independent: The sound of an action such as paper-ripping gives very little information about the way in which the paper has being ripped: whether you riped it with your feet or with your hands, or with one hand while holding the other side of the paper with your teeth will produce the same sound. The response of the neuron to the sound of the action is thus inherently effector independent and goal centered.

Interestingly, there is a roughly somatotopical organization within area F5, with dorsal sectors showing a prevalence of hand actions and ventral aspects a prevalence of mouth actions. In intermediate aspects, many neurons respond similarly to hand and mouth actions, and neurons with preference for one effector are often found side by side with neurons with preference for other effectors within this intermediate sector. As we will see later, this somatotopy is a useful tool for human neuroimaging, but is increasingly reinterpreted as an organization along goals more than along effectors.

1.2 Humans

Many studies have examined the presence of mirror neurons for actions in humans. Reviewing all these studies would go beyond the scope of this review and can be found elsewhere (e.g. Keysers and Perrett 2004; Keysers and Gazzola 2006; Rizzolatti and Craighero 2004). After a very brief description of the gist of this literature, we will concentrate on novel developments within the human mirror system literature.

1.2.1 The core human mirror system

Within the neuroimaging literature in humans, two areas are considered to form the core of the human mirror neuron system. These include the ventral premotor cortex, in particular Brodmann Area (BA) 6/44, and the rostral inferior parietal lobule (see Figure 1 right). These are considered to be the homologues of area F5 and PF where mirror neurons have been found in the monkey. Both of these areas are consistently activated both while viewing the actions of other individuals and while participants execute similar actions [18-33].

In addition, the middle temporal gyrus (MTG) and adjacent superior temporal sulcus (STS) often increase their BOLD responses both during action execution and action observation [23, 24, 26, 28]. While during the sound or vision of actions this augmentation is fully compatible with single cell recordings in the STS of monkeys, the augmentation of BOLD responses during action execution without visual feedback [23, 24, 28] is in contrast to the reduction of firing rate found in the monkey during the monkey's own actions [7, 8]. Two explanations have been offered to account for this finding. (1) The BOLD increase during action execution reflects the existence of mirror neurons in the STS that represent the expected visual and auditory consequences of the agent's own actions even if the agent cannot see him/herself [28]. After vainly searching for six month in the monkey's STS for cells showing such mirror-like properties in the STS, other authors favor the idea that (2) the BOLD signal augmentation might instead reflect the augmented blood flow required to perform the metabolically demanding task of inhibiting neurons in the

STS, that would otherwise respond to the sight or sound of ones own actions [13, 23, 24]. Explanation 2 is in accord with existing primate data [7, 8] and the fact that increase of the BOLD signal can occur without changes in the firing rate of the neurons because of the metabolic cost of (inhibitory) synapses [34].

The core mirror system is thus thought to be composed of the premotor cortex and inferior parietal lobule, while the MTG/STS is considered to be a very close partner of the mirror system.

Neuroimaging techniques of course can only map the voxels, within these areas, that are activated in both observation and execution, but cannot demonstrate that single neurons within these voxels respond in both cases. Attempts to show that mirror neurons (as opposed to mirror voxels) indeed exist in humans thus have to derive from other methods. Transcranial magnetic stimuli (TMS) in particular, although it is applied at the level of entire brain regions, provides encouraging indirect evidence for the presence of mirror neurons. TMS on the primary motor cortex can evoke so called motor evoked potentials (MEP), i.e. muscle activity that can be measured using EMG electrodes. A number of investigators have been able to show that observing an action that involves similar muscle movements facilitates these MEP, providing evidence for the fact that also in humans the vision of the actions of other individuals modulates neurons involved in executing similar actions [35-38]. In addition to TMS experiments, purely behavioral studies have provided evidence for the convergence of observed and executed actions: observing certain actions can interfere with the execution of incompatible actions [39-41]. In the experiment of Kilner and colleagues for example, subjects had to move their hands up and down along an imaginary straight vertical line. Interestingly, simultaneously seeing another individual move its hands from left to right and back (an incompatible movement) led the observer to deviate from the straight vertical line [40], demonstrating again the convergence of seen and executed actions in the human brain. Although these methods provide evidence for the existence of a convergence of visual, auditory and motor information in the human brain, they provide little information about where in the brain this convergence first occurs. In theory, the monkey's motor command could activate spinal motor neurons along a path that differs entirely from the visual information, and the facilitation and interference could occur entirely at spinal level.

Finally, in principle, singe cell recordings could occasionally be performed in human subjects undergoing surgery for the treatment of epilepsy. These recordings could provide direct evidence for mirror neurons in humans. The location of these recordings in though dictated by the suspected foci of epileptic activity, which are rare in premotor or posterior parietal cortex. However, Roy Mukamel and his colleagues in UCLA have recently recorded from single neurons in the supplementary motor cortex (SMA) of epileptic patients, and found a number of neurons active both during the observation and execution of hand actions [42], suggesting that the SMA may also contain mirror neurons, and that mirror neurons indeed exist in humans.

1.2.2 Shared Voxels and Shared Circuits

Neuroimaging shows that certain voxels are activated both during motor execution and observation, but cannot show that these shared voxels contain mirror neurons. They could simply contain interleaved populations of purely motor and purely visual neurons. Other techniques provide evidence for sensory motor convergence, but cannot indicate where in the brain this convergence occurs. At present, although the existence of MN in monkeys in premotor and parietal cortex makes it likely that humans have MN in premotor and parietal voxels that are active both during action execution and observation, it is advisable to use the term shared voxels (sVx) or shared circuits instead of mirror voxels or mirror neuron system when referring to human neuroimaging studies.

1.2.3 Audiovisual shared circuits

Often, we can recognize what others do even if we can only hear it. A number of studies suggest that humans have an auditory mirror neuron system [23, 31, 35, 38, 43, 44] that resembles the one found in monkeys [6, 17]. Gazzola et al. [23] for instance demonstrate that the sound of actions activates premotor and parietal voxels also activated during the execution of similar actions. Many of the same voxels also responded to the sight of similar actions. Interestingly, the voxels that were activated by the sound, vision and execution of actions were more numerous and more strongly activated in the left hemisphere, raising the intriguing possibility that left lateralization of spoken language in humans could be due to the fact that language builds upon the abstract representation of actions that are implemented in a left lateralized multimodal mirror neuron system [6, 17, 23, 38]. The left hemisphere dominance of the human auditory mirror system finds support from a study [38] showing that MEPs are facilitated more by the sound of actions when TMS is applied to the left compared to the right hemisphere.

1.2.4 Congruent selectivity

If mirror activity is to be informative about what other individuals do, the vision/sound of a particular action 'A' needs to recruit motor programs in the observer that subserve the execution of similar actions more than those subserving the execution of a dissimilar action 'B'. Vice versa, the vision/sound of action B has to activate motor programs for B more than for A. This feature has been demonstrated in monkeys at the level of single neurons [5, 6]. In humans, TMS experiments show that observation of particular actions or phases of actions selectively facilitate TMS-evoked motor potentials involved in these (phases of) actions [35-38]. Neuroimaging experiments have shown a certain somatotopy of activations during the vision of actions similar to those reported in the monkey, with hand actions causing more dorsal activations than mouth actions [18, 33], but did not measure brain activity during action execution to ensure the congruence between the visual and motor preferences of the voxels. Recently, Gazzola et al. tested subjects while performing and listening to hand and mouth actions, and provide the first direct neuroimaging evidence for congruent mapping in humans: a dorsal premotor cluster responded more to hand than mouth actions during execution and listening, and a ventral premotor cluster more to the sound and execution of mouth actions compared to hand actions. In addition to these locations that discriminated hand and mouth actions, many sVx in the premotor, parietal and temporal cortex responded similarly to actions of the hand and mouth. In analogy to the combination of strictly and broadly congruent MN in the monkey, the premotor cortex thus appears to transform the sound of particular actions into a combination of effector specific and effector unspecific motor programs.

1.2.5 Goal matching

As mentioned in section 1.1.3., most MNs are of the broadly congruent type. Some broadly congruent neurons match the sight of grasping with the mouth or hand onto motor programs for grasping with the hand, and others onto motor programs for grasping with the mouth. One might thus speculate, that the primate MNS matches actions not only in terms of details (precise effector, velocity of movement etc.) but also in terms of goal[1], i.e. what is achieved by the action (e.g. grasping), independently of how it is achieved. The predominance of goals in the mirror system of the monkey becomes even clearer for sounds of actions, which contain in themselves no information about the effector that was used to do the action: a crunching sound for instance can be the result of stepping on a potato chip with your foot, or crunching it with your fist or teeth.

A number of recent fMRI experiments have investigated the importance of goals in the human MNS. Gazzola et al., [24] have compared the vision of a robotic claw performing a variety of actions with that of a human hand doing similar actions. The actions were well known, every day actions such as taking and swirling a glass of whine, scooping soup out of a bowl etc. Motor areas activated when subjects performed these actions were recruited to the same extent by seeing a robot or a human perform these actions. This supports the idea that the MNS predominantly matches goals because the details of the action differed greatly between the robotic and human versions: Human actions had natural biological kinematics and the familiar aspect of a human hand which can be easily matched on the details of the observer's own hand actions using strictly congruent MN. In contrast, the robotic actions had very artificial motion parameters and a claw that looked very different from a hand. The details of these robotic actions cannot be mapped on the details of the hand actions of the observer using strictly congruent MN. Nevertheless, the activations in the MNS did not differ significantly, suggesting that broadly congruent MN somehow matched the goals of the observed actions onto motor programs with similar goals independently of the differences in effector and movement details (see [24] for why previous studies failed to find mirror activations to robotic actions). This finding finds support from another experiment in which 2 subjects born without hands and arms watched hand actions [46] and were compared with 16 control subjects watching the same actions. Both in the aplasic individuals and in controls, the vision of hand actions activated robustly a network of brain areas generally associated with the human MNS, and there were no significant differences between the groups. Both of these experiments raise the question of what motor programs are activated when subjects view actions that deviate from their own embodiment (e.g. robotic actions for control subjects and hand actions for aplasic individuals). The subjects of these last two studies were also asked to perform actions in the scanner using their mouth and feet, and for the controls, using their hands. Comparing the amplitude of activations in these conditions, we identified regions that respond similarly during the execution of actions with all effectors ('effector independent') and those that were activated more during the use of a particular effector (effector specific areas). It turned out that about half of the visual activations were in effector independent areas, while the other half fell within the effector-specific regions the observers would use to perform the observed actions (hand for the controls and mainly foot for the aplasics) despite the fact that this effector was not the one used by the observed individual (robotic claw ≠ hand and hand ≠ foot). This suggests that the MNS appears to map the goal of the observed action on a combination of effector independent motor programs and those effector dependent motor programs that the observer would use to achieve the goal independently of whether this is the effector used by the demonstrator or not.

These findings shed new light on two issues. First, although they are compatible with the idea of the mirror system matching observed actions onto corresponding motor programs ('direct matching hypothesis'), they indicate what 'corresponding motor program' really means: not only actions with directly corresponding details but also, and maybe predominantly, motor programs with corresponding goal. Second, they shed new light on somatotopy in the premotor cortex: if different effector activate the same region, the dorso-ventral organization of the premotor cortex is likely to reflect an organization in terms of goals, with goals that primarily relate to the mouth represented ventrally, and goals primarily relating to the hand more dorsally. These goals are then usually achieved using the dominant effector but can be implemented using different effector [23, 24, 45]

This interpretation also helps understand two behavioral observations that would seem puzzling if the MNS would match the details of an action and not its goals. First, from early on, children, unless explicitly asked to do otherwise, tend to imitate the goals of observed actions using the simplest way available to them instead of copying the details of the actions. For example if seeing an adult pushing a button with his head because her hands were otherwise involved, the child would press the button with his hand instead [47-50]. Second, monkeys have mirror neurons but they do not imitate the details of observed actions. On the other hand, they do learn to achieve goals by observing other individuals perform these goals[51].

A number of other studies confirm the importance of goals in the MNS. Hamilton et al. [27] elegantly showed that presenting participants two actions one after the other with the same goal but different means causes a more severe decrease in the BOLD signal (i.e. repetition suppression) than showing two actions with the same means but different goals. Given that selective adaptation is though to indicate that the same neurons were used in the processing of the consecutive stimuli, this finding suggests that even if two actions have separate means but similar goals, they activate the same neurons within the MNS. Finally, Fogassi et al. and Iacoboni et al. [3, 29] showed that the vision of a particular action (e.g. grasping a glass) causes different responses in the MNS if the context indicates that the action serves a different goal (e.g. grasping to eat or drink vs. grasping to place).

1.2.6 MNS and empathy

If the MNS contributes to an intuitive understanding of what other people do, one would expect more empathic people to activate their MNS more strongly. To address this question, we [23] measured how empathic 16 subjects were using the interpersonal reactivity index (IRI) of Davis [52] before measuring their brain activity while they executed or listened to various hand and mouth actions. While the six subjects with highest scores in the perspective taking subscale of the IRI showed very strong activations during the sound of actions in the premotor and parietal regions motor execution regions, the 6 least empathic individuals almost entirely failed to show activations in these regions (Fig. 2). The activity in the MNS while listening to the sound of actions directly correlated with how empathic individuals were in premotor, parietal and somatosensory areas, with r-values in excess of 0.6, suggesting that ~40% of the inter-individuals differences in empathy can be accounted for by differences in the putative MNS. While only correlational in nature, this is the first finding that differences in empathy may depend on differences in the MNS. As we will see below, a similar correlation appears also to exist during the perception of facial expressions, but on a different, more emotional subscale of the same questionnaire. In addition, lesions in the premotor cortex have been shown to impair the recognition of the gestures of other individuals, suggesting that this region may be necessary for a normal understanding of the actions of other individuals [53], a finding confirmed by rTMS 'virtual lesions' [54]. Together this data supports the idea that the MNS may indeed contribute to our intuitive insights into the actions of other people.

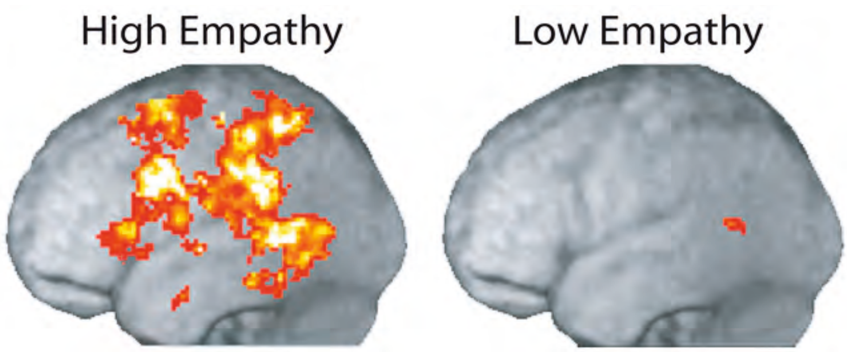

Figure 2. Left panel, voxels involved both during the sound of actions and the execution of similar actions in participants ranking high in empathy according to self report. Right panel, same for participants ranking low in empathy. Adapted from [23].

1.2.7 Are shared circuits limited to the premotor and parietal lobe?

While in the monkey only areas F5 [5, 6, 17, 55], PF [3]and the anterior bank of the intraparietal sulcus [4] have been thoroughly examined for the presence of mirror neurons, human neuroimaging has generated data for the entire brain. Of particular interest, a number of studies have examined the same subjects during action execution and action observation [20, 23, 24, 26, 30]. In these experiments, it is possible to define which voxels of the brain were involved both during the observation and the execution of actions. The existence of such shared voxels cannot demonstrate the presence of MN in these voxels but can identify candidate areas that could contain such neurons. Next to the classic mirror regions, these experiments have identified a number of brain areas that contain shared voxels (Figure 1 right). In particular, the somatosensory cortices (primary and secondary) often contain voxels active both during action execution and observation/listening [23, 24, 26, 56-58], a finding we will come back to in the next section. A number of additional areas show sVx in a number of experiments: the dorsal premotor cortex and SMA [21, 23, 24, 26, 59-61], the superior parietal lobule [23, 24, 61], MTG [23, 24, 28, 61] and the cerebellum [23, 24, 26].

1.2.8 Single subject analysis using unsmoothed data instead of conventional group analysis reveal the consistency of shared voxels within and outside the premotor and posterior parietal cortex

In conventional fMRI studies the interpretation of shared voxels in terms of MN is particularly difficult because shared voxel at the level of a random effect group analysis can occur without any of the single subjects showing shared voxels. There are two reasons for this problem. First, data in most all fMRI studies is smoothed using Gaussian kernels of 6-10mm. A voxel at the border between two unimodal territories can then appear to be shared simply because the smoothing makes the properties of unimodal territories artificially bleed into each other. Second, data is typically analyzed in terms of group analyses of normalized data. Given that the border of cytoarchitectonic [62, 63] and functional [64] areas is very variable from subject to subject and a voxels at the margin between two functional areas (e.g. SI and SPL) within a group analysis will thus contain voxels truly belonging to SI in some subjects and truly belonging to the SPL in other subjects. If SI would, for instance, only be activated during action execution (due to the somatosensory and kinesthetic consequences of performing the action) and the SPL only during action observation, at the group level, voxels at the border between SPL and SI would appear to be activated during both action execution and observation, because the t-tests would indicate that the average activation is significantly above zero both during action execution (due to the proportion of subjects that had their SI in this voxel) and action observation (due to the proportion of subjects that had their SPL in this voxel). Both these problems can be overcome by analyzing the data of each subject separately (thereby avoiding the problem of mixing subjects) and by using unsmoothed data. Doing so, Gazzola et al [58] confirmed that shared voxels can be reliably defined in all subjects in premotor and inferior parietal locations, but that these classic areas constitute only about 20% of the shared voxels in the brain during action observation and execution. The other 80% were mainly in somatosensory cortices, the MTG/STS, the superior parietal lobule, the cerebellum and the middle cingulate cortex. All these brain regions are known to integrate visual and motor/somatosensory information, and could very well contain neurons shared between action observation and execution, although calling them mirror neurons might be incorrect if one sticks to the original definition of mirror neurons as a shared motor representation. Single cell recordings in these areas will constitute an important step in the next decade to understand the spatial extent of the MNS.

1.3 Conclusions

Monkeys have mirror neurons that respond during the vision, the sound and the execution of certain actions. Most of these mirror neurons are broadly congruent and map observed actions onto motor programs with similar goals, generalizing beyond the precise effector used by the demonstrator. These neurons have so far been found in the monkey ventral premotor and parietal cortex. Humans appear to have a similar system, that matches the goals of observed or heard actions onto matching motor programs in the observer. This system has the capacity to bridge differences in embodiment between observer and agent. It provides a neural correlate for the tendency during imitation to achieve the observed goal using whatever means make most sense for the observer. Neuroimaging though suggest that the more than the premotor cortex and inferior parietal lobule are common to action observation and execution, encompassing potentially the mid temporal gyrus, the superior parietal lobule, somatosensory cortices and the cerebellum. Activity in the putative human mirror system is stronger in more empathic individuals, suggesting a link between these activations and our capacity to share the goals of other individuals.

2. Sensations

2.1 Touch

If shared circuits may be essential for our understanding of the actions of others, how about their sensations? If we see a spider crawl on James Bond's chest in Dr. No, we literally shiver, as if the spider crawled on our own skin. What brain mechanisms might be responsible for sharing the sensations of others? May shared circuits exist for the sensations of touch or pain?

A number of investigations now support this idea. First, we [65] showed participants movies of legs being brushed. In control movies, the same legs were approached by an object, but never touched. In the second part of the experiment, the same participants were touched on their own legs. Within the secondary somatosensory cortex (SII or cytoarchitectonic area OP1), shared voxels for touch were found: they responded more during the vision of touch compared to the control stimuli and more during the experience of touch than the baseline. Again, neuroimaging cannot show that the same neurons within SII indeed respond during the experience and the observation of touch, but this finding suggests that SII could be part of a circuitry that transforms the vision of the sensations of other individuals into what it would feel like to be touched in similar ways. Using single subject analysis, we confirmed the presence of these voxels in the SII of most of our single subjects, supporting the idea that the overlap between the vision of touch and the experience of touch was not the result of group analysis alone.

Later, Blakemore et al. [66] were intrigued by subject ('C') reporting that when she sees someone else being touched on the face, she literally feels the touch on her own skin. They scanned C and a group of normal controls while touching them on their faces and necks. In a following session they showed them video clips of someone else being touched on the same locations. As in our study, the experience of touch activated primary and secondary somatosensory cortices. During observation, they found SI and SII activation. In C, these activations were significantly stronger, potentially explaining why she literally felt observed touch on her own skin.

It therefore appears as though seeing someone else being touched activated a somatosensory representation of touch in the observers, as if they had been touched themselves. This finding is particularly important as it demonstrates that the concept of shared circuits put forward for actions appears to be applicable to a very different system: that of touch.

Interestingly, as mentioned above, somatosensory activations are also common to the observation and execution of actions [23, 24, 26]. This suggests that during action observation, activations of somatosensory cortices may reflect a transformation of the observed kinesthetic and somatosensory information into a representation of what it would feel like to perform a similar action.

2.2 Pain

Painful stimulation of the skin and the observation of a similar stimulation applied to others also appear to share a common circuitry. First Hutchison et al. recorded from single neurons in the anterior cingulate cortex (ACC) of surgical patients and found a neuron that responded both when pinpricking the patient and when the patient could see the surgeon pinpricking himself [67], demonstrating the existence of (at least one) mirror neuron for pain. The first fMRI investigation of this phenomenon by Singer et al. [68] examined brain activity of female participants in four conditions. In the condition PainSelf, subjects viewed a colored cue on the screen and felt a mildly painful electroshock on their own hand. In the condition NoPainSelf, a different colored cue was shown and a milder electrostimulation caused a non-painful tingling sensation in the hand. In the conditions PainPartner and NoPainPartner, cues indicated that the romantic partner of the participant received a painful or non-painful electrostimulation of the skin. Singer et al. found that the contrast PainSelf-NoPainSelf and the contrast PainPartner-NoPainPartner activated overlapping regions in the anterior cingulate cortex and the anterior insula. A replication of that study with male and female participants [69] indicated that while the anterior insula was shared between pain experience and observation in all groups of subjects, the ACC shared activation was specific to female subjects. Singer et al. were the first to correlate brain activity in shared voxels with empathy scores of their participants, and found that brain activity was stronger in more empathic individuals, strengthening the idea that activating ones own pain areas while witnessing the pain of others indeed may reflect the neural correlate of empathy for pain.

Singer et al. also manipulated the relationship between the participant being scanned and the actors receiving the electroshock [69]. She contrasted two actors, one that had previously played in an unfair manner with the participant in sequential prisoner's dilemma game, and one that had played in a fair manner. She found that for female participants, shared voxels were similarly activated whether the participants knew that a fair or unfair confederate was being shocked. For males, only knowing that a fair actor was being electro-shocked activated pain regions of the anterior insula.

A number of other studies have confirmed that the sight of pain activates regions of the brain processing one's own pain, including somatosensory, insular and anterior cingulate cortices [70-74]. Many of these experiments have used more naturalistic stimuli, in which participants could directly see a painful event happening to someone else (e.g. a needle entering the skin of an actor). The fact that both the symbolic cues of Singer et al. and more explicit stimuli activate the pain matrix indicates that the brain can activate a simulation of pain using a variety of stimuli.

For the case of pain, some issues though remain unclear. Singer et al. and Jackson et al. failed to find activations in somatosensory cortices while subjects empathized with the pain of others, while other investigators [75] find that even the primary somatosensory cortex is activated during the vision of pain in others in agreement with the aforementioned findings on touch [65, 66]. Singer et al. may have failed to find somatosensory areas because they subtracted a non-painful tactile sensation. Jackson et al. may have failed to find it because of the lack of motion in their stimuli. These differences though will require further clarification. Second, the anterior insula is the most robustly reported region of overlap between seen and experienced pain. What though is actually represented in the Insula? Very similar locations of the insula become activated seeing and experiencing disgust and pleasure [76, 77] (see below), raising the question of whether pain in particular, or any emotionally laden bodily sensations are represented in the anterior insula. Finally, unlike the case of actions [58] and touch [65], attempts to demonstrate shared voxels using unsmoothed data and single subject analysis have failed to reliably find shared voxels in the ACC [78].

3. Emotions

The capacity to understand and share the emotions of other individuals is possibly what most of us associate most with the word empathy. The word 'emotion' comes from the Latin verb emovere which means something that moves out, and this is exactly what emotions are from a social neuroscientific point of view: an inner state of another individual that comes out through his movements and can be perceived by others. There are always two aspects to our perception of the emotions of others: the bodily movements and behaviors that signal the emotion and the hidden inner state of the other individual that can be deduces from these behaviors.

To take a dramatic example, if on a bus trip through the mountains we witness someone looking pale, suddenly retching and filling a paper bag with clumps of undigested food, we clearly witness an action but cannot help but feel and share the deep state of physical nausea of that unfortunate motion-sick travel companion. A number of experiments now show that while we witness such emotions, we activate (1) insular voxels that would be activate if we would experience similar emotional states and (2) premotor voxels that would be active if we would perform the actions that signaled the emotion (i.e. facial and bodily movements).

3.1 Sharing the emotional state and shared voxels in the insula/frontal operculum

As seen above, the perception of other people's pain activates voxels in the anterior insula that are also recruited while we experience pain ourselves. A series of imaging studies by Phillips and collaborators [79, 80] suggested that the anterior insula is also implicated in the perception of the disgusted facial expressions of others. The same area has independently been implicated in the *experience* of disgust [81]. It therefore appears as though the insula, in addition to pain, also provides a shared circuit for the experience and the perception of disgust.

This hypothesis was directly tested in two fMRI studies. In the first study, we [77] measured brain activity while participants viewed short movie clips of actors sniffing the content of a glass and reacting with a appreciative, neutral or disgusted facial expression. Thereafter, we exposed the subjects to pleasant or disgusting odorants through an anesthesia mask in the scanner. Both during observation and experience, the emotion of disgust was intensely perceived and experienced while the emotion of pleasure was less intense in both cases, and serve more as a control condition as a truly emotional condition. Results indicate that voxels in the anterior insula were activated both by the experience of disgust and the observation of the disgusted facial expressions of others (Wicker et al., 2003). These voxels were not significantly activated by the pleasant odorants or the vision of the pleased facial expressions of others, but this may have been related to the less intense experience and perception of pleasure. The location of the voxels involved in the experience of disgust and in the observation of disgust in this fMRI experiment overlap in location with the insular damage of two patient combining a reduced experience of disgust and problems in recognizing disgust in others [82, 83], suggesting that this circuit is indeed necessary for our understanding of disgust in others.

With Mbemba Jabbi we then replicated the experiment of Wicker et al. using tastes instead of smells to induce disgust and used more intense expressions of pleasure in their movies [76]. In addition we also measured how empathic their individuals reported to be using the IRI scale [52]. During the observation of both pleased and disgusted facial expressions, participants activated voxels in their insula more strongly if they reported being more empathic. The same voxels were also activated by the intense sensation of gustatory dislike induced by tasting quinine. This result indicates that the anterior insula is thus not liked to the experience of olfaction in particular, but the strong visceral sensations associated with smells or tastes more generally. In addition, the correlation between activations while subjects viewed pleased facial expressions and their empathy scores indicate that the role of the insula in empathy is not limited to negative emotions such as disgust or pain, but includes also positive emotions.

The evidence for shared voxels for various emotions in the insula raises the question of what aspect of these emotions is represented in that particular cortical location. Penfield and Faulk [84] stimulated similar locations of the anterior insula in epileptic patients undergoing exploratory surgery. They found that patients reported a variety of visceral sensations, including unpleasant sensations in their digestive system. This finding supports the idea that insular activity during the observation of the facial expressions of others does not reflect abstract cognitive representations of these emotions but rather more embodied visceral sensations that might be an integral part of experiencing these emotions. In addition, insular stimulation did not cause overt facial movements as one would expect if the facial expression of disgust would be represented in this area.

Interestingly, just as we showed for the shared circuits for actions, the insula also appears to receive auditory information about the disgust of others. Adolphs and colleagues (Adolphs et al., 2003) showed that their patient B with extensive insular lesions was unable to recognize disgust, even if it was acted out with distinctive sounds of disgust, such as retching and vocal prosody.

One of the challenges for the next years will be to investigate the insula using singe cell recordings in primates during the observation of facial expressions in order to examine more precisely the nature of the neural representations triggered during the experience and observation of emotions. So far, such recordings have only been performed during the experience of tastes and smells. Cells have been found with opposite preference (e.g. quinine and sucrose) with similar frequency within the volume of a single fMRI voxel in the insula, suggesting that the apparent indiscriminative BOLD response to the sight of pleased, disgusted and painful facial expressions in the insula may actually result from highly selective representations at the single cell level that are blurred at the level of fMRI voxels [85].

3.2 Sharing the facial expression of other individuals in the motor MNS

In the experiment described above, investigators mapped regions involved in experiencing emotions and observing those of others [76, 77]. A complementary approach is that to map the regions involved in producing deliberate facial expressions and to investigate if these facial motor circuits are involved in perceiving the facial expressions of others. Recently, with van der Gaag et al. [86] we have addressed this question in 3 experiments conducted on the same participants. We first scanned our subjects in a passive viewing task in which participants had to observe short movies of actors displaying emotional and non-emotional facial expressions. Participants then received new instructions: if for instance they saw two happy faces one after another, they had to press the button 'same emotion', if they saw a happy followed by a sad face, the button 'different emotion', and were scanned again. At the end, subjects received new instructions again, and had to imitate the facial expressions they saw. These 3 experiments indicated that even during passive viewing, a network of temporal, posterior parietal, somatosensory, premotor, insular cortices and amydgalae were activated for all facial expressions, suggesting that the brain spontaneously transforms the facial expressions of other individuals into a sensory-motor simulation of what it would feel like to make that facial expression and experience that emotion. The discrimination and imitation task though augmented the responses in these brain areas, showing that although spontaneously activated, these circuits can be modulated by attention and task demands. When comparing different facial expressions with each other, it became apparent that despite the dramatic differences in the emotions shown in the movie clips, brain activity was generally rather similar. The amygdalae for instance responded to the sight of fearful facial expressions, in agreement with previous reports, but did so as strongly as to neutral, disgusted and happy facial expressions in all three tasks [87]. Also the insula, which responded significantly to the vision of disgusted facial expressions in accord with previous findings [76, 77] did not do so more than to happy or fearful faces [86]. It will thus remain for future studies to determine if particular emotions can be discriminated from the *pattern* of brain activity in shared voxels induced during the observation of facial expressions.

3.3 Facial expressions and empathy and autism

Jabbi et al. [76] showed that activations in the anterior insula during the observation of the facial expressions of others are stronger in more empathic individuals. Pfeifer et al. found a similar correlation within both the premotor and insular cortex while children observed or imitated the facial expression of others [88] and further showed that children with more intense activations in these regions function better in social situations according to their teachers. Interestingly Dapretto et al. [89] found that autistic children activate their premotor and insular cortex less than typically developing individuals during the observation and imitation of facial expressions. Interestingly, we found the opposite effect in adults with autism if movies of facial expressions are used instead of static images [90]. Together, these findings support the idea that activations in premotor, somatosensory and insular regions during the observation of the facial expressions of others are somehow linked to empathy, and are compatible with the idea that simulating both the facial expressions and emotional states of other individuals may underpin our intuitive understanding of the emotions of other individuals.

While fMRI cannot indicate whether the somatosensory and premotor activations we find to occur during the vision of facial expressions are indeed necessary for understanding the emotions of other individuals, lesion studies can address this question. Adolphs et al. [91] examined participants capacity to label facial expressions in a large number of patients with acquired brain lesions. They noticed that patients with lesions in somatosensory and premotor areas reliably showed deficits in labeling facial expressions, supporting that these areas are indeed essential for correctly labeling the facial expressions of others. Impairment in labeling could be due to a complete lack of understanding of what goes on in other individuals or to impairments in the process that transforms our intuitive gut feeling of what goes on in other individuals into words.

3.4 Summary

Evidence now supports the idea that in analogy to actions and sensations, also the emotions of other individuals are transformed into a representation of the observer's own emotions. This process recruits premotor regions that are also involved in producing the same facial expressions, somatosensory areas that are also involved in experiencing similar facial expressions and the insula that is involved in experiencing emotional states such as pleasant and unpleasant tastes, pain and nausea. Without these brain regions, subjects report difficulties in labeling the facial expressions of other individuals. Activations in these regions are stronger in more empathic and less autistic individuals.

4. Shared circuits for actions, sensations and emotions

Subsuming the above evidence, it appears that in three systems – actions, sensations and emotions – certain brain areas are involved both the in first person experience (*I* do, *I* feel) and the third person perspective (knowing what *he* does or *he* feels). These areas or circuits, that we call shared circuits, involve the premotor, supplementary motor, somatosensory, posterior parietal, temporal cortex and cerebellum for the case of actions; somatosensory cortices for touch, the premotor, somatosensory, posterior parietal, insular and temporal cortex for emotions and the somatosensory cortices, insula and ACC for pain. In all these areas, observing what other people do or feel appears to be transformed into an inner representation of what we would do or feel in similar situations – as if we would be in the skin of the person we observe. The idea of shared circuits, initially put forwards for actions (Gallese and Goldman, 1998) therefore appears much broader [1, 92].

These findings sketch a tentative dynamic picture of the brain processes involved in social simulation. First, social situations appear to be processed by the superior temporal sulcus to a high degree of sensory sophistication, including multimodal audio-visual representations of complex actions. These representations privilege the third person perspective, with reduced responses if the origin of the stimulus is endogenous [7, 8]. Through the recruitment of shared circuits, the brain then adds specific first person contents to this description. If an action is seen, the parietal, pre- and supplementary motor areas and potentially the cerebellum add an inner representation of the motor programs the observer would use to achieve the observed goals to the sensory third person description. If somatosensory events are witnessed, be it with [23, 24, 26, 56, 58, 61, 93, 94] or without an action [65, 66]), the somatosensory cortices add an inner representation of what it would file like to perform a similar action or be touched in a similar way. If pain is witnessed, the somatosensory [75], anterior insular [68-71, 74, 75] and anterior cingulate [67, 68, 70, 71, 74, 75] cortices add a sense of pain. If facial expressions of emotions are witnessed, premotor and somatosensory cortices add a sense of what it would feel like to make a similar facial expression [89, 91, 94, 95] and the insula adds a gut felling for what the other individual is feeling [76, 77, 82, 83, 95].

As a result, the observer does not only see or hear what movements the other individual is performing: she shares a substantial amount of neural activity with the observed individual, including activity relating to motor, somatosensory and emotional/visceral states. These shared neural representations reflect what would be going on in the observer's brain if he/she would have done the observed actions or been exposed to the observed stimulations. We thus appear to observe other individuals through the potentially deforming mirror of our own sensations and actions. This will provide valid insights into other individuals only to the extent to which the observed individuals are similar to us. By simulating the brain activity of other individuals using our own brain activity, the brain implicitly makes the assumption that other individuals are similar to us. This assumption becomes particularly evident in cases where the observer and observed differ in embodiment: typically developed individuals activate their premotor, somatosensory and parietal hand representations while observing robots although robots do not have a premotor cortex. This shared activity thus clearly does not reflect the neural state of the robot, but that which the observer would have while performing similar actions. Neuroimaging studies which examine the neural activity while a group of subjects perform particular actions or experience particular somatosensory stimulation show how similar the basic pattern of activation is across different human beings. This observation suggests that the shared circuits of our brain do not make a fundamental mistake by simulating the brain activity of other individuals by assuming implicitly that the neural states of the people they observe are similar to their own.

Interestingly, we do not normally confuse our own actions/sensations/emotions and those of other individuals because although shared circuits react in similar ways to our own experiences and those of others, many other areas clearly discriminate between these two cases. Our own actions include strong M1 activation and weaker STS activations, while those of others inhibit M1 but strongly activate the STS. When we are touched, our SI is strongly active, while it is much less active while we witness touch occurring to others. In contrast, patient C who is literally confused about who is being touched shows abnormally strong SI activity during the sight of touch (Blakemore et al., 2005). Even the parietal and premotor regions that contain mirror neurons include many neurons (~80-90%) that only respond either during the monkey's own actions [3-6, 17]. In this context, the distinction between self and other is quite simple, but remains essential for a social cognition based on shared circuits to work (Gallese and Goldman, 1998; Decety and Sommerville, 2003). Some authors now search for brain areas that explicitly differentiate self from other. Both the right inferior parietal lobule and the posterior cingulate gyrus have been implicated in this function (Decety and Sommerville, 2003 and Vogt 2005 for reviews).

The account based on shared representation we propose differs from those of other authors in that it does not assume that a particular modality is more important than another. Damasio and coworkers (Damasio, 2003) emphasize the importance of somatosensory representation, we on the other hand, believe that somatosensory representations are important for understanding the somatosensory sensations of others, but are not more important than motor or emotional structures. The current proposal represents an extension from our own previous proposals (e.g. Gallese et al., 2004), where we emphasized the motor aspect of understanding other people. We believe that motor representations are essential for understanding the actions of others, but somatosensory and emotional structures are equally important for empathy. Each modality (actions, sensations and emotions) is understood and shared in our brain using its own specific circuitry. The joint neural representation of actions, emotions and sensations that result from the recruitment of these various shared representations are the intuitive key to understanding other people, without requiring that they have to pass necessarily though an imperative modality (somatosensory or motor) to be interpreted.

Of course many social situations are complex, and involve multiple modalities: witnessing someone hitting his finger with a hammer contains an action, an emotion and a sensation. In most social situations, the different abovementioned shared circuits thus work in concert.

Next to being potentially helpful in understanding what occurs in the mind of other people, the combination of shared circuits we propose have important implications for learning and culture. Culture is unthinkable without being able to learn from other people through observation. Currently, we have a much better understanding of the neural basis of trial and error learning than we have of social learning. During social learning, we typically witness another individual perform a certain action and receive a certain reward or punishment following this action. While in principle, it would be possible for the brain to develop a specific mechanism for learning by observation, in the light of the model we propose, there is no need for such a separate mechanism: shared circuits will activate both a representation of the action and a representation of its consequences in the brain of the observer 'as if' the observer had experienced the episode himself. The brain mechanisms of individual trial and error learning can then operate on the simulated input provided by shared circuits to help us learn socially what would have needed to be learned individually without shared circuits. How useful this is becomes evident when deciding whether to try bungee jumping or not. If the rubber band is too long, we might die. Trying this out by individual trial and error learning is certainly efficient (one only ever makes one mistake) but potentially costly. Examining whether another individual of similar weight survives the jump however is equally instructive and much safer.

Once shared circuits have transformed the actions, sensations and emotions of others into our own representations of actions, sensations and emotions, understanding other people boils down to understanding ourselves – our own actions, sensations and emotions. This aspect will return in relation to theory of mind.

5. Demystifying Shared Circuits through a Hebbian Perspective

For many, the existence of single neurons responding to the sight, sound and execution of an action – to take a single example – remains a very odd observation. How can single neurons with such marvelous capacities develop? The plausibility of a shared circuit account of social perception depends on our capacity to give a plausible explanation of how mirror neurons can emerge.

Shared circuits and mirror neurons could be inborn and/or they might be acquired through learning. The problem with the idea of genetically prewired mirror neurons is that the genome would need to specify the individual connections between neurons in STS and F5 with similar properties (e.g. a vision-of-grasping neuron in STS has to be wired with an execution-of-grasping neuron in F5, and so on). It is difficult to imagine how the genome would suffice to specify such a vast amount of connections. In addition, such genetic predisposition could not explain how mirror neurons can be acquired for novel skills, e.g. piano playing or opening a can of pop [23, 31, 43]. Recently, we have developed a hypothesis termed the 'Hebbian perspective' that attempts to provide a plausible account of how shared circuits develop from canalized Hebbian learning. This account is described in details elsewhere [13, 96], but we will describe it briefly here (the reader should consult [13, 96] for references supporting the claims made in this chapter).

Monkey and human infants spend most of their waking time watching themselves perform actions [97]. Each time, the infant's hand wraps around an object, and brings it towards the infant, a particular set of neural activities overlaps in time: neurons in the premotor cortex responsible for the execution of this action are active at approximately the same time as the audio-visual neurons in the STS responding to the sight and sound of the same action. Given that STS and F5 are connected through PF, this provides ideal conditions for Hebbian learning [98]: what fires together wires together. As a result, the synapses going from STS vision-of-grasping neurons to PF and F5 execution-of-grasping neurons will be enhanced as the grasping neurons at all three levels will be repeatedly coactive. After repeated self-observation, neurons in F5 receiving the enhanced input from STS will fire at the mere sight of grasping. Given that many neurons in the STS show reasonably viewpoint-invariant responses, responding in similar ways to views of a hand taken from different perspective, the sight of someone else grasping in similar ways then suffices to activate F5 mirror neurons. All that is required for the emergence of such mirror responses is the availability of connections between STS-PF-F5 that can show Hebbian learning, and there is evidence that Hebbian learning can occur in many places in the neocortex [98]. In this perspective, what is genetically predisposed are general connections between temporal, parietal and premotor regions and the tendency of infants to observe their own actions. These predispositions then 'canalize' learning, i.e. provide the right structure and the right experiences, in a way that is ideal for Hebbian learning [99]. The precise wiring of a grasping observation neuron in the STS and a grasping execution neuron in F5 is not genetically predisposed but a result of the canalized Hebbian learning.

Arguments in favor of the idea that the MNS for actions originates from self observation stems from the fact that children's understanding of the actions of others depend on their own expertise in executing these motor skills, with a training improving infant's grasping expertise improving the infant's capacity to understand similar actions in others [100]. In addition, the existence of auditory shared circuits for the sound of actions that are unlikely to be genetically predisposed (e.g. opening a coca-cola can or playing the piano) suggests that shared circuits can be acquired [23, 31, 43]. Also during action observation, acquired motor expertise modifies the response in shared circuits [21, 59].

This proposal does not preclude the possibility that although part of the MNS may originate from Hebbian learning, part of it may still be inborn [101].

The same Hebbian argument can be applied to the case of sensations and emotions. While seeing ourselves being touched, somatosensory activations overlap in time with visual descriptions of an object moving towards and touching our body. After Hebbian learning the sight of someone else being touched could trigger somatosensory activations (Keysers et al., 2004; Blakemore et al., 2005). While seeing our own actions, the visual description of our actions overlap in time not only with motor, but also kinesthetic representations of what it feels like to perform the action [23, 24, 26, 56-58].

The presence of multimodal responses in the STS and shared circuits is essential for understanding how shared circuits could develop to represent cases where we cannot see our own actions. Associating the sight of someone's lip-movements with our own lip-movements is an important step in language acquisition. How though can we link the sight of another individual's mouth producing a particular sound with our own motor programs given that we cannot normally see our own mouth movements? While seeing other individuals uttering certain sounds with their mouth, the sound and sight of the action are correlated in time, and can lead to STS multimodal neurons. During our own babbling attempts, the sound and the motor program are in turn correlated in time. As the sound will recruit multimodal neurons in the STS, the established auditory-motor connections will also link the sight of other people producing similar sounds to our own motor program. The visual information thereby rides on the wave of the auditory associations (Keysers and Perrett, 2004).

The case of emotional facial expressions presents similar difficulties. How can the sight of a disgusted facial expression trigger our own emotion of disgust, despite the fact that we do not typically see our own disgusted facial expression? First, disgust can often have a cause that will trigger simultaneous disgust in many individuals (e.g. a disgusting smell): ones own disgust then correlates directly with the disgusted facial expression of others. Second, in parent-child relationships, parents imitate the facial expressions of their children (e.g. Stern, 2000). In our Hebbian perspective, this imitation means: the parent then acts as a mirror for the facial expression of the child, leading again to the required correlation between the child's own emotion and the sight of similar facial expression. What is genetically predisposed might again be the parental tendency to imitate the facial expression of the child, thereby generating the right environmental stimuli for the infant's brain to engage in Hebbian learning.

To summarize, Hebbian association (a simple and molecularly relatively well-understood process), could explain the emergence of shared circuits. The value of this hypothesis lays in showing that shared circuits *could* emerge from learning without requiring for shared circuits to be fully determined by genetics. The extent to which genetics do preprogram this wiring still remains to be investigated.

6. Shared circuits and communication

The brain appears to spontaneously transform the visual and auditory descriptions of the actions, sensations and emotions of other people into neural representations normally associated with our execution of similar actions, and our experience of similar sensations and emotions. This transformation represents an intuitive and powerful form of communication: it transmits the experience of doing and feeling from one brain to another. This simple communication has obvious adaptive value: being able to peek into someone else's mind, and share his/her experiences renders constructive social interactions faster and more effective. For instance, sharing the disgust of a conspecific probing a potential source of food will prevent the observer from tasting potentially damaging items.

Most forms of communication have however a fundamental problem: the sender transforms a content into a certain transmittable form according to a certain encoding procedure. The receiver then receives the encoded message, and has to transform it back into the original content. How can the receiver learn to decode the message? When we learn a spoken language we spend years of our life guessing this encoding/decoding procedure. For the case of actions, the shared circuits we propose use the correlation in time in the STS-PF-F5 circuit during self observation to determine the reciprocal relationship between the motor and somatosensory representation of actions and their audio-visual consequences. Similar procedures may apply to sensations and emotions. The acquired reciprocal relationships can then serve as a rough Rosetta stone that lays out fundamental relationships between our own inner world and that of others, and can provide important keys for deciphering the encoded messages hidden in other individual's behaviors.

The link between shared circuits and language remain a matter of intense debate. Rizzolatti and Arbib [102] first claimed that mirror neurons for hand actions could be essential for the development of gestural language. More recently, the idea has been put forwards that the combination of auditory and visual mirror neurons could provide an important step in the evolution of spoken language [6, 17, 23, 92]. This latter idea has found support from the observation that the putative auditory mirror system in humans is more left lateralized than the visual mirror system [23, 38], and that only the left premotor cortex thus has extensive auditory and visual mirror neurons in humans, in accord with the left hemisphere dominance of language in humans.

As we will see below, mirror systems have however to integrate with more cognitive knowledge to explain the complexities of communication and social interactions. Clearly, mirror neurons per se do not explain language, yet they could be an important pre-adaptation, evolved under evolutionary pressures to control ones own behavior and predict that of others, but later exapted for the purpose of language [13, 92].

7. Simulation and Theory of Mind – a hypothesis

Social cognitions are not limited to the simulations that shared circuits provide. Explicit thoughts exist in humans and clearly supplement these automatic simulations. If we see someone smile, we activate our premotor, somatosensory and insular cortex as if we would be smiling, especially if we are empathic. If the person smiling is a politician promising us an attractive tax cut, we become skeptical: experience has taught us that politician's promises are often more instrumental than sincere. Similarly, if we see a person cry, shared circuits would lead us to share her sorrow. The added knowledge of knowing that she has just received a love letter stating that the man she loves is leaving his wife to move in with her, can significantly modify our interpretation of her tears, realizing that they are probably tears of joy. There are many examples of our daily life in which we clearly use explicit thoughts to guide our interpretation of the social stimuli we observe, utilizing our knowledge of the rules that govern social interactions in addition to the intuitive use of shared circuits.

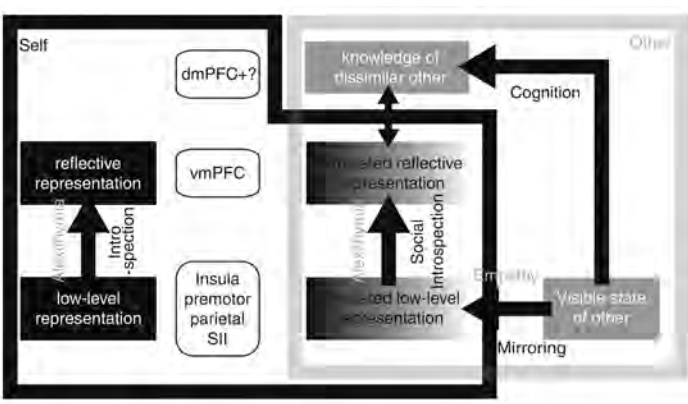

Figure 3. Illustration of the model linking theory of mind and simulation. The self is shown in dark grey, the other in light grey and candidate brain areas thought to implement representation shown in empty boxes. During our own experiences, pre-reflective representations can lead, through introspection, to reflective representations (left). While witnessing the states of others, mirroring leads to activations that simulate pre-reflective representations of our own bodily states. A process of social introspection, utilizing the mechanisms of introspection, activates representations that simulate reflective representations of our own bodily states. A more cognitive route leads to more abstract knowledge about the other that escapes from the constraints of our own experiences.

The words Theory of Mind (ToM) and Mentalizing have often been used to describe the set of cognitive skills involved in thinking about the mind of others, in particular about their beliefs [103]. People are considered to have a ToM if they are able to deal with the fact that other people can have beliefs that differ from reality, a capacity that is tested with so called false belief tasks such as the famous 'Sally and Anne' test [104]. In that test, an observer sees Sally hide an object in a basket. Sally then goes away for a while, and unbeknown to her, Anne moves the object from the basket into a box. Sally then returns, and the observer is asked: 'where will Sally [first] look for her object?' If the observer answers 'in the basket, because she doesn't know that Anne moved it', the observer is thought to have a ToM. If the answer is 'in the box', the observer failed. Children from the age of 4 years pass this test, while autistic individuals often fail the test even in their teens [104]. ToM tasks usually activate medial prefrontal (mPFC) regions of the brain and the temporo-parietal junction (TPJ).

In contrast to authors that see simulation and ToM as competing perspectives of social cognition [105], we believe that one of the challenges of current social neuroscience is to examine the link between simulation and ToM and have recently proposed a hypothesis on the nature of this relationship (Figure 3 adapted from [106]). From a first person perspective, we have experiences (e.g. we eat an oyster gone bad and feel bad) and thoughts about these experiences that are based on introspection (e.g. "I probably feel so bad because I ate a rotten oyster…."). The former cause activations in premotor, parietal and insular regions, while the latter are linked to activity in the insula and mPFC [107]. What is important is that we do not always engage in the interoceptive processes that turn the lower-level representations of what we feel into higher-level thoughts about these states that can be verbally communicated. Indeed, subjects vary in how good they are at introspecting their states, with alexithymia measuring interindividual differences in this capacity. At first sight, this distinction between (a) states and (b) conscious thoughts about states, with introspection going from a to b seems entirely detached from social cognitions: introspection is a process that only deals with ourselves. In contrast, we propose that a very similar concept may be key to examining the relationship between simulation and theory of mind.

While we observe or hear other people, shared circuits transform their actions, emotions and sensations into representations of our own actions, emotions and sensations. As a result, we have a simulated inner state that mirrors the state of the people we observe. Based on the brain locations involved in this spontaneous mirroring, these simulated states are akin to the low-level representations of our own actions, emotions and sensations. If asked to mentalize about what goes on in the mind of other people, as is the case in ToM tasks, as an observer we have two options: either we rely entirely on abstract, un-embodied knowledge about other people (e.g. "politicians lie") or we take advantage of the simulation process, and introspect the state of our own lower level representations, which during social cognition not only represent our state but also the simulated states of the people we observes. This introspection allows us to interpret the inner state of other individuals just as we would interpret our own states. In support of this idea, Mitchell et al. [108] found that reflecting about yourself and reflecting about people you believe to be similar to yourself indeed activate overlapping regions of the mPFC (introspection = social introspection) whilst thinking about people you believe to be too different from yourself activates a separate region of the mPFC in analogy to our disembodied cognitive route.

Along these lines, ToM and simulation are complementary processes, and empathy could measure how well we transform the states of others into our own states, while alexithymia how well we can reflect about our own states or the simulated states of others.

8. Overall conclusions

While 15 years ago, a neuroscientific understanding of our capacity to intuitively understand other individuals was unthinkable, scientific discoveries over the last decade start to sketch a unifying theory of intuitive social cognition. While we witness the actions, emotions and sensations of other individuals our brain spontaneously recreates a pattern of neural activity that resembles that while we perform similar actions or have similar sensations and emotions. At the neural level, this appears to occur through networks of brain areas shared between the experience of actions, sensations and emotions and the observation of these states in others. These shared activations are stronger in more empathic and weaker in more autistic individuals, suggesting that these mechanisms may be the neural basis of our intuitive empathy for other individuals. Lesions in regions involved in our own emotions or actions reduce our capacity to understand similar aspects of the mind of other individuals, supporting the view that shared circuits are necessary for an intuitive understand of other individuals. Such shared circuits need not be mysterious: they could arise from Hebbian associations during self observation. While the interaction of these intuitive and spontaneous processes and more deliberate mentalizing processes remain to be understood, shared circuits start to give a plausible neural basis for our remarkable connection to the people that surround us.

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(1) The term 'goals' will be used throughout this chapter with the meaning of 'what is being achieved'. In that sense, the goal of grasping a glass is to take possession of this object in order to use it in some way. In this very pragmatic sense, a goal does not apply higher psychological concepts such as a sense of agency etc. It is a useful concept though, as it expresses what is common to performing a certain action (e.g. grasping) independently of how it is done (with your mouth, foot, hand or a tool). Naively, one might wonder if such a concept is not mentalistic, detached from neuroscientific evidence. This though seems not to be the case: signing a sheet of paper with your foot or hand for instance relies on the same location of the premotor cortex, suggesting that the premotor cortex indeed represents goals, which can then be flexibly mapped onto the most suited effector depending on environmental contingencies.

EMOTION AND STATES OF CONSCIOUSNESS: FROM THE INTRAPSYCHIC THROUGH THE SOCIAL TO THE TRANSPERSONAL[1-2]

Etzel Cardeña*

Emotions and consciousness are intimately linked. Strong emotions can change an individual's state of consciousness while alterations in states of consciousness can have a profound impact on emotions, yet the various connections between states of consciousness and emotions are not often discussed in the literature. As a researcher of anomalous experiences, I have two goals in this paper. The first one is to provide a selective but integrative survey of diverse bodies of literature on the connection between emotions and states of consciousness. The second is to briefly review the evidence that although emotions can be analyzed from a purely intrapersonal perspective, they are also embedded within intrapersonal and transpersonal systems.

Emotions can be described as loosely-coupled, transient behavioural/expressive, physiological, cognitive, and experiential processes that involve a whole organismic response (cf. Fridja, 1986). However, there are various physiological, cognitive, personality, and cultural variables that may prevent the full expression of all affective components. Deliberate deception or cultural prohibitions may thwart emotional expression (Ekman, 2002), or the uncoupling of the experiential aspect of emotions known as dissociation may prevent the person from having a *feeling* despite emotional behavioural responses (Cardeña, 1994; Erdelyi, 1994). Although the evolutionary implications of emotions through their effect on conscious experience and their fostering of action tendencies, behaviors, and social communication have been established (Plutchik &

[1] This paper is dedicated to the living memory of May Buelna de Cardeña (1924-2008). And to M. O.

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Kellerman, 1980), it must be borne in mind that learning and development vicissitudes can give rise to various types of maladaptive emotional responses (Greenberg & Safran, 1987).

Diverse authors have given a priority to specific affective components such as action tendencies (e.g., Frijda, 1986) or cognitions (e.g., Ortony, Clore, & Collins, 1988), but a more realistic view is that different emotional components may have priority according to the context. For instance, influential acting techniques propose that the best trigger of emotions may be physical actions rather than cognitions (Cardeña & Beard, 1996). Furthermore, as the insightful analogy to a musical fugue by Lewis, Sullivan, and Michalson (1980) reveals, which component of an emotion comes first depends on the framing of the analysis and, from a longitudinal perspective, causes and effects may become indistinguishable. It makes most sense to think of emotions as systems with multiple feedback loops among their constituents (Plutchik, 2001; see figure 1), and the relationships among the various affective components as involving a heterarchy (i.e., every component has potentially equal importance) rather than a hierarchy (i.e., one or more components are more important).

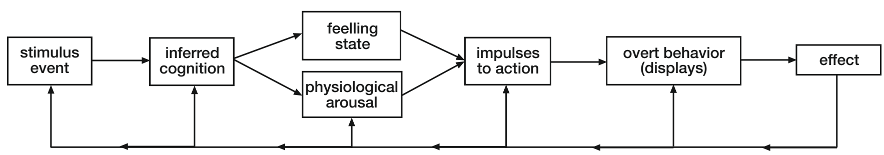

Figure 1. Emotions as multiple feedback loop systems.

Emotions as intra-personal systems

At an intrapsychic, personal level of analysis, intense emotions such as limerence (falling in love) can bring about a qualitatively distinct state of consciousness (Verhulst, 1980). Conversely, altered states of consciousness and anomalous experiences (Cardeña, Lynn, & Krippner, 2000) may produce substantial changes in emotion. On one extreme, the experiential component of an emotion may not be integrated with other affective components, a phenomenon referred to as compartmentalization dissociation, the lack of integration of psychological processes that are normally integrated (Cardeña, 1994; Holmes, Brown, et al., 2005). In this case, some individuals, typically after experiencing trauma, may manifest the physiological and behavioral aspects of an emotion, but not experience the associated feeling (see figure 2). Dissociative phenomena are common among individuals diagnosed with posttraumatic stress disorder (PTSD) (Bremner, Southwick, et al., 1992). I witnessed a demonstration of this type of dissociation when, some years ago, in the midst of conducting group therapy with war veterans, one of them started shouting at the therapists in what most observers would have interpreted as a very angry display, while tears rolled down his cheeks. An emotional outburst is not exceptional in therapy, but the disconnection between what he was saying ("I cannot feel anything") and his behavioral display was striking (see figure 3, schematizing the dissociation between the experiential and the other components of emotion). Individuals experiencing a chronic form of dissociation (depersonalization) may not feel any emotion, or perhaps only feel suffering at their lack of other emotions (Simeon & Abugel, 2006).

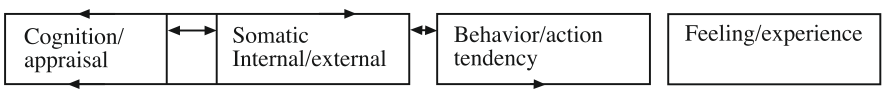

Figure 2. Experiential disconnection between feelings and other emotional components.

On the other side of the spectrum, some alterations of consciousness such as mystical, near-death and drug-induced experiences are often associated with very intense emotions (Cardeña et al., 2000). Greyson provides a typical case in which an individual retrospectively reported that during his near-death experience (NDE) he had arrived to a "region of warmth, love, and peace… [awaking] with an intense passion for helping others" (2000, p. 315). The intensity and effect of these altered states on experients' lives can be gauged by the statement that the majority of participants in a controlled psilocybin experiment rated that experience as among the five most meaningful (and impactful) in their lives. Independent observers agreed that these people had been changed for the better (Griffiths, Richards, McCann, & Jesse, 2006), an effect most often, although not always, reported after NDEs (Greyson, 2000). In the case of dreams, both pleasant and unpleasant emotions seem more prevalent than in waking consciousness (Hobson, 1995), but the experience typically does not have such a lasting influence as that of NDEs or other altered states.

As compelling as these reports may seem, they are open to charges of retrospective distortions (NDEs) or the effect of psychoactive drugs on the CNS. My laboratory has been conducting studies for a number of years that circumvent some of these criticisms, through the use of concurrent reports during minimal-suggestion, "neutral deep hypnosis", with high hypnotizable individuals. Hypnotizability has been defined as the ability to follow suggestions to affect conscious experience and behavior (Kirsch, 1994). Hypnotic responding is partly the product of becoming absorbed in and allowing suggestions or spontaneous subjective phenomena to affect experience (Cardeña & Terhune, under review). Participants in our experiments have been given a simple induction (counting from 1-30, with the only suggestion of progressively going deeper and deeper into hypnosis) and then asked about their experience every five minutes. As compared with a no-hypnosis baseline, high hypnotizables reported significant alterations of consciousness during hypnosis, including a sense of being connected with everything and having very positive emotions such as: "It's great… all the feelings that are good just surround me" "(V)ery, very happy, full of euphoria" "This is the best place to be" (Cardeña, 2005; unpublished data). These experiences do not seem to be related to demand characteristics since individuals with medium or low hypnotizability do not report such phenomena and exhibit differences in cortical activity (Cardeña, Lehmann, et al., 2007), and are compatible with the positive correlation between emotional intensity and hypnotizability (Crawford, 1989).

It is worth noting that when participants would seem to be foremost in their "inner" experience, they report interconnectedness with everything, as do individuals during deep meditation (Holroyd, 2003). Rosch (2001) points out that such experiences manifest a valid, although uncommon, form of cognition, and a study by Carpenter (2004) supports a significant relationship between reports of self-transcendence and successful performance in a controlled parapsychological experiment suggesting anomalous transfer of information. That "inner" experience may not be strongly demarcated from "external reality" is also maintained in other areas of psychology. For instance the influential perceptual psychologist J. J. Gibson also questioned the distinction between "inner" and "outer":

The supposedly separate realms of the subjective and the objective are actually only poles of attention… no line can be drawn between the subjective and the objective. The information for the perception of "here" is of the same kind as the information for the perception of "there" (1979, p. 116).

In line with this view, systems theory advocates a discussion of the individual within a larger context. Bateson (1972), while discussing "mind" defined it as a property immanent to the whole interactive system including the organism and its environment, not bounded within consciousness or a body. Although an intrapersonal perspective of emotions is particularly valuable when analyzing long-term emotional dispositions (e.g., Charles, Reynolds, & Gatz, 2001), it fails to capture the co-creation of affective episodes among individuals. A full consideration of emotions should view them as not only happening "inside" the individual, but as part of larger interpersonal and, arguably, transpersonal systems.

Emotions as inter-personal systems

The critique of a rigid objective-subjective split is consistent with an analysis of emotions as intersubjective, rather than purely intrapersonal, systems. The intersubjective nature of experience is reflected in the term consciousness itself, although typically assumed to refer to "private experience," etymologically based on the notion of shared knowledge (co-sci) (Natsoulas, 1983). Indeed, developmental psychology depicts the nature of the self as fundamentally interpersonal (Stern, 1985). Shortly after birth, infants are ready to develop meaningful interactions with their primary caretakers (e.g., Trevarthen, 1994), and throughout life emotions and shared narratives are co-created through linguistic, musical, and other means (Gratier & Trevarthen, this issue). From the field of neurosciences, the recent discovery of "mirror neurons," which fire when the individual carries out an actions or sees someone else carry out that action, provide clear evidence of a neuronal architecture primed to resonate to actions carried out by others. As two of the pioneers in this area state it:

"[H}ow strong and deeply rooted is the bond that ties us to others… how bizarre it would be to conceive of an I without an us" (Rizzolatti & Sinagla as cited by Rosenfield & Ziff, 2008, p. 65).

Thus, emotions can be considered not just as inner events but as the product of ongoing interactions between various emotional processes of two or more individuals and even aspects in their surroundings such as the weather, which may affect mood. In dyadic interactions or in more collective situations, there are multiple recurrent loops effecting emotional displays and experiences. For instance, a performer may be enthused by the audience's response and sing better, which will then further deepen the esthetic and emotional experience of the audience, who will respond accordingly, and so on; or a jazz improvisation may be the ongoing creation of a musical narrative (Gratier & Trevarthen, this issue). As Rosch writes, "the perception of the other is inherently, moment by moment, also defining of the self" (2001, p. 244). Figure 3 schematizes this interpersonal model.

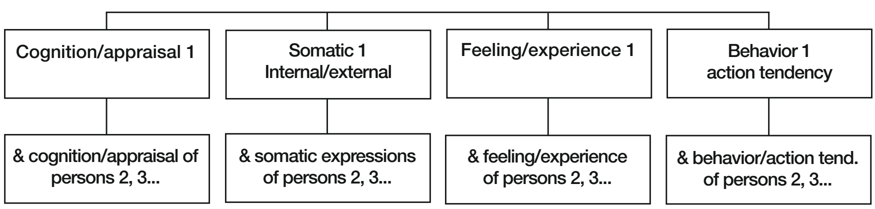

Figure 3. Emotions as interpersonal systems

With respect to states of consciousness, research on hypnosis, mental boundaries, and emotional contagion shows that the realms of the intra- and inter-personal are related. A proposed general permeability of conscious experience has been discussed in terms of access to "subliminal" experience (Myers, 1903), transliminality (Thalbourne, 2000) or, perhaps most clearly, mental boundary thinness (Hartmann, 1991). The construct of mental boundaries refers to proposed individual differences in independence ("thick boundaries") or interdependence ("thin boundaries") of a person's psychological processes (Hartmann & Kunzendorf, 2007). Examples of thinness in this construct include the propensity to not make sharp distinction between states of consciousness, interpersonal relations, and thoughts and feelings. That subjective experience and social interactions are related is evidenced by studies showing that hypnotic experience and behavior are positively correlated with "emotional contagion," the propensity to adopt the facial and bodily expression and experience the emotion of another being (Cardeña, E., Terhune, D., Lööf, A., & Buratti, in press), and to empathy (Wickramasekera & Szlyk, 2003). Although alterations of consciousness during hypnosis and the propensity to become fully focused are correlated with experiential aspects of mental boundaries such as emotional sensitivity or dream phenomena, they have no clear relation to conceptual aspects of the mental boundaries construct, such as opinions about the world or other matters (Cardeña & Terhune, under review). Thus, there seems to be a close relationship between alterations of consciousness and emotions than between the former and "cold" cognitions. The various perspectives of developmental and consciousness psychology support a view of emotions as interpersonal rather than as a purely intrapersonal system.

Emotions as trans-personal systems

The interpersonal level of analysis, which emphasizes the socially interconnected nature of emotions is not particularly controversial. A more debatable proposition is that emotions may also be viewed as transpersonal systems in which the self may be affected in ways not restricted by the usual spatial and temporal constraints. Although some spiritual disciplines may consider this a matter of faith, parapsychological (psi) data actually provide scientific evidence that we may be indeed part of such systems. Furthermore, psi research suggests that we may be part of transpersonal systems that are very much dependent on the valence and intensity of emotions and relationships. This is not the place to review the general evidence for the validity of psi phenomena, suffice it to say that even after very tight experimental controls, some of them proposed by critics, researchers continue to produce significant results for psi phenomena, despite the great difficulty in producing these phenomena at will (for a review see Irwin & Watt, 2007). The most comprehensive level of emotional analysis might take into consideration not only the links among individuals mediated by the senses or reason, but the possibility that emotional relationships may comprise systems that go beyond such constraints (cf. von Lucadou, Römer, & Walach, 2007). Figure 4 represents the *traditional* interactions (solid lines) along with *anomalous* (i.e., not mediated by the senses or reason, represented by broken lines) interactions among various emotional components.

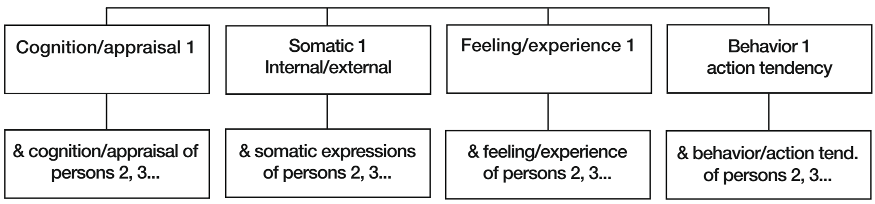

Figure 4. Emotions as transpersonal systems

This brief review of the evidence starts with anecdotal evidence. As Palmer (2006) states, the value of such data is not just to provide ideas for hypothesis testing but to evaluate in real *life* the findings of controlled studies. Ideally, evidence from controlled studies and anecdotal evidence should be consistent with each other, and it seems that such is the case in the link between emotions and psi phenomena. Various surveys throughout decades consistently show that the vast majority of putative psi-related experiences (e.g., having a dream or a hunch of someone dying at the same as s/he unexpectedly died) refer to someone emotionally close to the experient in the context of an emotionally-charged event, such as a death or a serious accident (Rhine, 1967; Targ, Schlitz, & Irwin, 2000), although there may be a report bias in that psi impressions for unfamiliar or unemotional events may not be remembered or reported as often as more dramatic ones involving those close to the percipient (Irwin & Watt, 2007). It bears mentioning that in most anecdotal accounts, putative psi phenomena cannot be produced at will and happen rarely, which may help explain why controlled research on psi shows a far from ideal, but still significant, replication rate.

In a parallel fashion, data from controlled experiments suggest that, as compared with neutral, emotional stimuli are more likely to be perceived anomalously. Although a couple of earlier studies did not find unambiguous support for this hypothesis (Delanoy, 1988), more recent work is more supportive of this hypothesis. Radin and Schlitz (2005) report that, as compared with neutral emotions, positive or negative emotions of distant individuals were significantly more likely to influence the gastric contractions of a "receiver." In a different area, dream clairvoyance (that is, anomalous information affecting dream content) was significantly more frequent with negative than with neutral or positive emotional stimuli (Sherwood, Dalton, Steinkamp, & Watt, 2000).

With respect to the possible anomalous anticipation of a future event (precognition or presentiment), information presented randomly in a computer seems to affect physiological and/or cognitive processes *preceding* the presentation of the stimulus. A number of studies in various laboratories (Bem, 2008) and a meta-analysis of a precognitive priming effect in 16 experiments have found significant effect for emotional stimuli (Schooler, 2007). It is of considerable theoretical and practical importance that the recent series of studies on *physiological* anomalous anticipation of information seems to show more robust effects than the *cognitive* anomalous anticipation of information (cf. Irwin & Watt, 2007). Consistent with this hypothesis, Delanoy and Sah (1994) reported that, as compared with neutral, positive emotional stimuli were associated with a psi effect for a physiological (electrodermal) but not for a cognitive (awareness of information) measure. This state of affairs is compatible with the notion of emotions as loosely-coupled set of structures and with the notion that psi information may generally be of such small magnitude that other than in emergencies it remains out of consciousness (Honorton, 1977). Few sources of information actually become conscious because of other competing sources of stimulation (cf. Baars, 2001), and as Plato described in his allegory of the cave, sensory information may prevent other valid information from becoming consciously apprehended.

Finally, the impact of the emotional stimuli may depend on specific psychological dynamics, as suggested by a preliminary analysis of event-related potential (ERP) data of two lists of words, trauma-related and neutral, presented in a random order to a group of war veterans with or without posttraumatic stress disorder (PTSD) (Cardeña & Jönsson, unpublished data). A significant cross-interaction suggests that brain reactions *before* the presentation of the stimuli show opposite effects depending on whether the participants had or did not have PTSD; see figure 5).

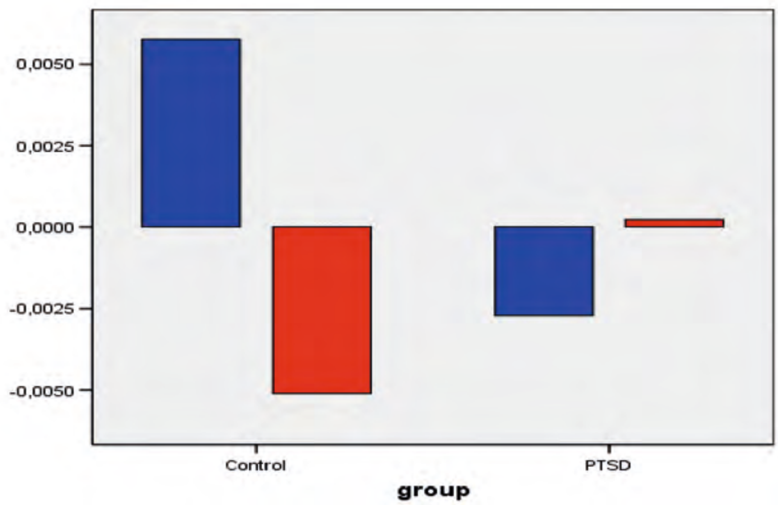

Figure 5. EEG measured in site T4 from -100 to 1 (stimulus presentation). Blue bars represent neutral stimuli, red represent war-related stimuli.

Research is also consistent with the anecdotal evidence that psi phenomena are more likely to occur in the midst of close emotional relations. Rice and Townsend (1962) found that whereas emotionally-related pairs scored significantly above chance in a controlled psi test, emotionally unrelated pairs scored significantly below chance (see also Sabell, Clarke, & Fenwick, 2001). Results from various independent laboratories have also found significant correlations of EEG signals between spatially and sensory isolated human beings (Standish, Kozak, Johnson, & Richard, 2004), although not every experiment has found a difference between emotionally-close and unrelated pairs (Wackermann, Seiter, Keiberl, & Walach, 2003). More recent work also suggests that attempts to influence at a distance the skin conductance level of an emotionally-close person may be more successful in couples in which there is training to direct one's intention to a partner affected with a serious disease (Radin, Stone, et al., in press).

There have also been observations of a potential relationship between strong emotions and non-living physical systems such as machines ceasing to function around over-stressed workers (Morris, 1986). That these phenomena may also involve a system of individuals and not a sole recipient was painfully brought to the writer's attention by circumstances surrounding the death of his mother. He was notified of her death while he was working and when he came back home, he found out that a kitchen clock had stopped at about the time that he had been notified, although the second pendulum continued to move. When he next went out, various different systems suddenly stopped working (his wrist-watch, a computer mouse, a computer interface, a computer program from an office computer, and a computer keyboard interface from his home computer). A person emotionally close to him, but who had no direct links with his mother, experienced on the same day four different machines suddenly stop functioning (two different washing machines, a car, and a lamp). Of course, there is no possibility to estimate the baseline rate or generality of such occurrences just by chance, but they are compatible with surveys and experimental research. Various studies, although not unambiguously, support the relevance of emotions on the putative direct effect of consciousness on non-living physical systems (i.e., "PK") (e.g., Lumdsen-Cook, 2005). At a more dramatic level than that found in controlled laboratory studies, "recurrent spontaneous psychokinesis" (RSPK, more popularly known as "poltergeist" phenomena) has been explained as the exteriorized pent-up aggression, especially of teens in a very troubled situation, although Irwin & Watt (2007) point out that these observations have lacked a comparison with a non-RSPK teen group. A possible PK effect may also be advantageously analyzed within an interpersonal system as suggested by cumulative and highly significant data of the so-called "global consciousness project," in which emotionally-charged socially significant events (e.g., the 9/11 terrorist attack) seem to significantly alter the output of random number generators throughout the globe (Nelson, 2008; but see May & Spottiswoode, 2001).

In sum, at the intra-, inter- and trans-personal level, emotions are intimately related to various aspects of consciousness and manifest different forms of interconnectedness within and without the individual. The various emotional and consciousness phenomena reviewed here challenge some views of emotions such as that they are located "within" individuals, that they follow simple causal lines, or that they cannot be affected non-locally. Instead, a multi-level, embedded systems approach better accommodates what we currently know about emotions and consciousness. It is also remarkable that not only do anecdotal and experimental psi data on emotions match so well, but that they are also congruent with research at the intra- and interpersonal levels. To conceive of emotions as embedded within interpersonal and transpersonal fields does not only have empirical support, but has also ethical implications in our treatment of other beings, who are also part of the various systems we live in (Newell, 2007). Although F. W. H. Myers's 1903 statement "Love is a kind of exalted but unspecialized telepathy" is more a poetic than a scientific statement, it does not do violence to the evidence reviewed here.

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COGNITIVE AND EMOTIONAL CONTROL IN THE MAJOR PSYCHOSES

Sophia Frangou*

The concept of cognitive control

Cognitive control describes the ability to optimise processing of contextually relevant information and to select responses in accord to intended goals.

Several processes have been identified as elemental components of cognitive control: (i) forming associations between stimuli, and between stimuli or actions and their outcomes (ii) extracting general principles from contingencies (e.g. task rules) (iii) maintaining and manipulating goal-relevant information (often referred to as working memory) (iv) implementation of goal-related perceptual and response bias (v) performance monitoring and evaluation.

The concept of cognitive control is intimately linked with the view of the brain as a limited capacity information processing system. The basic premise of this model is that at one or at multiple points between sensory input and behavioural output different stimuli compete at the neural level for representation, analysis and control of response.

Desimore and Duncan (1995) argue for a bidirectional control of information processing; competition between stimuli can be biased by bottom-up mechanisms influenced by the physical attributes of a stimulus and the temporal and spatial parameters of its presentation and by top-down signals that favour stimuli relevant to current behaviour.

In contrast, Norman and Shallice (1980) and Shallice (1982) emphasised the role of top-down mechanisms in controlling behavioural responses. In their model hierarchically organised schemas or memory representations control complex patterns of behavioural responses. Environmental

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stimuli trigger a number of associated responses and these schemas then compete for control of action. They distinguish between two mechanisms for control-to-action. Contention Scheduling describes the lateral inhibition of competing routine schemas that are triggered automatically. The Supervisory Attentional System (SAS) (Baddeley and Della Sala (1998) is a top down control mechanism triggered by situations requiring more complex processing than routine action selection. These involve willed actions, error correction, generation of novel responses or inhibition of reflexive behaviour in favour of more appropriate goal-directed responding. The concept of the SAS is analogous to the Central Executive proposed by Baddeley and Hitch (1974).

The Neural Infrastructure of Cognitive Control

At the neural level, cognitive control represents the orchestrated operation of sensory, motor and memory systems along a common internal theme. The prefrontal cortex (PFC) has long been ascribed an instrumental role in effecting cognitive control based on observations about the consequences of frontal lesions on behaviour. Advances in neuropathology have confirmed the presence of extensive reciprocal connections between PFC regions and all other more posterior cortical and subcortical structures (Fuster1989; Barbas and Pandya 1991; Pandya and Barnes 1997; Miller 1999;). The PFC is not a homogeneous structure but is commonly considered as having a lateral, orbital and medial division. The lateral surface occupies the superior, middle and inferior frontal gyrus and is further subdivided into dorsolateral (comprising of Brodmann Areas 9, 46 and 8) and ventrolateral PFC (which includes BA 44, 45 and 47). The medial PFC consists of the medial frontal gyrus, which includes the supplementary motor area (SMA) and pre-SMA (both included in BA6) as well as medial aspects of BA8 and 9. The anterior cingulate cortex (ACC) is often included with the medial PFC subdivision. The ACC is also subdivided into ventral (BA32, BA25), rostral (BA32, BA24), and dorsocaudal portions (BA32, BA24). The orbital PFC occupies the orbital and recturs gyri, both included in BA11, and the frontopolar region (BA10).

The dorsolateral PFC (DLPFC) receives visual and somatosensory input from the inferior parietal cortex and operculum. It also projects to the premotor cortex (Akkal et al. 2007) and to the pre-SMA and cingulate motor area CMAr (Lu et al. 1994). The PFC is not directly connected to primary motor areas but it influences action execution through the premotor cortex, the SMA and pre-SMA as well as through its projection to the basal ganglia and thalamus (Mink 1996).

The ventrolateral PFC (VLPFC) receives visual and auditory information from the inferior and superior temporal cortex respectively (Pandya and Yeterian 1998), and somatosensory information from the parietal operculum (Carmichael and Price 1995). The medial PFC receives information from the insula and pyriform cortex (Carmichael and Price 1995). Both VLPFC and medial PFC are connected to each other and to the amygdala.

This pattern of connectivity provides the anatomical infrastructure for synthesising complex information relating to the external and internal environment and coordinating brain processes required for goal-orientated behaviour. A number of neuroimaging studies have reported relative dissociations in the activity of the regions implicated in cognitive control, which indicates a degree of functional specialisation.

The DLPFC is active in tasks that require maintenance and manipulation of information in working memory; initial evidence for this come from studies in primates showing that neurons in the DLPFC are active when a simple cue has to be maintained over a delay (Goldman-Rakic 1987; 1990). The role of the DLPFC in human working memory has been amply supported by neuroimaging studies (D'Esposito 2007). The VLPFC, through its connections with the visual association cortices in the inferior temporal cortex is engaged in mapping visual stimuli to their outcomes (Passingham et al. 2000) and is also involved in intended action such as controlled memory retrieval (Fletcher and Henson 2001) or response inhibition/modification (Konishi et al. 1999; 2005) by biasing response selection. In both ventrolateral and medial PFC, there are cells that respond to cues predicting a specific reward (Schultz et al. 2000; Kringelbach and Rolls 2004; Watanabe and Sakagami 2007). The ACC is engaged in many different tasks particularly those involving divided attention or overriding prepotent or habitual responses; it has been proposed that the core underlying contribution of the ACC to cognitive control is through conflict and error monitoring (Carter et al. 1998). This evaluative function serves to adjust top-down organisation so as to optimise performance. It has also been proposed that ACC involvement in conflict and error prediction applied mostly to tasks where two response tendencies are activated concurrently. In more complex paradigms, with multiple potential responses and/or when the conflict arises at the level of knowledge (or uncertainty) then medial BA8 activation appears to perform an evaluative role (Volz et al. 2005).

Cognitive Control in the Major Psychoses

Disruption in cognitive control may be a key feature of major mental illnesses such as schizophrenia (SZ) and Bipolar Disorder (BD). In both conditions dyregulation is noted in fundamental aspects of cognition such as perception (exemplified by the presence of hallucinations), allocation of attentional resources, memory including working memory (Schretlen et al. 2007), planning and response inhibition (Quraishi and Frangou 2002; Schretlen et al. 2007). The section below discusses similarities and differences between SZ and BD in abnormalities in cognitive control as revealed through patients' performance and patterns of neural recruitment during tasks known to assess fundamental aspects of cognitive control.

Response Inhibition - Stroop Colour Word Test

Cognitive control is particularly relevant for goal-related neural activity in the face of interfering stimuli or conflicting demands (Botvinick et al. 2001). Behaviourally, cognitive control is reflected in the ability to suppress or modify competing responses that are not compatible with the intended goal. This concept is included in a number of theories about the organisation of higher cognitive functions. Shallice (1988) attributed the function of inhibiting or modifying reflexive behaviour in favour of appropriate goal-directed responding to the "supervisory attention system".

The Stroop Colour Word Test (SCWT) is an established and widely used test of response inhibition. In the SCWT participants are asked to read colour words (non-interference condition) or to name the font colour of incongruous colour words (interference condition) (Stroop 1935). The task demands the resolution of a conflict between reading and naming, with reading being the prepotent response. Difficulty with inhibition of the prepotent response is reflected by an increase in response time in the interference condition (MacLeod 1991).

Neuroimaging studies of the SCWT using both Positron Emission Tomography (PET) and functional magnetic resonance imaging (fMRI) have shown that the task consistently engages a widespread neural network involving the ACC, in the supplementary motor, inferior parietal, inferior frontal, and DLPF cortices, as well as the caudate nuclei and visual association and inferior temporal regions (Peterson et al. 1999). The degree of activation in the ACC is greater during responses in the interference condition (Pardo et al. 1990; Larrue et al. 1994; Carter et al. 1995; Peterson et al. 1999; Leung et al. 2000; Gruber et al. 2002). MacDonald et al (2000), using fMRI, were able to show that ACC activity was associated with error and conflict monitoring supporting an evaluative role for this region in cognitive control. In contrast, the DLPFC appeared equally active in both congruent and incongruent conditions and this has been interpreted as evidence that it contributes to the representation and maintenance of task-related information and perceptual bias (MacDonald et al. 2000). Activation in the VLPFC during the SCWT is primarily seen on the left; it is considered to reflect activation related to semantic context and carries out selective processing enabling the appropriate, colour naming response (Taylor et al. 1997). As already discussed VLPFC activation is also seen in a number of tasks requiring response inhibition (Konishi et al., 2005).

Patients with SZ and BD show performance decrements in the SCWT (Frangou et al. 2006). Neuroimaging studies however suggest that the neural underpinnings of this impairment are different. Kerns et al

(2005) used fMRI to compare healthy participants to minimally symptomatic, medicated patients with SZ (n=13) while performing the SCWT. The two groups differed in the degree of activation of the ACC, which was reduced in patients with SZ both in post-conflict trials and in trials with incorrect responses. Similar findings with regards to the ACC have been reported by Weiss et al (2007) in unmedicated, acutely symptomatic SZ patients (n=8). These observations suggest that in schizophrenia there is reduced ACC monitoring and this deficit in performance evaluation may also impair adjustment and implementation of prefrontal cognitive control. In contrast, fMRI comparisons of patterns of brain activation during the SCWT between patients with BD and healthy subjects revealed relative hypoactivation in patients in the VLPFC (Blumberg et al, 2003; Kronhaus et al. 2006). The VLPFC is involved in the implementation of cognitive control by biasing response selection mostly in conditions where inhibition is required.

Therefore, the nature of abnormality in cognitive control in the two major psychoses appears to differ, at least with respect to the SCWT; Dysfunction in SZ seems associated with the evaluation while in BD with the implementation of cognitive control.

Working Memory – The N-back Sequential Letter Verbal Working Memory Task

Working Memory is a core component of cognitive control and refers to the ability to maintain and manipulate goal-related information (Baddeley and Hitch, 1974). The N-back sequential letter verbal memory task is commonly used in the study of working memory. There are several variations of the task but the most typical version involves the sequential presentation of letters, one at a time. In the baseline or 0-back condition participants are asked to respond when a designated letter appears. The task becomes progressively more difficult in the 1-, 2- and 3- back conditions where participants are asked to respond when the letter they currently see matches the one presented in the previous 1, 2, or 3 trials.

In healthy individuals, as shown by Owen et al (2005) in their meta-analysis, the N-back task produces robust and replicable neural activation within a widely distributed network. This includes the DLPFC (BA9, 46), the VLPFC (BA45,47), frontopolar region (BA10), the parietal cortices (BA7,40), the premotor cortex (BA6,8) and dorsal cingulate gyrus/SMA. During the n-back, engagement of the DLPFC is considered to contribute to maintenance and manipulation of representations of goal-related information while that of the VLPFC is thought to reflect mapping of stimuli to responses as each stimulus is presented and compared to preceding stimuli. Recruitment of frontopolar regions may facilitate task performance via co-ordination of the multiple strategic processes involved while the parietal cortices may function as additional storage buffers (Owen et al. 2005). As task-difficulty increases there is also a parallel increase in prefrontal activation up to the point where the capacity limit of working memory is reached. Thereafter, prefrontal activation and behavioural performance decrease (Callicott et al. 1999). The relationship between performance and prefrontal activity has therefore been described by an inverted-U function (Callicott et al. 1999).

There are numerous neuroimaging studies of the N-back in SZ (Manoach 2003; Glahn et al. 2005; Honey and Fletcher 2006). Initial studies reported hypofrontality in schizophrenia during this task; however more recent explanatory models have used the inverted-U relationship between DLPFC activation and performance to account for the prefrontal function in schizophrenia during working memory paradigms (Manoach et al. 2003; Honey and Fletcher 2006). At low levels of difficulty, schizophrenic patients may recruit greater prefrontal resources but still underperform compared with controls ("inefficiency"), while at higher levels of difficulty patients may fail to sustain activity within the prefrontal network subserving working memory, achieving even lower accuracy as a result (Cannon et al. 2005). In patients with SZ working memory overload may occur at a lower threshold due to disease-related pathology and the reduced DLPFC response may therefore reflect normal attenuation of activity in this region when working memory capacity is exceeded (Perlestein et al. 2001); this deficit appears to affect both maintenance and manipulation of goal-directed information (Cannon et al. 2005).

There are relatively fewer neuroimaging studies of the n-back task in BD. Monks et al (2004) examined remitted BD patients in the two-back version of the n-back task. There was no difference between patients and controls in performance but patients showed hypoactivation in dorsal PFC. In a preliminary fMRI study of 7 asymptomatic, minimally treated BD patients performing the n-back task we showed that relative to controls patients failed to show the failed to show the predicted dynamic response in dorsal prefrontal regions associated with increasing memory load from the 0-back to the 3-back condition; behavioural performance in BD patients was maintained at levels comparable to controls via recruitment of more posterior cortical regions (Frangou et al. 2008). In a further study from our lab, data from 47 remitted BD patients were compared to 47 healthy participants while performing the n-back task. As memory load increased, BD patients showed less activation than controls in the dorsal PFC, in BA9 and , and increased activation in temporal cortical regions (BA 21and 22) and in the ACC (BA 32) (Jogia et al. Submitted). The brain regions where decrements in activation where observed in BD are considered to contribute to maintenance of information. Lateral temporal cortical involvement has been associated with semantic and episodic memory retrieval (Kirchhoff et al. 2000) and suggests that BD patients may engage resources normally subserving episodic or semantic memory to maintain their behavioural performance together with enhanced error monitoring reflected in increased ACC engagement in this group relative to controls.

Decision-making – The Iowa Gambling Task

In goal-orientated behaviour, deciding on a particular action is biased by the anticipation of the outcome of such an action. If an action does not lead to the expected reward then action-reward contingencies need to be re-evaluated and response selection adjusted.

A number of tasks have been employed to study the effect of affective processing on decision-making, the most widely known being the Iowa

Gambling Task (IGT) (Bechara et al. 1994). In this task, participants are asked to win as much hypothetical money as possible by selecting cards arranged in four decks (decks A-D). They are told that each card has a monetary value, which is revealed only after it has been selected. Unbeknown to participants, cards in decks A and B are “disadvantageous” as they are associated with high gains but higher and more frequent losses while the opposite is true for the “advantageous” decks C and D. Rewards and punishments are sequenced so that it is difficult to this work it out initially bit over time participants are expected to choose more cards from the advantageous decks. In healthy individuals, the IGT is known to engage a widespread neural network that includes the ventral and dorsolateral PFC, the ACC, the insula, the inferior parietal cortex, the caudate nucleus, the thalamus, and cerebellum (Ernst et al. 2002).

Patients with schizophrenia show very subtle impairments in behavioural studies of the IGT (Ritter et al. 2004; Shurman et al. 2005;Sevy et al. 2007; Premkumar et al. 2008) and there have been negative reports (Wilder et al. 1998; Cavallaro et al. 2003; Rodriguez-Sanchez et al. 2005) as the effect size of difference between patients and controls if generally small (Premkumar et al. 2008). The impairment seen in IGT performance in patients with SZ has been examined in detail by Premkumar et al (2008) who compared SZ patients to controls in terms of the component processes of the IGT. Three components are thought to determine an individual's pattern of performance on the IGT (Yechiam et al. 2005). *Attention to reward* assesses the influence of gains rather than losses and defines a reward-driven performance style. *Memory for past, relative to recent, outcomes* describes the influence of the most recent, over past outcomes, in card selection. *Impulsivity* evaluates the reliability with which decisions are made based on expectancies about each deck. Poor performance in SZ patients was accounted for by their poor memory for past, relative to recent, outcomes; they were comparable to controls in attention to reward and impulsivity. These observations suggest that patients' poor planning ability on the IGT did not reflect abnormalities in emotional processing but working memory deficits as reflected in difficulties retaining information over a number of trials regarding reward size and frequency.

In our fMRI study (unpublished data), 41 remitted BD patients were compared to an equal number of healthy controls while they performed the IGT. Both groups performed at a similar level with regards to overall emotional learning. In the fMRI data analysis, a main effect of diagnosis was found bilaterally in the medial frontal gyrus (BA 10) and ACC (BA 32) and unilaterally in the left caudate and the left subgenual cortex (BA 25). In all these regions, BD patients had greater signal intensity than healthy individuals. As previously discussed ACC engagement is increased in error recognition and response selection particularly in the face of changing reward contingencies (Williams et al. 2004) or novel rules (Walton et al.2004). Increased activity in the ACC is also seen as a function of task difficulty (Paus et al. 1998). In this study, increased activation in the ACC in BD patients included BA25, often referred to as subgenual cortex. This region, which is heavily interconnected with BA32, and with somatosensory structures such as the insula and amygdala is considered crucial in reward processing (Drevets et al. 1998). It could be argued that the increased activation in the ACC may simply reflect the fact that patients may have found this task more difficult than controls but it may also represent increased inhibitory control of the insula or amygdala. It should be noted that increased ACC activation was also observed by Rubinstein et al (2001) in a PET study comparing cerebral blood flow between manic and healthy individuals while performing a gambling task suggesting that this finding is state independent. In contrast, medial frontal activation within BA10 was found by Rubinstein et al (2001) to be reduced in manic patients while it was increased in our study of remitted BD patients. Activation in medial BA 10 is considered to reflect maintenance and monitoring of information specifically as applied to the reward value of stimuli/responses and to contrast these with those of future stimuli/responses (Elliot et al. 2004). Remitted BD patients may therefore require a greater engagement of this region to maintain performance.

Concluding Remarks

This review uses the concept of cognitive control as a framework for exploring, understanding and contrasting changes in elemental components of brain function and their corresponding neural networks in the major psychoses. The evidence outlined is representative rather than comprehensive but they argue convincingly for abnormalities in cognitive control both in SZ and BD. It also demonstrates the inadequacy of behavioural measures in interrogating the issue of similarities and differences between the two disorders. The studies presented argue for abnormalities in three components of cognitive control in SZ and BD. Both disorders are associated with impaired response inhibition which however may reflect failure at different nodes of the relevant neural network; in SZ, the failure is in the performance evaluation and monitoring while in BD deficits are seen in the implementation of response inhibition. The two disorders appear to share abnormalities in working memory and recruitment of associated PFC regions; the differences appear quantitative with deficits being greater in SZ than BD. In addition, BD may be also associated with greater neural plasticity as shown by the recruitment of alternate brain regions within the temporal cortex to compensate for the PFC inefficiency. Finally, patients with SZ underperform in decision-making tasks because of their deficits in working memory and their inability to retain, over time, information about stimulus-outcome associations. In BD, the impairment is in the processing of affective (reward vs punishment) information.

The outline presented also argues that dorsal PFC and working memory failure is a fundamental, disease-non specific feature of severe brain dysfunction associated with psychosis; changes in other networks may be more disease specific and therefore of greater diagnostic value.

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RECOGNIZING CONCEALED EMOTIONS: MICRO EXPRESSIONS[1]

Paul Ekman*

Nearly forty years ago I taught a class to the psychiatric trainees at my university. I told them about my exciting new findings suggesting that emotional expressions are universal. Wonderful as they thought that was, they wanted help with a critical decision they were sometimes asked to make when inpatients requested a pass to return home for a day. Such patients would claim to be feeling much better, no longer depressed, no longer thinking about suicide. How could they tell if the patient was telling the truth or lying to get free of the hospital's supervision to commit suicide? It happened. But if the patient was being truthful and really did feel better, spending a day at home would be an important step on the path back to a normal life.

I had no idea what the answers would be. I didn't know if there would be any sign in the expression itself or in the patient's gesture that an emotion was fabricated, not real. Was there any way to see the true emotion beneath any false mask? Are human beings capable of deliberately suppressing from view any sign of their true feelings, especially when those emotions are felt very intensely? And, can anyone other than a trained actor voluntarily create an expression that looks genuine when it is not?

I began by examining in detail one of the films in my library of motion picture films (this was before the advent of video, when sound motion picture film was the only medium for recording expression and gestures). For the previous year I had been filming interviews when psychiatric patients were first admitted to the hospital, again when the staff thought there had been significant improvement, and a third time a week before patients were discharged. I remembered that the staff had told me that one of the patients had confessed she had been lying during her mid-hospitalization interview when she claimed to be no longer depressed, and asked for a weekend pass. When the doctor did not grant her request

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she admitted that she had intended to take her life if he had let her leave the hospital. I had, by luck, a film when she was lying.

Mary (not her real name), was a forty year-old woman who had made three nearly successful suicidal attempts before being hospitalized. The first time I watched the mid hospitalization film in which she had been lying I saw no evidence of that; she smiled a lot, spoke optimistically and seemed cheerful. I would have believed her; the doctor was about to grant her request when she confessed her lie. She had fooled him too.

I and my co-worker Wally Friesen then used an elaborate slow motion projector to examine each and every facial expression and gesture, frame by frame, then in very slow motion, then a bit more rapidly, and so forth. It took more than one hundred hours for us to go through the twelve-minute film, but it was worth it.

In a moment's pause before answering the doctor's question about her plans for the future we saw a look of intense anguish, it was only two frames out of twenty four - 1/12 of a second -quickly covered by a smile. We watched it again and again; there was no doubt what it revealed. In freeze frame her true emotion was extremely clear, revealing her deliberately concealed anguish! Alerted then about what to look for we found three other such very fast expressions of anguish in the twelve-minute film. Once we had seen them in slow motion, we found that we could spot them when looking at the film in real time.

We called them micro facial expressions in our first publication[2] on what we termed nonverbal *leakage*. Later I found that Haggard and Isaacs had discovered micros three years before us but they differed from our report in two ways: they proposed that micros are signs of repressed emotion, not deliberately suppressed emotions[3]; and they claimed that micro facial expressions are not visible at real time. We had found that it was possible to see micro expressions at real time, without slowed motion, if you knew what to look for. We didn't yet know how easy it would be to teach people to spot micro expressions.

Putting our two discoveries together, (supported by further evidence we had obtained on both deliberate concealment and repressed emotions[4]) it is now clear that micro expressions can occur for either of two reasons:

like Mary, when there is deliberate concealment; and, as Haggard and Isaacs found, when the person doesn't know how he or she is feeling, that is, the emotion has been repressed. It is important to note that the micro expression looks the same – whether it is the result of suppressed or repressed emotions. The micro expression does not itself tell us which it is; that must be determined by the context in which the micro occurs and further questioning.

This is a good place to explain what I mean by *context,* for that term typically refers to four quite different matters, and each of them is important in evaluating the information contained in a micro expression. The broadest meaning of context is the *nature of the conversational exchange;* is it a first meeting, a casual conversation, a formal interview, an interrogation in which the other person knows that he or she is under suspicion of wrong-doing? The very same micro expression might have different significance in each of those conversational contexts.

The second contextual issue is the *history* of the relationship; what has transpired before in this same conversation, and in previous contacts between the person being evaluated and the evaluator. And what do each expect and want their future relationship to be?

A third contextual issue is what has been called speaker turn, is the micro expression shown when the person being evaluated is speaking or listening? The fourth contextual issue that has to be considered in evaluating a micro expression is *congruence*; by that I mean whether the emotion shown in the micro expression fits or contradicts the simultaneous, speech content, the sound of the voice, the gestures and posture. If the micro expression is shown when the person is listening, then the focus should be on how well it fits with what the evaluator is saying, and with what the person being evaluated next says.

All four of these contextual matters must be considered not only when evaluating the emotion revealed in a micro expression, but also when evaluating the information shown in a macro, normal facial expression of emotion. They must also be considered when evaluating signs of emotion in the voice, in posture, and other cognitively based clues to deceit that I am not discussing in this chapter.

Most people do not see micro expressions when they occur during a conversation, competing for attention with words, the sound of the voice, and the gestures. Another reason they are missed is that we are often distracted by thinking about what to say next rather than watching closely the person who might show a micro expression. Even when we have shown people micro expressions out of context – with the sound turned off, and no need to think of replies – most people do not report seeing many of them.

When I first tried to teach people how to spot micros I was surprised how quickly they learned. After a few years I put the training materials on to a self-instructional CD, The Micro Expression Training Tool (METT). METT significantly improves the ability to spot micro expressions in about one hour. It can now be learned on-line (www.METTonline.com), and depending on the time invested most users achieve 80-95% accuracy. Separate training is provided to learn how to recognize micro expressions when only a profile view is seen; it is much harder, but vital to recognize in the many situations in which a head-on view is not available.

Our evidence[5] shows that people can not only improve on our training tool, but importantly that skill once acquired transfers to spotting that information when it occurs during interviews, competing for attention with voice, words, gestures, gaze direction and posture. Our unpublished evidence and the evidence of others[6] has found that micro expressions are a very valuable indicator that the truth is not being told in those situations where there are only two possibilities: lying and truthfulness.

My Micro Expression Training Tool (METT) is now used in the training of law enforcement, national security, health professionals, visa interviewers, salespersons, job recruiters, and mental health professionals. I don't want to give the impression that most lies are detected because of micro expressions or any other sign of emotional behavior. Often it has nothing to do with the liar' demeanor, but instead the lie is betrayed by incontrovertible evidence from another source, such as a reliable eyewitness or physical evidence. Sometimes the liar can't resist bragging, revealing his secret to an untrustworthy source who turns him in. The notorious spy John Walker sold secrets to the Soviet Union about how we were able to make the propellers on our nuclear submarine silent - a very important fact, because before they learned that the Soviets couldn't tell where our subs were hiding, but their noisy propellers revealed the location of their submarines. Walker wasn't caught by the polygraph or by an astute interrogator. He bragged to his wife about how much he was being paid, without taking heed of the fact that she was his ex-wife, and he was behind in alimony payments! She turned him in.

There are occasions when the liar doesn't deliberately or unintentionally spill the beans, when there is no other incontrovertible contradictory evidence. Most criminal prosecutions that go to trial, rather than being settled by a plea bargain, are just like that. The decision about truthfulness is made by a jury, in some part at least by evaluating demeanor, trying to decide who is telling the truth from what they say and how they say it. In those cases the lie is not usually, like Mary's, about what emotion is being felt at the moment of the lie. It is instead about an action, usually but not always an action that already occurred. Even then emotions can become involved in lying.

Three emotions are most often aroused when a person engages in a lie: the fear of being caught; guilt about lying, and duping delight, the excitement and pleasure about the prospect of succeeding in the lie. Their presence, if noticed may indicate that a lie is being told. Elsewhere[7] I have discussed at length what determines whether or not each of these emotions will occur when a person engages in a lie.

If the lie is about how the person feels at the moment (such as Mary's lie about her mental state), it usually will have two components: the concealed emotion and the fabricated cover or mask. It is easier to conceal with a masking expression than with a blank, unemotional face. Very often the situation that motivates the lie requires both concealment (anguish in Mary's case) and fabrication (cheerfulness). The smile is the most common mask, perhaps because the likelihood is that most of the time when we are lying about how we feel it is to conceal fear, sadness, anger, contempt or disgust. Of course one of these emotions could be masked with another; probably that most often happens when anger is used to mask fear. Lies about emotions may produce micro expressions that reveal the emotion being concealed, or leakage of the felt emotion that escapes the mask.

Let me repeat again - emotions do not tell us their source. When we see signs of a concealed emotion in a micro expression, or a normal facial expression that contradicts the words, voice or gesture that is a *hot spot*. Hot spots are not proof of lying; they instead mark places where we need to find out more to make an accurate evaluation of truthfulness.

Let me mention a second caution: not everyone who suppresses or represses an emotion shows a micro expression. We have found micro expressions in about half of the people who are deliberately lying in our research studies. The presence of a micro expression means something (an emotion exists and it is being concealed), but its absence does not tell us whether concealment is or is not occurring. We still do not know why only some people generate micro expressions when they conceal emotions.

More generally, we have not found any behavioral change that always occurs in every person who is lying; that is why lie catchers must learn to be alert to every aspect of demeanor, for it is never possible to know ahead of time where the important information will be apparent. This news always disheartens television interviewers and print media writers, who are disappointed I can't tell them the one sure-fire behavioral clues to deceit. It doesn't exist. Anyone who says there is an absolutely reliable sign of lying always present when someone lies and never when someone is truthful is either misguided or a charlatan.

Most people in law enforcement or national security positions currently are either taught nothing about how to conduct an interview or are taught just such mistaken notions. It is reassuring to be told here is the clue or set of clues you can always rely upon and never miss spotting a liar. Unfortunately the feedback that you made a mistake doesn't always occur.

We have also provided training to military intelligence and counter-intelligence. I didn't realize how different those two jobs are. Military intelligence conducts interrogations of those suspected of intending harm against the United States, when they are encountered overseas in a military action, such as Iraq. While there has been a lot of publicity about those who have used inhumane, cruel or abusive methods, few people know that we have taught one group of military intelligence officers our non-coercive methods of evaluating truthfulness and those people went to Abu Ghraib prison. Some have reported back to us how useful they found our training to be in that setting.

Counter-intelligence is an entirely different matter, aimed at detecting those people who knowingly or unwittingly are supplying information to foreign governments. Most of those under consideration do *not* know that they are being evaluated. Not until the decision is made to arrest or deport someone would that be revealed and a formal interview conducted. Some people considered to be spies are fed false information, or simply watched for years. The counter-intelligence agent does not reveal his or her identity, but nevertheless finds the means to have informal conversations with the suspect. We do not teach them how to disguise themselves or their intent, but our information on evaluating truthfulness helps them evaluate the person of interest to them.

A few years ago we were asked to help the Foreign Service Institute (FSI) of the State Department train new personnel just entering the service. The primary focus has been on visa interviews with foreigners seeking to visit the United States, the goal being to identify those who are lying when they say it is just a visit for a holiday or visit friends or family, and intend to stay as illegal workers, or much worse, are smuggling drugs or money, or intend to engage in terrorism. We sent two person teams, a scientist and a law enforcement officer, to Toronto, Cairo and Mexico City to watch the young Foreign Service officers do their visa interviews. The crush of people they have to evaluate allows no more than three minutes per interview to decide whether to accept or reject the application, or refer the person for more intensive interviewing. In Mexico City, where I went, they do about 1000 visa interviews a day.

When I heard that the interviews were only three minutes I initially thought it would be impossible to teach them anything they could use in such a short period of time. However, watching the interviews in Mexico City, and videotapes of interviews in Toronto, it became very clear that our work would apply, and we have been continuing to work with the FSI for a few years, up through the present.

They use our training not just in dealing with visa applicants, but Americans who come into an embassy or consulate to obtain advice, get a passport renewed, arrange for an adopted child to leave the country with them, and so forth. It was in regard to interviewing an American that one of the people we trained noted, "…a passport applicant's face drew up, for a split second in a classic disgust micro expression when asked about his supposed hometown. It was enough to raise the suspicion of the Vice Consul, who investigated further and discovered that the true holder of the identity used by the applicant is locked up in a Florida prison. The applicant himself is a U.S. citizen wanted for robbery and rape in another state. He had been on the run for several years and had been previously issued a passport in the false identity. Dutch police arrested him and he is awaiting extradition back to the United States."

Airport security is an even more difficult setting in which to identify those intending harm or criminal activity, because the *base rate* is so low. Two million people enter our airports every day and it is believed that more than ninety-nine percent of them pose no problem. Trying to find the terrorist among them is like searching for the proverbial needle-in-a-haystack, but missing that needle could result in enormous damage. It is not possible to interview every person who enters an airport; they can do that in Israel since they only have 50,000 who go through their one international airport each day, not two million.

Behavioral observation is now adding a new layer of airport security, in addition to checking tickets, baggage, and names against a watch list. The program is called SPOT, which stands for Screening Passengers by Observational Techniques. These are not the people who search your hand baggage or ask you to take off your shoes. The Behavior Detection Officers stand off to the side watching each person to notice anything that is amiss, looking for people who are behaving quite differently from most of the people waiting on line. It might be a micro expression or one of a number of other behaviors on their checklist. If a certain number of signs of something suspicious are shown, the SPOT officer approaches the person and asks a few questions, while the person remains in line. In the overwhelming number of instances they discover an innocent reason for the person's unusual behavior, for example a person showing many signs of worry who it turns out can't remember if he or she turned off the stove before leaving the house. In a few instances the person is detained for further interviews, and in those cases a very high percent turn out to be wanted criminals, drug or money smugglers, illegal immigrants, or terrorists. Our group is now providing training on evaluating truthfulness to the SPOT personnel. We have also trained those who train the equivalents at English airports.

Our training is just now entering the corporate area, where it has use in many aspects of business. Corporate security, hiring evaluations, negotiations, sales, and evaluating the credibility of a spokesman for a company reporting expected earnings or intentions regarding new products or acquisitions.

Learning how to spot micro expressions could be very important for doctors and nurses. It is not just to identify the patient who feigns illness to get workmen's compensation, or those peculiar people who seek to have surgery for nonexistent problems in themselves or their offspring. Patients with no malevolent intent often conceal their fears, doubts about proposed treatment, or the competency of the health care provider, because of embarrassment or fear of being rejected. Patients may also lie about whether they are following the prescribed treatment and taking the prescribed medications. We have provided such instruction to the medical students at Mayo Clinic and the University of California, San Francisco. Hopefully this is just the beginning.

We did not anticipate that training on micro expressions would benefit patients diagnosed with schizophrenia, but Tamara Russell and her colleagues found just that[8]. Training with METT resulted in significant improvement from pre to post test, with the schizophrenics at the post test become as skillful as the normal control group was on the pretest. In another study they found schizophrenics trained with METT improved but those just shown the faces without training did not. Moreover, those trained with METT changed in what they looked at. Changed visual check of feature areas endured a week and a month later.

Computer dating, jury selection and gambling are other settings in which micro expressions surely occur, but we have chosen not to work in those markets.

Shortly we will be providing on-line instructional tools for learning how to identify the signs of when an emotion is first beginning by using he Subtle Emotion Training Tool (SETT), and be warned of the likelihood of an impending physical assault by using the Dangerous Demeanor Detector (D^3).

Notes

[1] This report is drawn from chapter 10 in the second edition of my book Emotions Revealed, 2007, Owl Books; and from an article in preparation Frank, M. Matsumoto, D. Ekman, P. Kang, Sanuk, and Kurylo, A. "Improving the ability to recognize Micro-Expressions of Emotion" Submitted for publication, 2008.

[2]Ekman, P. and Friesen, W.F. Nonverbal leakage and cues to deception, Psychiatry, 1969, 32, 1, 88-105.

[3] Haggard, Ernest A. and Isaacs, Kenneth S. "Micro-momentary facial expressions as indicators of ego mechanisms in psychotherapy", in Methods of research in psychotherapy, ed. (Gottschalk, Louis A. & Auerbach, Arthur H.), Appleton-Century Crofts, 1966.

[4] I am grateful to Mardi J. Horowitz, M.D. for providing the opportunity to examine interviews with patients who had repressed specific emotions.

[5] Frank, M. Matsumoto, D. Ekman, P. Kang, Sanuk, and Kurylo, A. "Improving the ability to recognize Micro-Expressions of Emotion" Submitted for publication, 2008.

[6] Porter,S. and Brinke, L "The Deceptive Face", Psychological Science, May 2008

[7] Telling Lies, WW Norton, 1985; third edition, 2002.

[8] Russell, Tamara A, Chu, E., Phillips. An investigation of the effectiveness of emotion recognitionmediation in schizophrenia using the micro expression training tool. British journal of Clinical Psychology, 2006.Tamara A. Risse;. Milissa J. Green, Ian Simpson, & Max Coltheart, Remediation of social perception in schizohrenia: concomitant changes in visual attention. Submitted for publication.

SESSÃO DE ENCERRAMENTO E HOMENAGEM AO PROF. NUNO GRANDE

CLOSING SESSION AND HOMAGE TO PROF. NUNO GRANDE

DISCURSO DO PRESIDENTE DA FUNDAÇÃO BIAL

Luís Portela

Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Professor José Mariano Gago, Senhor Professor Nuno Grande, Senhor Bastonário da Ordem dos Médicos, Dr. Pedro Nunes, Senhor representante do Conselho de Reitores das Universidades Portuguesas e Magnífico Reitor da Universidade do Porto, Professor José Carlos Marques dos Santos, esperamos a todo o momento o Senhor representante da Câmara Municipal do Porto, Engº Vladimiro Feliz, Senhor Presidente da Comissão Organizadora deste Simpósio, Professor Fernando Lopes da Silva, minhas Senhoras e meus Senhores.

Esta cerimónia é de encerramento do "VII Simpósio Aquém e Além do Cérebro" e, simultaneamente, de homenagem ao Professor Nuno Grande. Relativamente ao simpósio, desejo agradecer a presença e o entusiasmo de todos. Foi para mim muito agradável ter aqui estado convosco, embora, este ano, por inadiáveis afazeres profissionais, não me tenha sido possível estar todo o tempo, pelo que peço desculpa.

Mas a Fundação Bial entende que foram claramente atingidos os objectivos, com crescentes níveis de qualidade, por parte da organização e também por parte das intervenções. Por isso, tenho o gosto de os informar que é nossa decisão organizar o "VIII Simpósio Aquém e Além do Cérebro", a ter lugar em fins de Março ou princípios de Abril de 2010. Se não for antes, esperamos poder voltar a encontrá-los, aqui no Porto, em 2010. Umas palavras finais ainda sobre este Simpósio, muito e muito obrigado a todos pela vossa paciência, pela vossa persistência, pela vossa participação e sobretudo um obrigado muito especial aos membros da Comissão Organizadora. Bem hajam, muito obrigado.

Recordo-me de um pequeno gabinete de trabalho, com muitos papéis acumulados, algumas fotografias e diversas peças relacionadas com a actividade médica, espalhados um pouco por todo o lado. Sentei-me num pequeno sofá que estava num canto. Estava ali a pedido de um amigo comum - o Professor Eurico Figueiredo.

O meu interlocutor era magro, de estatura média, ar muito determinado, cordial na forma como se exprimia, parecia-me correcto e de coração maior que o próprio nome. Mas, o que mais senti naqueles momentos era que estava perante uma força da natureza.

Eu tinha 27 anos, estava numa fase de alguma indecisão na minha carreira médica e docente. E estava ali a ser convidado para fazer parte do corpo docente do, então incipiente, Instituto de Ciências Biomédicas Abel Salazar.

Entendi não aceitar o convite, sobretudo pelo facto de não ter encontrado comprador para a posição que em Bial tinha herdado de meu Pai, o que fez com que terminasse por deixar a minha carreira clínica e académica para me dedicar à empresa. Mas aqueles momentos foram marcantes para mim, não mais os podendo esquecer.

A vida demonstrou-me que eu tinha razão: a pessoa que me convidou - o Professor Nuno Grande - é, de facto, uma força da Natureza. O seu coração é, de facto, maior que o seu nome de família. Grande médico, grande professor, grande cidadão, grande chefe de família, grande amigo, mas, sobretudo, grande coração. Ao longo de muitos anos, nunca o ouvi dizer mal de ninguém, mesmo daqueles que objectiva e obstinadamente o prejudicaram. Muitas vezes o vi tratar ao pormenor e com muito carinho casos clínicos ou sociais, com a dimensão de quem é verdadeiramente Grande.

Claro que lhe fiquei muito grato pelo amável convite que me fez. Mas, não o tendo aceite, nos anos seguintes, por força das circunstâncias, tivemos poucos contactos pessoais.

Contudo, quando, em 1984, os Laboratórios Bial criaram o Prémio Bial, o Professor Nuno Grande foi-nos aparecendo invariavelmente no Júri, como representante do Conselho Científico do ICBAS. Assim nos fomos conhecendo melhor e partilhando ideias em torno de possíveis melhorias e desenvolvimentos do prémio e da postura mecenática de características científicas de Bial.

Foi com o Professor Nuno Grande que engendrámos as bolsas que agora atribuímos, foi com ele que conquistámos o Conselho de Reitores das Universidades Portuguesas a aderir ao nosso projecto de criação da Fundação Bial. O Professor Nuno Grande é administrador desta Fundação desde a primeira hora, sempre em representação do Conselho de Reitores. Já alguém disse por brincadeira que se eu sou o pai da Fundação, o Professor Nuno Grande é a mãe, tão vinculado ele está a esta instituição. Peço desculpa pela graça Senhor Professor.

Por força dos estatutos que ele ajudou a redigir, no final do actual mandato, o que ocorrerá no próximo ano, o Senhor Professor não poderá ser reconduzido como administrador, embora já nos tenha feito sentir que deseja continuar ligado à Fundação, o que será sempre para nós um gosto e uma honra. Mas pensamos que este era o momento de lhe prestarmos uma justa, embora simples, homenagem, como gratidão por tudo aquilo que fez por esta instituição. Mas também ao homem, ao profissional, ao cidadão que muito admiramos e de que muito gostamos.

Pedimos a um familiar do Senhor Professor para nos falar do homem e pedimos a um dos seus pupilos para nos falar do profissional. O Bastonário da Ordem dos Médicos, Dr. Pedro Nunes, quis associar-se com a sua presença e com algumas palavras. O mesmo aconteceu com a Câmara Municipal do Porto que, não podendo estar presente devido a um compromisso inadiável, o seu Presidente, Dr. Rui Rio, delegou no Vereador Eng.º Vladimiro Feliz uma significativa mensagem.

O Magnífico Reitor da Universidade do Porto, Professor José Carlos Marques dos Santos, aqui a representar o Conselho de Reitores, também quis associar-se com a sua presença e as suas palavras. Finalmente, encerrará a sessão o Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Professor José Mariano Gago, que fez questão de aqui estar com o nosso homenageado neste dia.

Senhor Professor Nuno Grande, a Fundação Bial e eu próprio agradecemos-lhe toda a sua fantástica colaboração ao longo de mais de vinte anos. Muito e muito obrigado por todo o seu contributo em prol desta instituição. Mas eu, o seu muito amigo Luís, agradeço-lhe muito mais. Agradeço-lhe ser quem é. Agradeço-lhe ter-me permitido estar a seu lado, aprendendo, mais do que com o mestre da Academia, com aquele a quem considero um Mestre de Vida.

São muito poucas as pessoas a quem tenho classificado ao longo da vida de meus Mestres. Mas, indubitavelmente, o Senhor Professor é para mim, pela sua força interior, pela sua integridade, pela forma positiva e construtiva como sabe estar na vida, pela sua capacidade de realizar e, sobretudo, pela sua capacidade de amar, um Mestre.

Muito e muito obrigado Senhor Professor Nuno Grande, para quem peço a expressão do vosso apreço numa calorosa salva de palmas.

Prometo que não vou ocupar mais o microfone para além de vos anunciar o prelector seguinte.

Dizia-lhes eu há pouco que quisemos convidar alguém para nos falar do homem Nuno Grande e alguém para nos falar do profissional Nuno Grande. Para nos falar do homem nós procurávamos alguém que o conhecesse muito bem, alguém que o conhecesse muito de perto, alguém que o conhecesse há cerca de 50 anos. Para nos falar de quem é o Professor Nuno Grande entendemos que só a Dra. Ana Maria Grande nos podia fazer esse favor.

DISCURSO DO PRESIDENTE HONORÁRIO DO SIMPÓSIO

Nuno Grande

Eu peço desculpa por ter alterado a ordem das coisas mas gostava de aproveitar este momento muito rápido, e prometo que é muito rápido, para dizer umas simples palavras e para dizer que, quando em representação do Conselho de Reitores das Universidades Portuguesas, passei a integrar o Conselho de Administração da Fundação Bial, já o programa de Bolsas de Investigação se afirmara.

Contudo, a circunstância de contemplar as áreas de Parapsicologia e de Neurofisiologia determinou a necessidade de procurar um conjunto de conselheiros científicos que seleccionassem os projectos concorrentes. Foi, deste modo, que o Professor Robert Morris da Universidade de Edimburgo veio integrar este conselho e definir as normas científicas que apoiam as exigências dos projectos propostos, particularmente na Parapsicologia. Quero dizer-vos que, após uma conferência que ele fez, alguns dos inscritos desistiram logo quando souberam que as regras eram aquelas.

A Comissão Organizadora do 1º Simpósio foi recebida pelo Professor Morris e pelo Departamento que ele dirigia na Universidade de Edimburgo. Vivemos momentos com grande convivência que ficaram comemorados pelo encontro de todos nós, e que foi baptizado pelo Senhor Dr. Luís Portela pelo "encontro dos adamascados". Eu não sei muito bem o que a palavra significa porque é um neologismo, mas peço ao Senhor Dr. Luís Portela para depois interpretar o que é que ele nos quis chamar.

Foi também determinado que promoveríamos os encontros periódicos entre os bolseiros que fossem tendo resultados expressivos e investigadores de reputação mundial que aceitassem deslocar-se ao Porto para participarem numas jornadas científicas e ao mesmo tempo contactar com os bolseiros e respectivos resultados. Como se tinha iniciado a década do cérebro, as jornadas passaram a chamar-se "Aquém e Além do Cérebro", das quais hoje estamos a finalizar a 7ª edição.

Esta homenagem que me quiseram prestar é uma prova de amizade e simpatia dos membros da Comissão Organizadora desta edição e, de um modo particular, do Senhor Presidente e também do Conselho de Administração da Fundação Bial, do Professor Daniel Bessa e finalmente do Senhor Ministro a Ciência, Tecnologia e Ensino Superior, Professor José Mariano Gago, que é meu amigo desde longa data e que cumprimento afectuosamente.

Estou muito grato por este facto e pela presença de todos vós, que são amigos que vieram testemunhar este momento, o que muito me envaidece pela amizade que traduz. Desculpem pela vaidade.

DISCURSO DE ANA MARIA GRANDE

Desde há 46 anos sou a Ana Maria Grande. O convite, que muito agradeço, foi feito pelo nosso amigo Luís Portela para dar um testemunho pessoal do vosso homenageado e foi aceite com alguma reserva. Assim, optei por lembrar momentos que poderão dar uma imagem diferente do homem, sempre tolerante, aberto e disponível para quem conhece. Intitulei estas frases que vou dizer com "Sempre".

Sempre foi um homem de família.

Sempre venerou o Avô como um exemplo.

Sempre lembrou a Mãe e a Irmã que o apoiaram.

Sempre esteve presente para os filhos na sua vida afectiva e escolar.

Sempre se alegrou com os sucessos dos seus filhos.

Sempre assistiu ao nascimento dos netos com comoção e recebeu-os em primeiro lugar no colo.

Sempre acompanhou com vaidade as conquistas de linguagem, atitudes e vida escolar dos netos.

Sempre lutou pelas causas que acreditava justas não olhando a credos, raças e partidos. Aqui, especialmente, apetece-me lembrar o Padre Américo, que é alguém que ele conheceu pessoalmente e cuja obra é de tal maneira que ele traz na carteira um retrato do Padre Américo.

Sempre respondeu às chamadas dos doentes, não olhando à hora e ao local, muitas vezes duas da manhã, três da manhã, quatro da manhã. Havia doentes que vinham jantar ao Porto, depois iam ao cinema e depois iam à consulta, porque era assim que ele sabia estar, e tanto dava uma hora como uma hora e trinta como duas horas; eu acho que ele foi um médico de família.

Sempre lembrou os quatro mestres: Hernâni Monteiro, Álvaro Rodrigues, Corino de Andrade e Abel Salazar.

Sempre gostou de leitura, cinema e teatro. Nunca esqueceu os bons tempos do Teatro Universitário do Porto, onde representou durante a sua vida como estudante universitário. [O bobo que está ali atrás é o Nuno Grande na noite de reis de Shakespeare.]

Sempre considerou os seus colaboradores como amigos, encorajando-os nas suas pesquisas e carreiras. [Isto é no grupo da Anatomia, já aqui no ICBAS - uma família.]

Sempre gostou de apresentar os trabalhos do grande grupo de Anatomia em congressos internacionais, num ambiente de companheirismo e de grande amizade. Que bons tempos passamos juntos!

Sempre acreditou nas capacidades dos seus alunos e deles sempre recebeu amizade e calor humano. [Isto é um jantar de despedida de alunos que hoje são uns senhores médicos, com 40 e tantos anos ou mais.]

Sempre sentiu fundo a primeira aula depois do concurso para catedrático em Luanda e os festejos que se seguiram. [Estava combinado dar uma primeira aula que juntou todos os alunos de medicina - ele não conseguiu dar a aula e, neste momento, está a chorar porque não contava e não conseguiu dar a aula, e acabou.]

Sempre esteve disponível para os amigos, conhecidos e desconhecidos.

Sempre enfrentou as doenças com frontalidade, sabendo os riscos e as consequências.

Sempre encarou as suas limitações físicas, aceitando os desafios que lhe propunham. [Aqui está ele a entrar nas Biomédicas, que é uma imagem muito bonita de um Senhor com um chapéu. No outro dia diziam-lhe: - Aquele Senhor é o dono das Biomédicas, aquele que tira o chapéu quando a gente pára na passadeira e ele agradece com o chapéu.]

Sempre sonhou e enfrentou as dificuldades para levar o mais longe possível a Universidade de Luanda e o Instituto de Ciências Biomédicas Abel Salazar. [Este é o anfiteatro de Angola, da anatomia de Angola. Estes são antigos alunos de Angola que fomos encontrar agora numa das visitas que fizemos.]

Sempre esteve ligado às mais diversas actividades para que era solicitado [estes já são os alunos das Biomédicas numa queima das fitas], nomeadamente Programa da NORAD - ligação da Noruega a Trás os Montes -, Associação de Médicos de Família [este é o grupo do Programa da NORAD, são os Noruegueses e o Dr. Coutinho da Costa, esta é a comissão instaladora do Instituto de Ciências Biomédicas Abel Salazar], Biomédicas na Estónia, Fundação Bial, Escolas de Enfermagem, Mestrados em Medicina e Enfermagem e Doutoramentos em Medicina e Enfermagem. Uma disponibilidade total para falar em escolas, em grupos; é só pedirem e ele não sabe dizer não, é assim desde sempre. E sempre unidos vestimos a mesma camisola [esta é a camisola do ICBAS, por isso estamos os dois com a mesma camisola vestida.]

Sempre foi o homem bom e de bem que eu tenho como companheiro de uma vida que vale a pena.

Muito obrigada.

DISCURSO DO PRESIDENTE DO CONSELHO DIRECTIVO DO ICBAS

António Sousa Pereira

Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Senhor Dr. Luís Portela, Bastonário da Ordem dos Médicos, Senhor Reitor, Senhor Professor Lopes da Silva, Senhor Representante da Câmara, meu querido mestre e amigo Professor Nuno Grande.

Fui convidado pelo Dr. Luís Portela para dizer algumas palavras nesta homenagem, num momento em que a força da idade impõe que, face aos regulamentos, abandone o cargo que até agora ocupava. Aceitei honrado a incumbência desta oportunidade que me foi dada de homenagear, mais do que um mestre, um amigo de muitos anos. Amigo desde que entrei no ICBAS em 1979 para fazer a licenciatura e, mais tarde, como docente de Anatomia que fui, primeiro como seu monitor e depois fazendo todos os degraus da carreira académica. Devo confessar que me encontro numa situação extremamente complicada, porque é difícil acrescentar algo mais a tudo aquilo que se sabe sobre o Professor Nuno Grande e a tudo aquilo que a comunidade médica e científica veio, ao longo dos anos, testemunhando sobre aquilo que foi a sua postura na vida enquanto cidadão, enquanto médico e enquanto Professor Universitário.

Posso dizer, contudo, que o Professor Nuno Grande realizou a confluência harmoniosa de cidadania, ciência e cultura e que, em todos os momentos, teve para connosco uma atitude prudente e avisada e sempre nos ajudou a distinguir do acessório para nos concentrarmos no essencial o que, na fase em que nós nos encontramos de crescimento ao longo de uma carreira universitária, é absolutamente fundamental.

O nosso homenageado de hoje é uma das figuras mais ilustres da medicina portuguesa contemporânea. Médico distinto, de quem se admirava a dedicação e a solidariedade na sua prática clínica diária e de quem ouvimos agora mesmo exemplos dados por quem com ele partilhou toda a sua vida, tornou-se uma referência para gerações de médicos que entenderam, ao nível dos cuidados de saúde primários, desenvolver a batalha pela melhoria dos cuidados de saúde em Portugal.

Dele, poder-se-á dizer com propriedade, que o médico quando não cura, consola, apoia, ajuda, divide a dor. Curar é a sua obsessão. O estímulo dessa obsessão é o sofrimento do outro, do seu semelhante. Acompanha o homem desde o seu nascimento, convive com ele e acompanha-o na sua morte como sua sombra e como seu anjo. O que conta na realidade é a solidariedade que o médico representa e eu penso que poucos como o Professor Nuno Grande terão tido uma prática ao longo da vida que se encaixe nesta definição, que eu acho uma definição belíssima da prática médica, e que acho que é urgente recuperar para a nossa actividade do dia-a-dia, numa altura em que há uma certa deriva tecnológica e em que nos esquecemos do valor da solidariedade como valor fundamental da prática.

Mas o Professor Nuno Grande não se limitou a ser um clínico brilhante; foi um mestre e um Professor Universitário inquestionável. Espalhava a sua influência científica, cultural e o seu indesmentível magnetismo e encanto pessoal por numerosos discípulos, no progresso da anatomia e da medicina no nosso país.

Já com a experiência de ter criado uma Faculdade de Medicina em Luanda soube reunir uma equipa, que viram aqui retratada numa imagem que a Dra. Ana Maria Grande mostrou, que participou na grande obra que foi a construção do ICBAS; ICBAS esse que atravessou numerosas vicissitudes, como é natural de qualquer instituição que se procura afirmar no terreno e que procura afirmar uma filosofia inovadora, mas que sob a sua liderança o conseguiu e que se transformou hoje numa instituição de referência em Portugal, no domínio do ensino e de investigação em ciências da vida e da saúde. E eu digo em ciências da vida e da saúde e não da medicina, porque o Professor Nuno Grande sempre entendeu que a saúde era muito mais do que a medicina e abarcava muito mais aspectos do que a medicina, e essa foi uma lição que ele nos deu. Penso que o Instituto de Ciências Biomédicas é hoje a prova disso mesmo. Nós, efectivamente, não somos uma Faculdade de Medicina, nós efectivamente não somos uma Escola Médica, nós somos uma Escola de Ciências da Saúde, e eu penso que essa é uma herança que devemos ao Professor Nuno Grande e que devemos salientar.

O ICBAS é hoje uma instituição marcada pelos altos níveis académicos, pela preocupação do meio social e pela integração no meio social em que se insere, procurando dar resposta às necessidades que surgem da sociedade. A escola podia ter-se transformado numa mera transmissora de conhecimentos da saúde, mas sempre foi muito mais do que isso, apresentando aos seus alunos uma visão crítica do país e da inserção no mundo contemporâneo.

A homenagem que hoje aqui prestamos significa também um sinal de respeito e reconhecimento por aqueles que, de forma exemplar, dignificaram a Academia e a Medicina, procurando revitalizar esse património humano, científico, profissional e ético que são as nossas referências e que deverão balizar o nosso percurso, sendo nosso dever preservá-los e dar-lhes continuidade para as gerações futuras.

Muito obrigado Professor Nuno Grande por tudo o que nos ensinou e irá continuar a ensinar. Pelo seu exemplo como médico, cidadão, professor ilustre, respeitado e admirado pelos seus alunos e discípulos, pela abertura de espírito sempre ávida pelas novidades da cultura, da ciência, pela sua inteligência, pelo seu humor, pela sua lucidez rigorosa e implacável com que ainda hoje sabe desmontar a nossa argumentação menos fundamentada.

No momento em que cede o lugar a outros mais jovens pela inexorável lei do tempo quero reafirmar-lhe de que continuará sempre a participar na vida do ICBAS de muitas maneiras, com a intensidade que escolher. Continuará a participar nas nossas reuniões, continuará a orientar alunos embora sem o fundamentalismo legal, continuará a promover e a dar ideias para novos projectos de investigação. O ICBAS foi uma parte fundamental da sua vida; a sua vida e o seu trabalho continuarão a ser uma contribuição inestimável para a nossa escola.

O nosso desafio é saber merecer o seu exemplo, dar continuidade actuante para as novas gerações, honrando assim a sua contribuição notável para a Medicina e para a cultura portuguesa.

Muito obrigado Professor Nuno Grande.

DISCURSO DO BASTONÁRIO DA ORDEM DOS MÉDICOS

Pedro Nunes

Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Senhor Dr. Luís Portela, Senhor Professor Nuno Grande, Senhor Presidente da Comissão Organizadora, Magnífico Reitor, Senhor Presidente Regional do Norte da Ordem dos Médicos, Senhores Professores, ilustres Colegas, minhas Senhoras e meus Senhores.

Não poderia a Ordem dos Médicos deixar de estar presente perante o amável convite que lhe foi dirigido. Não poderia por dois motivos que são fáceis de compreender. Se para mim, em termos pessoais, é uma honra o convite e é uma honra poder-me associar a uma cerimónia de homenagem a uma pessoa por quem tenho um enorme respeito e consideração, por outro lado, institucionalmente, tem a Ordem dos Médicos a obrigação de estar presente nas cerimónias de encerramento deste Simpósio da Fundação Bial.

O Dr. Luís Portela costuma dizer, e já ouvi mais do que uma vez, que por circunstâncias da vida deixou a clínica, deixou de ser médico. Eu também já tive a oportunidade de dizer que isso não é verdade. A medicina exerce-se de muitas formas, e ao projectar o nome de Portugal, a investigação médica realizada em Portugal, e ao desenvolver um projecto de excelência na área da saúde e da medicina, o Dr. Luís Portela é um médico brilhante que a Ordem dos Médicos respeita como um dos seus associados mais queridos. Bom seria para a Ordem dos Médicos se houvessem muitos médicos assim.

Ao Senhor Professor Nuno Grande não me cabe dizer nada porque, por um lado, provavelmente nesta sala todos os que aqui estão presentes melhor o conhecem até do que eu. Por outro lado, como já ouvimos, quem melhor que a esposa, quem melhor que o seu distinto seguidor, aluno e colaborador, para traçar o percurso do homem. Mas eu, modestamente, permitam-me que eu fale um pouco em termos pessoais e vos conte os dois encontros, dos muitos que tive, com o Professor Nuno Grande, dois encontros que me marcaram como observador externo da personalidade do Professor Nuno Grande.

Eu conheci o Professor Nuno Grande na qualidade, não de médico, mas de académico. Eu era muito jovem na Faculdade de Medicina, fui convidado para trabalhar como monitor de Anatomia e fiz a minha carreira académica durante cerca de 20 anos na Anatomia, como colaborador de uma pessoa brilhante que é o Professor José António Esperança Pina. O Professor José António Esperança Pina é uma pessoa por quem eu tinha um enorme respeito e consideração à época, porque era alguém de novo na Universidade Portuguesa, alguém que trazia uma abertura de que a universidade portuguesa, na altura, claramente sentia necessidade, e os jovens sentiam necessidade dessa evolução da universidade. O Professor Esperança Pina fez as suas provas de agregação e foi seu arguente o Professor Nuno Grande. Eu tive a oportunidade, como modesto monitor que era na altura sentado numa das filas de trás, de assistir a um duelo de inteligências gigantescas. Foi uma prova interessantíssima, não sei se o Professor Nuno Grande se recordará. De mim não se recorda de certeza, eu era um dos *back benches* daquela sala, mas eu recordo-me perfeitamente do diálogo, da argumentação, da inteligência, daquilo que a universidade tem de extraordinário. Foi aí que eu conheci o Professor Nuno Grande.

Mais tarde vim fazer serviço médico para a periferia em Oliveira de Azeméis e Vale de Cambra e descobri, com enorme espanto, que o Professor Nuno Grande tinha imensos doentes que me apareciam nos Postos e nas Caixas pedindo-me análises, e comecei a encontrar a outra vertente do Professor Nuno Grande, o clínico atento, que tinha os doentes sempre muito bem estudados e muito bem seguidos, e habituei-me a admirar esta vertente clínica do Professor Nuno Grande.

E, por último, depois fui-me encontrando várias vezes com o Professor Nuno Grande ao longo da vida, mas não é isso que vos venho aqui contar. Conheci há dois anos o Professor Nuno Grande noutro ambiente, visitando Luanda no congresso dos médicos de Angola. E então conheci a vertente do universalismo português, da capacidade de estar, da capacidade de dialogar com outras culturas e da enorme saudade, e esta é a única palavra que traduz, da enorme saudade de todos aqueles colegas que ali trabalham, que ali vivem, alguns ex-alunos dele, o enorme desejo que o acaso da vida lhe tivesse permitido lá continuar. O Professor Nuno Grande em Luanda é alguém que todos admiram e respeitam, mais que não seja, por o ouvirem falar.

Portanto, Senhor Professor, a homenagem que hoje a Ordem dos Médicos também lhe presta é a homenagem de todos os médicos portugueses a um de nós que é, de facto, muito Grande.

Muito obrigado.

DISCURSO DO REITOR DA UNIVERSIDADE DO PORTO

José Carlos Marques dos Santos

Começo por cumprimentar o Senhor Ministro da Ciência, Tecnologia e Ensino Superior, Senhor Professor José Mariano Gago, Senhor Dr. Luís Portela, Senhor Professor Nuno Grande, Senhor Bastonário da Ordem dos Médicos, Senhor Professor Fernando Lopes da Silva, Senhor Representante da Câmara Municipal do Porto, Engº Vladimiro Feliz, e todos aqueles que estão presentes nesta sessão.

E queria começar por, em meu nome, em nome da Universidade do Porto e também do CRUP, que me coube aqui representar por impedimento de saúde do Senhor Presidente, agradecer o honroso convite para participar na sessão de encerramento do 7º Simpósio da Fundação Bial. É com muito agrado que aqui estou, dada a elevada consideração que tenho pelo trabalho da Fundação Bial, a quem aproveito para felicitar pela organização do simpósio "Aquém e Além do Cérebro".

Uma palavra muito especial para o Dr. Luís Portela, cuja dimensão intelectual, científica e humana está bem presente em mais esta iniciativa da Fundação Bial. Figura emblemática e empreendedora, que muito gostaríamos de ver multiplicada na sociedade portuguesa, e grande amigo da Universidade do Porto, que muito nos tem honrado com a sua assídua colaboração e presença. Muito obrigado Dr. Luís Portela.

Gostava ainda de acrescentar que é uma honra dirigir-me a tão ilustre plateia que este simpósio teve a felicidade de reunir. Personalidades de referência das chamadas neurociências, facto que é naturalmente de louvar pela importância que esta área de estudo tem para a compreensão da natureza humana. De resto, a escolha das emoções para tema de análise e de debate no simpósio afigura-se da maior pertinência, conhecida que é a influência das circunstâncias emocionais nos variadíssimos aspectos do comportamento dos indivíduos, tema que é alvo de intensa investigação no momento presente.

Mas o que nos trouxe aqui hoje não foram, porém, as neurociências, área em que eu não sou um especialista. A minha tarefa é, simultaneamente, honrosa e complexa. De facto, participar numa sessão de homenagem ao Professor Nuno Grande é um privilégio e uma honra, pois falar de tão insigne figura pública honra mais quem o faz do que quem é homenageado. Por outro lado, é uma tarefa complexa e difícil procurar falar, em tão curto espaço de tempo, da figura e da obra de tão insigne personagem. Homenagear o Professor Nuno Grande perante esta plateia de cientistas e de amigos é naturalmente um acto de justiça e reconhecimento, mas qualquer homenagem ao Professor Nuno Grande ficará sempre aquém da dimensão da personalidade e da obra do homenageado.

O Professor Nuno Grande é um homem de visão global, poliédrica, com uma dimensão quase renascentista. Para lá do médico generoso, do pedagogo cativante e do investigador arguto, o Professor Nuno Grande tem a inteligência, a erudição, a verticalidade e a dignidade que faz a amplitude dos humanistas. Neste sentido é um Mestre, não apenas em termos de intervenção científica e pedagógica, mas também em termos de intervenção cívica.

O percurso académico do Professor Nuno Grande é notável, quer enquanto estudante, quer enquanto docente e investigador. Como pedagogo, o Professor Nuno Grande sobressaiu entre os seus pares, não apenas pelo imenso saber que transmitia aos estudantes, mas também pela forma como soube contagiar esses mesmos estudantes com a curiosidade científica, a determinação metódica e a integridade deontológica que são o seu apanágio.

Foi um professor diferente, um professor total, cujo património humano, científico e cultural marcou e enriqueceu várias gerações de médicos portugueses. Com o seu trabalho de investigador nas ciências da saúde o Professor Nuno Grande coroou de prestígio a Universidade do Porto e fê-la avançar num campo com enormes potencialidades científicas. O contributo científico do Professor Nuno Grande não é mensurável, até porque, para além das pertinentes descobertas de que foi responsável, o cientista notabilizou-se igualmente pela sua atitude não dogmática, pela sua acutilância crítica e pela sua visão original de velhas questões.

Minhas Senhoras e meus Senhores, para fortuna da instituição o brilhante percurso académico do Professor Nuno Grande foi trilhado em grande medida na Universidade do Porto, embora tenha deixado uma bela obra científica e pedagógica em Angola. O Professor Nuno Grande esteve sempre ligado à instituição onde se formou e onde acabaria por viver os principais momentos da sua carreira universitária. Foi assim em 1974, quando integrou a comissão instaladora do Instituto de Ciências Biomédicas Abel Salazar. Na altura, o Professor Nuno Grande conviveu frutuosamente com o reputado neurologista Corino de Andrade e, da sinergia gerada entre os dois cientistas, nasceria com auspicioso futuro, hoje auspicioso presente, o ICBAS, Instituto que passou então a ser dirigido pelo Professor Nuno Grande. Avaliar o trabalho do Professor Nuno Grande à frente do ICBAS é tarefa que o Professor Sousa Pereira fez com mais propriedade que eu podia fazer. Mas não obstante, gostaria de salientar que o inconformismo científico, a capacidade empreendedora e o espírito visionário do homenageado de hoje foram decisivos para tornar o ICBAS uma referência no ensino e investigação realizados em Portugal e internacionalmente na área das Ciências da Saúde.

O ICBAS faz jus à grandeza do seu patrono, o Professor Abel Salazar, e isso constitui para o Professor Nuno Grande um belo elogio que podem fazer à sua obra enquanto Director do Instituto. Sei da imensa admiração que o Professor Nuno Grande tem pela vida e obra do Professor Abel Salazar, porque dizer que o legado desse cientista e artista tem sido perpetuado e até expandido pelo ICBAS é, de facto, um louvor que o nosso homenageado certamente não desdenhará.

Nas palavras do Professor Nuno Grande, Abel Salazar é, e cito, "a maior referência de sempre da cultura portuguesa", e foi essa genuína admiração e respeito que encaminharam com toda a justiça e naturalidade o Professor Nuno Grande para a associação divulgadora da Casa Museu Abel Salazar, onde tem resgatado das brumas da desmemoria a vida e obra dessa figura ímpar da nossa história contemporânea. Movido por aquela força interior que todos reconhecemos, o Professor Nuno Grande tem-se afadigado na promoção da investigação, do estudo e da divulgação, do lado artístico, literário, filosófico e científico de Abel Salazar.

No campo cultural e da assistência social também devemos ao Professor Nuno Grande a criação e dinamização da Fundação da Casa da Cultura da Língua Portuguesa, numa altura em que não havia grandes alternativas para realizar a missão a que se dedicou esta instituição. A Fundação foi um importante fórum de cooperação lusófona, inter-universitária, responsável pela promoção da cultura num conceito amplo, ou seja, abarcando não apenas a criação artística, mas também os domínios pedagógico, científico, tecnológico e de solidariedade social. Neste âmbito merece destaque o apoio que foi prestado a estudantes lusófonos com dificuldades económicas e de integração social. Uma área onde o humanismo do Professor Nuno Grande se expressa cabalmente.

O Professor Nuno Grande foi ainda Pró-Reitor na Universidade do Porto para os assuntos sociais, função com que, uma vez mais, honrou a instituição e o ensino superior português. A área de intervenção a que se dedicou dir-se-ia, aliás, pensada à medida da sua, já aqui referida, amplitude humanista. Não é por isso de estranhar que o Professor Nuno Grande tenha dinamizado o serviço de reintegração escolar e de apoio social da Reitoria da Universidade do Porto, serviço com contributo relevante para permitir aos nossos estudantes uma boa qualidade de vida durante a sua passagem pela nossa Universidade, garantindo aos estudantes o respaldo essencial para as respectivas vidas académicas. Falo por exemplo de programas de educação para a saúde, de consultas médicas em algumas especialidades, de apoio psicológico e pessoal, de apoio social em circunstâncias difíceis, entre muitas outras acções dirigidas aos estudantes.

Minhas Senhoras e meus Senhores, como disse há pouco o Professor Nuno Grande é também uma referência cívica, com um apurado sentido de cidadania. O hoje Professor Jubilado e Professor de Mérito da Universidade do Porto não resistiu ao seu íntimo interior de ser útil à sociedade e de servir a causa pública.

Foram tantos os organismos a quem prestou a sua inteligência, saber e estoicismo que seria fastidioso estar aqui a enumerá-los. Lembro apenas a sua intenção como mandatário nacional na candidatura da Eng.º Maria de Lurdes Pintassilgo à Presidência da República, a Presidência da Comissão de Gestão do Instituto Nacional de Engenharia Biomédica, a Fundação da

Associação Portuguesa de Médicos de Clínica Geral e a participação no Conselho Científico da Sociedade Europeia de Anatomia Clínica, bem como no Conselho de Administração do Núcleo Europeu de Linfáticos.

Importa não esquecer também a intensa actividade publicista, ou como hoje se diz, *opinion maker*. Graças ao seu estofo cultural, à sua capacidade de observação dos acontecimentos e à sagacidade com que interpreta a realidade, o Professor Nuno Grande publica regularmente artigos de opinião em revistas e jornais e é com frequência convocado para proferir conferências de diferente índole.

Como articulista espraia-se por temas que fogem ao âmbito estrito da sua formação académica e assim ficam plenamente demonstrados o vivo sentido crítico, a versatilidade e erudição, bem como consciência social e política do homenageado desta cerimónia. Por toda esta actividade cívica intensamente vivida, o Professor Nuno Grande é hoje uma referência ética da República. Um verdadeiro Senador do país, com tudo o que isso significa em termos de credibilidade, pundonor e brilhantismo intelectual.

Cumpre-me, pois, agradecer ao Professor Nuno Grande esse tanto, esse imenso tanto, que deu ao país, à cidade do Porto e, principalmente, à sua Universidade. E não resisto em dizer que foi capaz de dar tudo isto, se me é permitida uma perspectiva mais intimista do homenageado, com aquela humildade, quase timidez, com que os primos inter pares celebram a vida.

Muito obrigado Senhor Professor.

Lista de posters com resultados finais apresentados pelos bolseiros da Fundação Bial

Posters with final results presented by Bial Foundation researchers

2000

19/00 - "The Go/No Go Contingent Negative Variation (CNV): Relationships with alcohol abuse and criminal recidivism"
Instituição/*Institution*: Broadmoor Hospital, Crowthorne - UK
Duração prevista/*Estimated duration*: 2001/06 - 2008/03
Investigadores/*Researchers*: Dr. Richard Charles Howard, Dr. John Lumsden, Dr. P. J. McCullagh, Dr. Peter Fenwick e Dr. H. G. McAllister

Abstract: The hypothesis under investigation in this study in that early onset alcohol abuse is a factor underlying impulsive violence particularly amongst personality disordered offenders. The study has recorded forensic and substance abuse histories, psychometric information, Contingent Negative Variation (CNV) and performance on the Iowa Gambling Task (IGT) in Personality Disordered patients in Broadmoor. Most prevalent diagnostic category is Anti-social personality disorder. CNV was first described by Grey Walter in 1964. Howard et al (1982), studying special hospital patients reported that, using a symmetrical avoidance paradigm, CNV differentiation was inversely related to psychometric Impulsivity. Previous study indicates that early onset alcohol and drug use is highly prevalent amongst high secure psychiatric patients in the England and Wales jurisdiction (Lumsden et al 2004). This potential risk factor may lead to reduced frontal lobe function. Multi-channel electrophysiological recording of the CNV were collected as a measure of frontal lobe (possibly anterior cingulate) function (Stephan et al 1995). Results are presented from the study relating electrophysiological function (CNV), neuropsychological function (IGT), psychometric/personality profiles (UPPS and IPDE) with behavioural measures (offending and substance use histories and ongoing behaviour in the hospital). Age of onset of alcohol abuse in combination with personality variables is a factor relating to offending and IGT performance.

Publications: Lumsden J, Hadfield J, Littler S and Howard R (2004) The prevalence of early onset alcohol abuse in mentally disordered offenders. Journal of Forensic Psychology and Psychiatry 16, 651-659

References: Howard RC, Fenton GW and Fenwick PBC (1982) Event-related Brain potentials in Personality and Psychopathology: A Pavlovian approach. Research Studies Press, Wiley: Chichester; Stephan KM, Lumsden J, Liu MJ, Fenwick PBC, Friston K, Squires KC, Ioannides AA and Frackowiak RSJ (1995) Contingent Negative Variation: functional anatomy and time course of motor preparation and expectancy. Human Brain Mapping suppl 1, 306; Walter WG, Cooper R, Aldridge VJ, McCallum WC and Winter AL (1964) Contingent Negative Variation: an electric sign of sensorimotor association and expectancy. Nature 203, 380-384

Keywords: CNV, alcohol, age, Personality, offending

2002

03/02 - ”The neural structures involved in procedural memory”
Instituição/*Institution*: Centro de Estudos Egas Moniz - Lisboa
Duração/*Duration*: 2003/11 - 2006/11
Investigadores/*Researchers*: Dra. Sara Cavaco, Prof. Alexandre Castro-Caldas, Prof. Steven Anderson

Abstract:

Objectives: The striatum has been implicated in the acquisition and retention of perceptual-motor skills. However, the parameters of its involvement are still largely unknown. This study proposed to explore the putative role of the striatum in perceptual-motor skill learning. It was hypothesized: 1) that individuals with unilateral focal damage to the striatum (FSD) would have reduced acquisition of new perceptual-motor skills when compared to healthy demographically matched subjects (HS), and that this impairment would be demonstrated across a variety of stimulus conditions and task demands; and 2) that patients with unilateral damage in other brain areas not including the striatum (OBA) would have normal acquisition of the perceptual-motor skills when compared to HS.

Methods: The performances of FSF (N=21) and OBA (N=16) on a series of perceptual-motor tasks (i.e., rotary pursuit - RP, mirror tracing - MT, geometric figures - GF, and control stick - CS) were compared to those of HS (N=35). Patients were selected from the Patient Registry of the University of Iowa’s Division of Behavioral Neurology and Cognitive Neuroscience and from the Hospital Geral de Santo António’s Neurology Outpatient Clinic.

Results: Despite normal baseline performance, damage to the striatum was found to be detrimental to skill learning when the task required constant update of the motor program in response to a moving target (i.e., RP and GF). However, when tasks involved an indirect relationship between motor response and visual feedback (i.e., MT and CS), patients with striatal damage showed normal improvement over trials. OBA patients showed normal learning of the tasks.

Conclusions: The results provide strong evidence for a task specific involvement of the striatum in the early stages of perceptual-motor skill learning.

Publications: Cavaco S et al. Focal basal ganglia damage and procedural memory. Journal of the International Neuropsychological Society, 2004; 10: 5.
Cavaco S et al. The Neural Structures Involved in Perceptual-Motor Skill Learning. Sinapse, 2005; 5: 88.; Cavaco S et al. The Neural Structures Involved in Perceptual-Motor Skill Learning. Journal of Cognitive Neuroscience, 2006 (Abstract Supplement).; Cavaco S et al. Perceptual-motor skill learning. In School learning and cognitive functions, edited by Mário Simões, PhD. (in press); Cavaco et al. Striatal involvement in perceptual-motor skill learning. (in preparation).

Keywords: procedural memory, skill learning, striatum

11/02 - "Os efeitos dos jogos electrónicos com equipamento de Realidade Virtual na activação psicofisiológica, estruturas cognitivas, estado emocional e comportamento agressivo" - *"The effects of violent computer games with virtual reality on physiological arousal, cognitions, affect and behaviour"*

Instituição/*Institution*: Centro de Estudos de Psicologia Cognitiva e da Aprendizagem - Lisboa

Duração/*Duration*: 2003/09 - 2006/11

Investigadores/*Researchers*: Dra. Patrícia Paula Lourenço e Arriaga Ferreira, Prof. Francisco Esteves, Dra. Mara Paula Carneiro

Abstract: Within the General Aggression Model framework, the present study was conducted to analyze the short-term effects of violent electronic games, played with or without a virtual reality device, on the instigation of aggressive behavior under provocation. Physiological arousal (heart rate), priming of aggressive thoughts, and state hostility, were measured to test their mediation effect on the relationship between playing the violent game and aggression. The participants - 148 undergraduate students - were randomly assigned to four treatment conditions: two groups played a violent computer game (Unreal Tournament), and the other two a non-violent game (Motocross Madness), half with a virtual reality device and the remaining participants on the computer screen. In order to assess the violent game effects, the following instruments were used: a BIOPAC System MP100 to record heart rate; an emotional Stroop task to analyze the priming of aggressive and fear thoughts; a self-report state hostility scale to measure hostility; and a competitive reaction time task to assess aggressive behavior. The main results indicated that the violent computer game had effects on state hostility and on aggression. Regression analyses also showed an indirect effect of state hostility between playing a VG and aggression.

Publications: Arriaga, P., Esteves, F., Carneiro, P., & Monteiro, M. B. (*submitted*). State hostility and interpersonal aggression enhanced by playing violent computer games.

Keywords: violent electronic games; virtual reality system; aggression.

25/02 - “Vinculação e regulação autonómica: desenvolvimento da versão 2.0 do BioDreAMS e aplicação a um grupo não-clínico” - “Attachment and autonomic regulation: Development of BioDReAMS 2.0 and application to a non-clinical group”

Instituição/*Institution*: Centro de Investigação em Psicologia, Universidade do Minho - Braga
Duração/*Duration*: 2003/05 - 2006/09
Investigadores/*Researchers*: Prof. Isabel Maria Costa Soares, Prof. João Paulo Silva Cunha, Prof. Carlos da Silva Fernandes, Prof. Paulo Manuel Machado, Prof. Ovídio Costa, Prof. Maria Carolina Costa e Silva

Abstract: Technological advances made possible to develop (Bial grant 43/96), a system (BioDReAMS 1.0, Bio Dual-channel and Representation of Attachment Multimedia System) that allows a synchronous collection of audiovisual information, ECG signals and skin conductance during the Adult Attachment Interview (AAI). This project aims:1) to improve BioDReAMS, by developing a new version (2.0); 2) to apply BioDReAMS 2.0 to a non-clinical group of 50 young females that will be compared to a matched clinical eating disorders sample.
Compared to the first version, BioDReAMS 2.0 has improvements at data acquisition, video capture, program structure, and document mode. Data of 50 females, between 18 to 30 years old, from different educational and occupational backgrounds, which were matched with a clinical group of eating disordered patients, will be analyzed. The AAI scored with Kobak’s Q-Sort method allows to identify attachment patterns (Secure, Dismissing and Preoccupied), mega-items, and security-insecurity and deactivation-hyperactivation strategies.
Out of the 50 non-clinical subjects, 33 were classified as secure, 11 as dismissing, and 6 as preoccupied. In the clinical sample, 15 patients were secure, 23 preoccupied and 9 dismissing. The clinical group, in comparison to the non-clinical group, showed higher scores in family disruption, preoccupied, dismissing, harsh mother, parental rejection and family enmeshment mega-items. Otherwise, the non-clinical group exhibited higher scores in the mother base and coherence mega-items. In terms of electrodermal activity, the non-clinical group evidenced more increases in the sympathetic activity, through all AAI questions, than the clinical group. Similarly, the heart rate of the non-clinical group showed an higher increase along the first part of the AAI (e.g., adjectives for mother and for father, upset). In terms of heart rate, the clinical group showed less increases, when talking about the background, relationship with the parents, adjectives for mother and for father. Considering the LF/HF ratio, the non-clinical group evidenced higher ratio values than the clinical group, when the interview asked about upset and separation experiences. In the clinical sample, moderate to high correlations were found between deactivation and increased parasympathetic activity in the response to questions like problems and rejections. The results will be discussed focusing clinical relevance and attachment research.

Keywords: attachment representation; psychophysiological correlates; eating disorders

35/02 - "Near-Death Experiences During Induced Cardiac Arrest" - only abstract available
Instituição/*Institution*: Division of Personality Studies, University of Virgínia - USA
Duração/*Duration*: 2003/06 - 2007/03
Investigadores/*Researchers*: Dr. Bruce Greyson, Prof. J. Paul Mounsey, Dra. Martha Mercier, Dra. Janet Holden

Abstract:

Objectives: "Near-death experiences" (NDEs) reported by some persons near death often include a sense of being out of the body and seeing from a perspective outside the body. Out-of-body perceptions, if accurate, may provide information about mind/brain relationships. Study of out-of-body perceptions during NDEs has been hindered by the unpredictable occurrence of NDEs and the lack of control of conditions of the NDE.
In cardiac electrophysiology clinics, patients with serious cardiac illness may have automatic implantable cardioverters/defibrillators (ICDs) surgically implanted in their chests. ICDs are electrical devices that monitor heartbeat, automatically detect cardiac arrest, and administer electrical shock to return the heart to normal rhythm. When ICDs are implanted in a person's chest, cardiac arrest must be induced under monitored conditions to test the ICD, allowing the opportunity for NDEs under controlled circumstances.
This study was designed to investigate the accuracy of out-of-body perceptions during induced cardiac arrests.

Methods: A computer in the operating room displayed randomly-selected targets visible only from a perspective looking down on the body of the patient from above eye level. In interviews with patients after implantation of the ICD, we determined the incidence of NDEs and sought evidence of accurate observations from an out-of-body perspective. We also hoped to assess the influence of NDEs on later psychological and physiological outcome at 9-month follow-up.
Results: In 52 induced cardiac arrests, no patient reported an NDE, leaving the body, or seeing from an out-of-body perspective. It was thus not possible to test the accuracy of their out-of-body perceptions or the effect of NDEs on psychological and physiological outcome.

Conclusions: Although this failure to find any NDE in induced cardiac arrests was surprising, I suggest three explanations: reassurance to the patients that they would not be in danger of dying; brief duration of induced cardiac arrest; and sedative medication that interfered with memory of NDEs.

Publications: Greyson, B., Holden, J. M., Mounsey, J. P. (2006). Failure to elicit near-death experiences in induced cardiac arrest. *Journal of Near-Death Studies*, *25,* 85-98.

Keywords: near-death experience, cardiac arrest, out-of-body perception

55/02 - "Mapping the time course of emotional information processing in anxious and repressive/defensive individuals"

Instituição/*Institution*: University of Leeds - UK - and University of Queensland - Australia
Duração prevista/*Estimated duration*: 2003/04 - 2008/03
Investigadores/*Researchers*: Dr. Nazanin Derakshan, Prof. Ottmar Lipp

Abstract: There is recent electrophysiological and behavioural evidence that anxiety is associated with a rapid spatial allocation of attention to threat (e.g. angry facial expressions of emotion; Fox, Derakshan, & Shoker, 2008). Behavioural evidence also indicates that anxiety is associated is associated with a failure to disengage from the processing of such material (see Bar-Haim et al. 2007). This is because anxiety enhances the influence of stimulus-driven processes over the efficient top-down regulation of attention, especially in the presence of threat (Derakshan et al. 2008). The current investigation recorded participants' eye-movements as a direct measure of attentional bias during a visual search task. High- and low- anxious participants were presented with a circle of faces, and asked to identify the 'odd one out' by pressing the appropriate response key. The emotional expressions assigned to the 'target' and 'crowd' faces were manipulated. Analysis of reaction times showed that high-anxious participants, compared with low-anxious participants, were slower to identify a happy face in an angry crowd and similarly, an angry face in a happy crowd. Analysis of eye-movements however found that this slowing was due to patterns of eye-movements AFTER target fixation: High-anxious participants re-visited other crowd faces after fixating target more frequently than low-anxious individuals and this effect was pronounced when both target and crowd consisted of emotional faces. These results importantly reveal the underlying processes during visual search tasks that were not understood previously through reaction time measures alone. The data clearly support the hypothesis that, in the presence of emotional material, anxiety interferes with the efficient allocation of attentional resources to task demands.

Keywords: Trait anxiety, attention, eye-movements

58/02 - "Vinculação materna: dimensões hormonais envolvidas no processo inicial de vinculação da mãe ao bebé" - *"Pregnancy and postpartum mood and hormones: Effects on mother-to-infant initial emotional involvement"*

Instituição/*Institution*: Centro de Investigação em Psicologia, Universidade do Minho - Braga
Duração/*Duration*: 2003/01 - 2007/06
Investigadores/*Researchers*: Prof. Bárbara Fernandes Figueiredo, Dra. Raquel Costa, Dra. Alexandra Pacheco, Dr. Álvaro Ferreira Pais

Abstract:

Objectives: The main aim of this study was to describe maternal bonding and to evaluate the impact of maternal psychobiological dimensions on initial mother's emotional involvement with the infant.

Methods: A sample of 100 women fulfilled the Bonding Questionnaire, the Edinburgh Postnatal Depression Scale and the State-Trait Anxiety Inventory, during pregnancy, in the first days and 3 months after childbirth.

Results: Most mothers had a moderate to high bonding toward the infant from pregnancy to 3 month after childbirth, nonetheless maternal bonding was generally better immediately after childbirth than during pregnancy or at 3 month postpartum. Both during pregnancy and 3 month after childbirth, mood but not hormones influenced maternal bonding: mothers with depressive mood or higher anxiety levels had worse bonding results. In the first days after childbirth both mood and hormones influenced maternal bonding: mothers with higher cortisol levels had a better bonding, mothers with depressive mood or higher anxiety levels had worse bonding results.

Conclusion: We conclude that psycho-physiological more than obstetrical factors seem to interfere in maternal bonding both during pregnancy and after childbirth. This fact leads us to think about the importance of attending to maternal mood in clinical context starting during pregnancy through the first months after childbirth in order to guarantee the mothers and infants quality of live.

Publications: Figueiredo, B. (2003). Vinculação materna: Contributo para a compreensão das dimensões envolvidas no processo inicial de vinculação da mãe ao bebé. *International Journal of Clinical and Health Psychology,* 3(3), 521-539. Figueiredo, B. (2005). 'Bonding' pais-bebé. In I. Leal (Ed), *Psicologia da gravidez e da parentalidade* (pp. 287-314). Lisboa: Fim de Século. Figueiredo, B., Costa, R., Marques A., Pacheco, A., & Pais, A. (2005). Envolvimento emocional inicial dos pais com o bebé. *Acta Pediátrica Portuguesa*, 36(2/3), 121-131. Figueiredo, B., Costa, R., Pacheco, A., & Conde, A. Mother's Stress, Mood and Emotional Involvement with the Infant: 3 months before and after childbirth. *Journal of Affective Disorders*, *submitted*. Figueiredo, B., Costa, R., Pacheco, A., Conde, A. & Teixeira, C. (2007). Anxiété, dépression et investissement émotionnel de l'enfant pendant la grossesse. *Devenir,* 19(3), 243-260. Figueiredo, B., Costa, R., Pacheco, A., Pais, A. (2007). Mother-to-infant and father-to-infant initial emotional involvement. *Early Child Development and Care, 177(5), 521-532.* Figueiredo, B., Costa, R., Pacheco, A., Pais, A. (2007). Mother-to-infant emotional involvement at birth. *Maternal and Child Health Journal,* 11(1), *in press.* Figueiredo, B., Marques A., Costa, R., Pacheco, A., & Pais, A. (2005). Bonding: Escala para avaliar o envolvimento emocional dos pais com o bebé. *Psychologica*, 40, 133-154.

Keywords: bonding, childbirth, infant, depression, anxiety

107/02 - "Sonhos em Surdos: alterações oníricas por défice sensorial" ***- "Dreams in Deaf subjects: oneiric alterations by sensitive deficits"***

Instituição/*Institution*: Núcleo de Lisboa do ISTEL - Instituto do Sono, Cronobiologia e Telemedicina - Lisboa
Duração/*Duration*: 2003/03 - 2007/01
Investigadores/*Researchers*: Prof. Maria Teresa Aguiar dos Santos Paiva, Dr. Helder Manuel Bértolo, Prof. Mário Andrea, Prof. Oscar Dias, Dra. Isabel Galhardo, Dra. Alexandra Medeiros, Dr. Tiago Mestre, Dr. Pedro Miguel Rocha, Dra. Lara Pessoa, Sra. D. Rosa Santos, Sra. D. Mónica Andrea, Sra. D. Raquel Aires, Dra. Graça Caldeira, Dra. Cristina Ramos

Abstract:

Objectives: Dream content analysis in congenital deaf with specific analysis of auditory, verbal activity. Relationships between sleep EEG mapping and dream content.

Material and Methods: Cases: 8 congenital deaf, (age between 25-50 years) half males and 8 normal hearing volunteers; dreams were collected by dream diaries (15 days) followed by nocturnal REM awakenings in the laboratory under full PSG. Dream content was analysed by Hall and Van Castle coding system. Cases were compared to published normative Hall and Van Castle data, through DREAMSTAT Excel spreadsheet. Statistics analysis was based on frequencies and comparisons of percentages through the "h" statistic (Cohen).
EEG mapping of the 5 minutes prior to the forced awakenings and therefore corresponding to dream reports was done. Mapping of the conventional frequency bands (delta, theta, alpha, sigma, beta and gamma) was done by means of spectral analysis using FFT. Statistical analysis was done in 2 steps: exploratory discriminative analysis and multivariate analysis using repeated measurements.

Results: Deaf's dream reports have auditory contents (e.g "I heard the noise of the sea") (6/296 activities) and frequent verbal activities (25/296).Dreams had significantly less male characters, familiar characters, negative events and emotions and more aggressive interactions in comparison with normal hearing subjects.
Delta, Theta, Alpha, Sigma, Beta and Gamma showed both statistically significant differences between diagnosis and across time but not so clear for topography. All of them are lower in deaf subjects.Delta activity was lower in deaf subjects, but in the periods prior to awake it is higher in deaf in Fp2, Fz, Fp1.

Conclusions: Despite the absence of auditory stimulation, dream auditory hallucinosis seems to persist in congenital deaf dreams. Verbal communication is frequent, although it is not possible to discriminate between oral and sign language in our study. Changes in other dream contents require a systematic evaluation on psychopathology probably common in these subjects.
Deaf present lower activities in REM prior to the forced awakenings. Besides the topography and temporal evolution of the different frequency bands also differs between the two groups. One of the main differences is the hemispheric lateralization of certain frequency bands, in the left side for congenital deaf and in the right for normal subjects.

Keywords: EEG, Dreams, congenital deaf

117/02 - "Psiconeurofisiologia comparativa entre as memórias traumáticas de vida actual e as memórias traumáticas de supostas vidas passadas: SPECT cerebral em 20 pacientes submetidos à Terapia Regressiva Vivencial Peres" – "The Psychoneuralphysiology of traumatic memories"

Instituição/*Institution*: Instituto Nacional de Pesquisa e Terapia Regressiva Vivencial Peres, São Paulo - Brasil
Duração prevista/*Estimated duration*: 2003/01 - 2008/03
Investigadores/*Researchers*: Dra. Maria Júlia Prieto Peres, Dr. Júlio Prieto Peres, Dr. Regis Cavini Ferreira, Dra. Vivian Pires de Albuquerque

Abstract:

Introduction: Many studies have pointed out that the brain does not really store emotional or traumatic memories, but stores traces of information that are later used to create memories. The psychopathological signs of trauma are not static along a time-line and neither is the expression of traumatic memories. The psychotherapeutic method *Terapia Reestruturativa Vivencial Peres* (TRVP) integrates tools of Cognitive Behavioral Therapy and Altered State of Consciousness to help the patient restructure emotionally and cognitively traumatic events.

Objective: The aim of this study was to compare changes in cerebral blood flow of patients during the retrieval of traumatic memories of present life and traumatic memories of supposed previous lives by using a script-driven symptom provocation paradigm adapted to Single Photon Emission Computed Tomography (SPECT). METHODS:

Twenty patients with partial post-traumatic stress disorder (PTSD) were examined by means of brain SPECT (99Tc-ECD). ROIs were used to semi-quantify flow. Values were generated for each ROI and normalized to the average whole brain activity and a Statistical Parametric Mapping was used for data analyses.

Results: The comparison between the baseline condition (relaxation) and the traumatic memories of present life showed significant attenuation of activity in the pre-frontal cortex (X=±10, Y=+36, Z=-15 $p<0.001$), and left hippocampus (X=-32, Y=-9, Z=-15 $p<0.001$), as well as increase of activity in the left amygdale (X=-17, Y=-6, Z=-23 $p<0.001$). The comparison between the baseline condition and the traumatic memories from supposed previous life showed the same neural reciprocities. The third comparison between the traumatic memories of present life and the traumatic memories from supposed previous life, did not reach significance. These findings suggest that fantasy, false memories and confabulation are distinct cognitive processes of traumatic memories of supposed previous lives, and neural mechanisms involved in these processes may share neural similarities with those underlying the fragmented and non-verbal nature of traumatic memories in partial PTSD.

Keywords: Traumatic memory, partial PTSD, SPECT

126/02 - "Servindo dois lados: As características do trabalho como preditores de respostas psicossociais e psicofisiológicas ao stress em médicos e enfermeiros em posições de gestão" - *"Serving two masters: Job characteristics as predictors of psychosocial and psychophysiological responses to stress in physicians and nurses in managerial positions"*

Instituição/*Institution*: Centro de Investigação, de Formação e Intervenção em Saúde - Maia
Duração/*Duration*: 2003/05 - 2007/09
Investigadores/*Researchers*: Prof. Scott Elmes McIntyre, Prof. Maria Teresa McIntyre, Prof. João Manuel Salgado, Dr. João Paulo Pereira, Dr. José da Costa Dantas, Prof. Derek Johnston, Prof. Martyn Jones

Abstract:

Objectives: 1) compare managers/subordinates on stress and job characteristics, 2) test the Demand Control and Effort-Reward Imbalance occupational stress models, 3) pilot-test the ecological momentary assessment of stress and job characteristics with the ambulatory measure of physiological stress indicators.

Methodology: The sample was 92 health professionals: 35 managers and 56 non-managers of both sexes (72 females and 20 males). The following self-report instruments were used: GHQ-12; Maslach Burnout Inventory; Job Content Questionnaire, Effort-Reward Imbalance inventory, Job In General, and the QuACO.
The self-report and physiological assessment of stress and coping during the shift was done on a random basis. The average number of assessments in a shift was 4 (SD = 1.19) and the total number of observations collected was 366.
The Real Time Assessment variables measured were:
Self-report

- Feeling "Stressed"
- Negative Affect
- Positive Affect

Objective indicators

- Blood Pressure
- Heart Rate

Work variables

- Demand, control, appreciation, social support

Conclusion: 1. Hierarchical position is important in terms of stress and job characteristics. The "head doctors/nurses" show stress vulnerability, especially in autonomic arousal, related to work characteristics (demand, control and reward). They showed high Overcommitment, a style of coping that has negative effects on well being and work.
2. The DC model did not predict job stress by questionnaire or self-report real time data, but predicted heart rate/systolic blood pressure. The *ERI model* explained job stress better by questionnaire and real time data, predicting higher stress. Reward was particularly significant for systolic blood pressure. The study of positive and negative emotions at work was an innovative contribution. Demand and Control were related to Negative Affect, and Strain predicted feeling energetic and alert. Organizational interventions which increase control and reward will reduce negative emotional responses and increase positive affect, with positive outcomes on health and work.
3. Our study has contributed two important *methodological aspects*. 1) *Measure stress* with a variety of indicators. The combination of self-report and objective measures, as well as longitudinal evaluations, should be used in future studies of job stress. 2) Pioneer the use of *EMA* in Portugal. This innovative methodology allows the study of links between job characteristics and psychological/biological responses.

Publications: McIntyre, S.E., McIntyre, T., Johnston, D. (in preparation). Stress and Job characteristics of manager and subordinate physicians and nurses, using ecological momentary assessment and ambulatory blood pressure.; McIntyre, S. E, McIntyre, T. M., Johnston, D., & Jones, M. (2006). The relationship between job characteristics and stress responses in health professionals: using real-time data. In S. E. McIntyre & J. Houdmont (Eds.).; *Occupational Health Psychology: key papers of the European Academy of Occupational Health Psychology, 7th Edition*. Maia: ISMAI Publications. ISBN 972-9048-21-5

Keywords: stress, occupational stress, ecological momentary assessment, occupational stress models

2004

01/04 - "Mystical experience, thin boundaries, and transhumanation as predictors of psychokinetic performance with a Random Number Generator" - only abstract available
Instituição/*Institution*: Anomalistic Psychology Research Unit, University of Adelaide - Australia
Duração/*Duration*: 2006/02 - 2006/10
Investigador/*Researcher*: Dr. Michael Thalbourne

Abstract:

Objectives: (1) to examine whether the psychological variables thinness of boundaries, mystical experience, and transhumanation could be used to predict the performance of a Random Number Generator (RNG); and (2) to examine the relationships between the three psychological predictors.

Method: 92 participants filled in a questionnaire survey containing, in order, the Boundary Questionnaire, the Rasch-scaled Mystical Experience Scale, and the Transhumanation Scale. They then attempted to influence the output of the RNG: there were 100 binary trials in each run, and 50 runs per session, of which just one was given; the output psychopractic score was called "scoresum".

Results: (1) there was *no* evidence that the three questionnaires (the Rasch-scaled Mystical Experience Scale, the Boundary Scale, and the Transhumanation Scale) could either singly or in combination predict scoresum, that is to say, performance on the RNG; (2) there *was* significant evidence that mystics tended to have "thin" (permeable) psychological boundaries, and to score higher on the Transhumanation Scale, which has four components: paranormal belief/experience, mystical experience, the Eastern concept of the body-energy Kundalini, and spirituality.

Conclusions: On this occasion, transhumanation, boundary thinness, and mystical experience were not able to predict psychopractic performance; however, there were moderately strong positive, significant correlations between these three scales.

Publications: In press at the *Journal of the American Society for Psychical Research.*

Keywords: thin boundaries; mystical experience; transhumanation; RNG

07/04 - "Prestimulus Response in the Sympathetic/Parasympathetic Nervous System" - only abstract available
Instituição/*Institution*: Laboratories for Fundamental Research, Palo Alto - USA
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigador/*Researcher*: Prof. Edwin C. May

Abstract: The objective of this study was twofold: (1) to observe prestimulus response effects using heart rate as in indicator of the autonomic nervous system and (2) to ascertain which of two potential models of the functioning best fit the data. Are the data indicative of a precognitive response to a future stimuli or an experimenter effect via Decision Augmentation Theory (DAT). Using a 3-point electrode system, we monitored heart rate continuously for approximately 45 minutes. At random intervals of 30±10 s, we consulted a predefined list of counter balanced stimuli of either 1 s of 95 dB white noise or a silent data marker as a control. The prestimulus region was defined as -4.7 to -1.2 s prior to stimulus onset and the heart rate data for each stimulus was referenced to that at -4.7s (i.e., clamped at that point). The dependent variable was the area between the average heart rate prior a future acoustic stimulus and a future control. A statistical assessment for this area was determined using a traditional non-parametric permutation technique. A DAT test required either 8 (condition A) or 24 (condition B) stimuli, respectively. Combining the two conditions we found essentially no effect ($z = -0.29$, $p = 0.6$, ES =-0.01, $n = 518$ stimuli). So also there appeared to be no observable effect in either of the two conditions: Condition A ($z = -0.46$, $p = 0.68$, ES = -0.043, $n = 121$ stimuli) and Condition B ($z = -0.12$, $p = 0.54$, ES = -0.006, $n = 397$ stimuli). It is difficult to ascribe a meaning to a null result; however, we do consider a number of potential explanations. (1) Heart rate may not be subject to prestimulus response effects. (2) This study was plagued with difficulties. The result was that we had to restart the study a number of times. This had two important side effects. The first is that it sharply reduced the available participant pool from which we could draw, and secondly and most importantly it had a demoralizing effect on the researchers. This last point requires further discussion. It is a well established effect that set and setting play an important role in experimental psychology and perhaps a determining role in parapsychological experiments. One of the strongest effects in the PSI literature is the so-called sheep/goat effect which may be a strong manifestation of this effect.

Keywords: prestimulus response, decision augmentation theory, heart rate, autonomic nervous system

09/04 - "Structural biology of human brain CNP, a protein essential for axonal survival" - only abstract available
Instituição/*Institution*: Institute of Cell & Molecular Biology, The University of Edinburgh - UK
Duração/*Duration*: 2005/02 - 2007/04
Investigador/*Researcher*: Dr. Andreas Hofmann

Abstract:

Objectives: Structure-function relationships of brain proteins need to be established in order to understand the molecular basis of brain disorders that affect organic health, as well as the psychological well-being.
Methods: Proteins have been prepared and purified, and subjected to structural investigation using spectroscopic and crystallographic methods. Molecular modelling has been used to assess protein-ligand binding.

Results and conclusions: Our study was originally concerned with full-length brain Cyclic Nucleotide Phosphodiesterase (CNP), a member of the 2H phosphodiesterase family, which is found abundantly in the myelin of oligodendrocytes in the central nervous system, and has been shown to be of major importance for axonal survival. As such, CNP is believed to be implicated in diseases such as multiple sclerosis and schizophrenia. The three-dimensional structure of the full-length protein is anticipated to yield new insights into the molecular mechanisms of the protein.
We have developed a protocol for expression and purification of the recombinant full-length protein, verified the integrity of the protein by mass spectrometry, and checked the fold and its stability by circular dichroism and fluorescence spectroscopy. Extensive crystallisation trials did not yield crystals suitable for X-ray diffraction so far. In selected trials, protein self-organisation was observed, probably indicating epitaxy-like formation of nanostructures on the glass plates.
Another family of brain proteins are the Visinin-like Proteins (VILIPs) that are neuronal calcium sensor proteins and an important factor for synaptic plasticity. They are involved in schizophrenia, neurodegenerative diseases such as Alzheimer’s and other disorders.
To obtain further insights into the molecular level mechanisms of VILIPs, homology models were generated and modelling techniques were used to elucidate the binding mechanisms of these proteins to specific membrane components (PIPs). We have developed the first three-dimensional model of VILIP:PIP complexes, and propose a mechanism whereby recognition of specific PIP derivatives contributes to the targeting of VILIPs to subcellular locations.

Publications: Braunewell, K.H., Altarche-Xifro, W., Lange, K. & Hofmann, A. (2007) Modelling of VILIP-Phosphatidylinositol Interactions - Implications for Differential Membrane Localisation of NCS proteins. Submitted.; Braunewell, K.H., Brackmann, M. & Hofmann, A. (2006) VILIP-1, A novel regulator of the guanylate cyclase transduction system in neurons. Calcium Binding Proteins 1, 12-15.; Brackmann, M., Hofmann, A. & Braunewell, K.-H. (2006) Structure, function and expression of members of the VILIP (visinin-like protein) subfamily of neuronal Ca2+ sensor proteins in Neuronal calcium sensor proteins (K.-W. Koch, Phillipov, P.), Nova Science Publisher, pp 115-135.

Keywords: Cyclic Nucleotide Phosphodiesterase, Protein Structure-Function Relationships, Visinin-likeProteins

21/04 - "Study of emotional perception and affective memory in a sample of normal subjects. Comparison with different clinical populations"
Instituição/*Institution*: Laboratório de Estudos da Linguagem, Faculdade de Medicina de Lisboa - Lisboa
Duração/*Duration*: 2005/05 - 2007/06
Investigadores/*Researchers*: Prof. Isabel Pavão Martins, Dra. Sílvia Fernandes, Prof. Alexandre Mendonça, Prof. Manuela Guerreiro

Abstract:

Objectives: The aims of this project were 1) to analyse emotion recognition and emotional memory in healthy subjects 2) to verify if focal and diffuse lesions of the lymbic system could affect the above functions.

Methods: Subjects performed a neuropsychological battery which included tests of emotion recognition (presented through facial expressions and sentence prosody) and an emotional memory test, composed of sentences with positive, neutral and negative content. Performance was compared with repeated measures ANOVA. Emotions were the within-subject factor and group (patients or healthy controls) was the between-subject factor.

Results: Healthy subjects (N=131) have enhanced memory for positive information compared to neutral and negative information both when analysed short and long term memory. This effect is independent of tested factors (age, education and gender). In what concerns emotion recognition, education positively influences the ability to recognize emotions, both by facial expressions and prosody. Contrarily, ageing negatively influences the recognition of emotional prosody.
The analysis of the clinical populations with focal or diffuse deficits on the limbic system reveals that after a unilateral Selective Amygdalo-Hipocampectomy for treatment of the epilepsy, patients (N = 35) do not show impairment on emotional processing. Subjects with Mild Cognitive Impairment (N = 38) and Major Depression (N = 39) significantly misunderstand neutral faces as sad, and are also impaired in the recognition of emotional prosody. Despite this impairment on emotion recognition both groups of patients have shown a pattern of emotional memory similar to healthy controls, which reveals dissociation between both processes.

Conclusions: Enhancement of memory for positive information was independent of demographic factors and is also spared in disorders that affect the limbic system. This effect should be an essential mechanism for daily living contributing for subject's motivation. Similarities on emotional processing between MCI and MD are a new discovery and are being interpreted with the recent highlights of the overlap of dementia and depression.

Keywords: emotion recognition, emotional memory, lymbic system

33/04 - "Dynamic brain patterns in neocortical areas during interpersonal transactions" - only abstract available

Instituição/*Institution*: Krembil Neuroscience Centre, Toronto Western Hospital and The Hospital for Sick Children, University of Toronto - Canada
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Prof. Richard Wennberg, Prof. Jose Luis Perez Velazquez

Abstract: Brain imaging performed during a variety of psychophysical experiments has demonstrated that specific neocortical areas change their activity when subjects are experiencing other subjects. Where in the brain self/other awareness is represented is an emerging area of investigation. We have addressed the neuronal dynamics of interpersonal interactions using simple psychophysical paradigms while recording brain activity using magnetoencephalography (MEG), and analysing the patterns of neuronal synchronization.. We build on current concepts of brain function and propose that the coordinated (synchronized) activity in distinct cortical areas will reveal brain regions involved in "self" versus "others" processing. The analysis of synchronization of cortical regions derived from the MEG recordings revealed enhanced synchronization between the activity of the midline and the prefrontal cortex, and that the midline cortex synchronizes its activity with parietal areas as well. The pattern of synchronization was similar when study participants experienced noxious stimuli (a self-administered painful stimulus to the fingers of the right hand) as when they were watching films of other people or animals experiencing pain. However, these synchronization patterns differed from those obtained when the participants visualised photographs of faces, themselves included. We thus conclude that midline and prefrontal cortices are important in the processing of sensory painful stimulation and in generating empathy towards others' pain. We expect that these studies will serve as preliminary background to undertake the investigation of reflective self-awareness and its relation to interpersonal transactions.

Results: Enhanced measured synchronization of unsynchronized sources: inspecting the physiological significance of synchronization analysis of whole brain electrophysiological recordings. L. Garcia Dominguez, R. Wennberg, J.L. Perez Velazquez, R. Guevara Erra. *International Journal of Physical Sciences*, 2(11), 305-317, 2007. Fluctuations in neuronal synchronization in brain activity correlate with the subjective experience of visual recognition. J.L. Perez Velazquez, L. Garcia Dominguez, R. Guevara Erra, *Journal of Biological Physics*, 33: 49-59 (2007)

Conference presentation: Brain coordination dynamics of the processing of self-referential stimuli. L. Garcia Dominguez, et al. 12th Human Brain Mapping Conference, Florence (Italy), 2006. NeuroImage 31, Supp. 1, S119, 2006

Keywords: self-reference; synchronization; magnetoencephalography; pain

34/04 - "fMRI and photo emission study of presentiment: The role of "coherence" in retrocausal processes"
Instituição/*Institution*: Parapsychologist Institute, Utrecht - Netherlands
Duração/*Duration*: 2005/05 - 2007/11
Investigadores/*Researchers*: Prof. Dick Bierman, Dr. Eduard van Wijk

Abstract: The rationale behind this experiment is that presentiment is supposed to be explained as an example of time-symmetry in physics. In physics, time symmetry generally is not observed, but theoretical considerations suggest that the breaking of time-symmetry is due to the asymmetry in the availability of coherent multi particle transmitters, such as lasers, and coherent multi particle absorbers.
Time symmetry might therefore occur when the brain state is extremely coherent. Meditation is thought to be a practice resulting in such coherent brain states. Therefore our main hypothesis is that meditators show larger presentiment effects. Presentiment effects are measured by comparing the brain activity **before** emotional stimuli with the brain activity before neutral stimuli. Because these stimuli are presented randomly and the subject cannot know which type of stimulus will be presented there should be no difference.
In order to evaluate this hypothesis we cannot use a whole brain analysis but should focus on certain regions in order to reduce the otherwise required corrections for multiple analysis. The strategy we used was to establish which brain regions do behave differently in control subjects and meditators when stimuli are presented **irrespective of the type of stimulus**. So in assessing these brain regions for possible presentiment we do NOT select on the basis of later differential behaviour between emotional and neutral stimuli because such a selection would basically result in spurious results as the signals before and after the stimulus are correlated.
Eight experienced meditators were trained to meditate in the hostile environment of brain scanner. There they were presented with, in total, 64 random neutral, erotic and violent visual stimuli during meditation in the scanner. In a separate session they were presented similar stimuli during the resting state. The resting state measurements were also compared to data obtained from 8 control subjects.
First we analyzed the ‘normal’ i.e. causal effects of the stimuli on the brain activity as measured by Bold-levels in the brain.
In total we found 36 brain regions that showed significant contrast between the session when the meditators were meditating and when they were not meditating and comparing the control subjects in rest with the meditator in rest.
Substantial effects of meditation on brain processing of different emotional visual stimuli were found in several brain regions. The relatively largest direct effects of meditation concerned Brodmann areas 18 and 19 in the Lingual Gyrus. Long term effects of meditation, inferred from the contrast between meditators in rest with control-subjects in rest, were only found in brain regions that have been shown to be involved in attention.
For the evaluation of the hypothesis concerning presentiment we focused on the analysis of the anticipatory brain signals preceding neutral and emotional visual stimuli in the 36 regions of interest. In previous work with unselected subjects it was found that these anticipatory signals are dependent on the type of the future stimulus, in spite of the fact that at the time the signals are recorded the future stimulus is completely unknown and will be selected randomly. The semi-qualitative analyses of the current results show that indeed this presentiment effect could be replicated in the brain scanner with control subjects. Experienced meditators showed stronger presentiment especially when they were meditating. The effect of meditation was quite clearly that the ‘retrocausal’ effect of violent stimuli was reduced resulting in a relative larger contribution of erotic presentiment. However, stronger conclusions, also with respect to spatial distribution of the effect, can only be drawn after full quantitative evaluation, which currently is in process.

Keywords: coherent brain states, meditation, presentiment, emotion, fMRI

37/04 - "The effect of conscious states of neural activity"
Instituição/*Institution*: The Weizmann Institute of Science, Rehovot - Israel
Duração/*Duration*: 2005/02 - 2007/07
Investigadores/*Researchers*: Prof. Shimon Ullman, Prof. Elisha Moses, Engº Shimshon Jacobi

Abstract:

Objective: The goal of this research project is to examine the interactions between mental and neural activity. In particular, whether the conscious states of a human observer can have an empirically detectable effect on neuronal activity.

Method: The study used two experimental setups. Both created a cooperative interaction between a subject and a separate neuronal system, based in one setup on EEG measurement from a second subject, and in the other on monitoring the activity in a neuronal dish. The EEG setup involved a player and a second subject. The player participates in a computer controlled tracking game developed for the study. EEG signals are measured from the EEG-subject. The success of the player's game is dependent on a combination of the tracking action, together with a signal from the EEG recording. The experimental test is whether there will be a detectable interaction between the observer's response and the recorded EEG signal. In the neuronal dish setup we placed a dish next to the player, with a physiologically active culture of rat hippocampal neurons. The cursor on the screen moves in response to the player's strokes, combined with a signal from the neuronal culture. We then compare the dish signal during game and non-game periods.

Results: Overall, the EEG signal during game time was slightly increased, but a larger body of data will be required for full statistical analysis. It will be of interest to incorporate learning algorithms to search for subsets of electrodes which show an enhanced effect. In the neuronal dish, considerable effort was invested in developing methods for growing stable active neuronal cultures. In most cultures, the variability in spike rates made it impossible to obtain statistically significant results. In only one dish culture was the activity during game and pause periods significantly different, and in this case the activity during game period was higher that during reference period.

Conclusions: Both methods are novel and challenging, and required significant development work. The EEG-based method is less direct, but it proved more robust and easier to use. We have reached a stage where the collection and analysis of a larger body of data for further statistical analysis is feasible. In the neuronal dish setup the variability in the signal across test game sessions is still high. Further testing will benefit from cultures, currently under development, with higher activity and lower variability.

Keywords: consciousness, neuronal activity, interactions, EEG

42/04 - "Exploring Psychomanteum as a psi-conducive state of consciousness (Phase 2): Adding new perceptual, personality, abnormal thinking, and phenomenological variables of anomalous cognition using two favourable conditions: (1) visual/musical targets and (2) psychomanteum/non-psychomanteum sessions"

Instituição/*Institution*: Instituto de Psicologia Paranormal, Buenos Aires - Argentina
Duração/*Duration*: 2005/03 - 2007/01
Investigadores/*Researchers*: Dr. Alejandro Enrique Parra, Dr. Jorge Fernando Villanueva

Abstract:

Objectives: The aim is of this researcg project was to explore whether the psychomanteum technique encourages a psi-conducive state of consciousness, which would result in scoring that is significantly above MCE.

Method: Although the psychomanteum technique was designed to facilitate reunion experiences with deceased individuals, is not normally employed to seek ESP information. Seventy eight percent claimed to have had a variety of ESP experiences. A number of variables, such as vividness of imagery and hallucinatory experience, were examined. Two conditions, psychomanteum and non-psychomanteum condition, were compared. A CD-pool containing 200 high-quality color pictures, were designed using a RNG for randomization. One hundred and thirty participants (92 females and 38 males; Mean age= 47.44) were recruited by announcements in newspapers and our web site.

Results: Using no-dynamic targets, that is, picture image as targets, the psychomanteum condition gave 30.6% of hits above the 25% expected by chance; however, in the no-psychomanteum ("control") condition we obtained 22.2%. Using dynamic targets (video-clips), the psychomanteum condition gave 27.0% (mean chance expected= 25%); however, in the no-psychomanteum ("control") condition we obtained 35.1%, notably above chance expected. The overall results (dynamic and non-dynamic targets joined together, N=75) gave 30.1%, also above chance expected in comparision with non-psychomanteum overall (28.8%).

Conclusions: A number of positive correlations were also found, for instance, participants who attained higher scores on auditory and visual hallucinations tended to demonstrate psi-hitting. Some participants indicated psychophysical relaxation, which is consistent with the score for sensation of pleasure about the experience. Although some of them indicated not to have experienced changes in their corporal perception, an some people said to be lighter, heavier, numb, and out-of-proportion. Some of them experiences lost the notion of elapsed time (temporal distortion) and less time than normal. This also might be in relation with the high score for sensation of pleasure and relaxation during the experience.

Publications: (2006). Exploring psychomanteum as a psi-conducive state of consciousness. En C.Simmonds-Moore (Ed.), *Proceedings of the 49th Annual Convention of the Parapsychological Association* (pp. 141-152). Hasselbacken Hotel Stockholm, Suecia.

Keywords: hallucinations – ESP information – vividness of imagery – dynamic targets

47/04 - "A combined psychophysiological and electrophysiological approach to investigate low-level visual perception in autism" - only abstract available

Instituição/*Institution*: Department of Psychology, The University of Sheffield - UK
Duração/*Duration*: 2005/06 - 2006/10
Investigadores/*Researchers*: Prof. Olivier Pascalis, Prof. Elizabeth Milne, Prof. David Buckley, Dr. Laurence Vigon

Abstract:

Background: There are reports of atypical visual perception in individuals with autistic spectrum disorder (ASD) yet the aetiology of this remains unknown. It is currently unclear at what stage atypical perception arises in autism; whether it is specific to certain classes of perceptual stimuli; or whether it reflects impairments in low or higher-level mechanisms.

Method: We investigated perception in 20 individuals with ASD and 20 matched controls by measuring visual evoked potentials (VEP) elicited by Gabor patches presented at a range of spatial frequencies.

Results: The latency to peak of the visual evoked potential, elicited by all spatial frequencies was significantly reduced in the individuals with ASD compared to the typically developing individuals (effect sizes ranged from -.65 - -1.53).

Conclusion: Atypical perception in autism occurs at an early stage of processing. It is apparent at a cortical level within 90 ms of stimulus onset and following presentation of very simple visual stimuli. We argue that autistic spectrum disorder is characterised by a low-level abnormality within the visual system.

Keywords: VEP = visual evoked potential, ASD = autistic spectrum disorder, TD = typically developing, EEG = electroencephalogram,

57/04 - "Imagery and emotion production during hypnosis: an electrophysiological approach"
Instituição/*Institution*: Psychological Institute, Russian Academy of Education, Moscow - Russia
Duração/*Duration*: 2005/04 - 2007/05
Investigadores/*Researchers*: Prof. Zvonikov Vyacheslav Michailovich, Prof. Stroganova Tatiana Alexandrovna, Dr. Tsetlin Marina Mihailovna, Dr. Anna Kirenskaya, Dr. Vladimir Y. Novotosky-Vlasov, Ms. Anastasia V. Marushkina

Abstract:

Objectives: The aim of the study was **to investigate the EEG and autonomic concomitants** of the hypnosis, internal imaging and emotional experience.

Methods: 13 high hypnotizable subjects participated in two experiments: (1) in hypnotic session (HS) that included live hypnotic induction, deep hypnotic relaxation, recollection of emotionally indifferent (I), positive (P) and negative (N) past events and (2) in a waking session (WS) that included inner silence condition, and recollection of the same I, P, N past events. To explore the dimension of the affect intensity two modes of the emotional events recollection were used in WS - "associated" (A - active participation of the subject in the remembered event) and "dissociated" (D - watching of the event "at the inner screen"). EEG (19 sites), ECG and skin conduction (SC) were recorded.

Results: Heart rate and SC changes during HS and WS paralleled the anticipated increase of arousal level from relaxation to inner imagery and further to P and N emotion recollection, thus verifying the emotional experience. The observed decrease of EEG spectral power (SP) and coherence (COH) within all frequency bands under HS may reflect the specificity of hypnosis as an altered state of consciousness. Mental imagery led to pronounced blockage of alpha SP over the posterior scalp area. During emotional conditions the generalized increase of EEG SP was observed. Delta and theta SP increase was more pronounced during N emotions, whereas alpha SP increase – during P ones. Beta2 and gamma1 SP was higher at right frontal, central and parietal sites during P emotions as compared to N ones. Emotion-related patterns of COH changes were frequency as well as hemispheric-specific depending on emotional valence. P emotions elicited more pronounced right-hemispheric COH increase within gamma bands. N emotions led to greater increase of left-hemispheric COH within theta and beta1 bands. EEG changes in WS had the same direction but were less pronounced than in HS. The SP and COH differences between A and D recollections of events in WS were revealed in the bands specifically depending on emotional valence. D mode as compared to A one led to less gamma SP during P event recollection, to higher alpha1 and alpha2 SP during N event and to less theta, beta and gamma COH during both emotional event recollection.

Conclusions: The obtained results corroborate and extend the existing findings of the role of EEG rhythms in hypnotic state and emotion production.

Publications: T. Stroganova, A.Kirenskaya, V. Novototsky-Vlasov, A. Chistyakov, M.Tsetlin, V.Zvonikov. EEG study of mental imagery and emotion production during hypnosis. Int. J. Psychophysiol., 2006, v.61, N3, P. 359. (13th World Congress of Psychophysiology, Istanbul, Turkey, 2006).; V.Zvonikov, .Kirenskaya, V.Novototsky-Vlasov, T. Stroganova, A.Chistyakov. The study of autonomic variables' changes during emotional experience of different intensity. Symposium «Psychotherapy in the system of medical sciences in the making of evidence based practice », St. Petersburg, Russia, 2006 (in Russian).; A.Chistyakov, .Zvonikov, A.Kirenskaya, V.Novototsky-Vlasov. The study of autonomic variables' changes during recollection of emotionally loaded past events. Symposium "Professional longevity and quality of life". Moscow, 2007, p.237-238 (in Russian).

Keywords: hypnosis, imagery, emotions, EEG.

58/04 - "Comparative study of brain processes related to microgravity-induced and clinical oculomotor disturbances in subjects with the right and left eye dominance"
Instituição/*Institution*: Institute of Biomedical Problems, Russian Academy of Sciences, Moscow - Russia
Duração/*Duration*: 2005/04 - 2007/04
Investigadores/*Researchers*: Prof. Inessa B. Kozlovskaya, Ms. Elena S. Tomilovskaya, Dr. Anna Kirenskaya, Dr. Vladimir Y. Novotosky-Vlasov, Dr. Vadim V. Myamlin, Ms. Nelly R. Gallyamova

Abstract:

Objectives: The aim of the study was the quantitative investigation of the slow negative presaccadic potentials in antisaccadic task depending on eye dominance under normal conditions, during simulated weightlessness and in schizophrenic patients.

Methods: Data of 41 healthy subjects, 14 volunteers, exposed to dry immersion (DI) and 19 schizophrenic patients were analyzed. Healthy subjects were right-handed males with right (RE) and left (LE) eye dominance, and patients had RE dominance. 2 modifications of antisaccadic task were used. In A1 task fixation period was 800-1000 ms, and in A2 task – 1200-1400 ms. EEG was recorded from 19 sites. Mean amplitude of slow cortical negative potentials (SN) time-locked to peripheral stimulus (PS) onset was evaluated. 600 ms epoch before PS was used for quantitative evaluation of SN amplitude in A1 task, and 1000 ms - in A2 task. Statistics comprised MANOVA and *t*-test. Correlations between SN amplitudes and PANSS scales were analyzed in schizophrenic patients.

Results: The saccade characteristics did not depend on task and experimental conditions in healthy RE subjects. In LE subjects percent of errors was lower in A2 task than in A1 one, and increase of errors and saccade latencies was revealed after exposure to DI. Patients performed A2 task better than A1 one, but they exhibited delays in performance of correct saccades and larger number of errors in both tasks compared to healthy subjects. RE subjects demonstrated high level of frontal activation before antisaccades in both tasks. Reduced SN amplitude in frontal region was revealed in LE subjects. The most pronounced decline of SN amplitude in frontal regions was found in patients. Higher PANSS values corresponded to lower amplitude of SN, and maximal number of correlations was found for Fz and F3 sites. Predominant left hemisphere activation was observed during the last 200 ms before peripheral cue in all groups. Changes in cortical activity after DI were similar in RE and LE groups: SN amplitude decreased, and foci of negativity shifted to the right hemisphere.

Conclusions: The obtained results demonstrate the independence of basic hemisphere specialization from eyedness, support the neurodevelopmental model of cerebral lateralization, and corroborate the important role of frontal disorders in genesis of schizophrenia.
Publication: A.V.Kirenskaya, E.S. Tomilovskaya, V.Yu.Novototsky-Vlasov, I.B.Kozlovskaya. The effects of simulated microgravity on characteristics of slow presaccadic potentials. Human physiology, 2006, v. 32, N 2, pp. 131-139.; A.Kirenskaya, V. Novototsky-Vlasov, V. Myamlin, I.Ushakova. The study of disturbances of cortical processes related to saccadic generation in schizophrenic patients. Int. Congress "Progress in Neuroscience for medicine and psychology", Sudak, Crimea, Ukrain, 2005, pp. 90-91.; A.Kirenskaya, V. Myamlin, V. Novototsky-Vlasov, E. Tomilovskaya, I.Ushakova, I.B.Kozlovskaya. Cortical potentials preceeding antisaccades in healthy subjects, schizophrenic patients and after simulated weightlessness. Int. J. Psychophysiol., 2006, v.61, N3, P. 346.

Keywords: antisaccades, schizophrenia, weightlessness, slow potentials.

61/04 - "A neuropsychological examination of specific and global frontal lobe functions in siblings with and without eating disorders"
Instituição/*Institution*: Institute of Psychiatry, King's College London - UK
Duração/*Duration*: 2005/08 - 2006/11
Investigadores/*Researchers*: Dr. Ulrike Schmidt, Dr. Kate Tchanturia, Dr. Pei-Chi (Thomas) Liao

Abstract:

Objectives: Patients with eating disorders favour immediate gratification and ignore long term negative consequences. These behaviours are reflected in data showing that individuals with anorexia nervosa (AN) have impaired decision-making (DM) ability. This study aimed to investigate DM in individuals with bulimia nervosa (BN) using the Iowa Gambling Task (IGT) and skin conductance responses (SCR).

Methods: A total of 26 BN patients and 51 healthy controls were recruited. Participants completed the IGT while their SCR were recorded. Published data of 29 patients with AN were included as an additional clinical comparison group.

Results: Both of the AN and the BN groups performed poorly in the IGT in comparison with the HC group. The BN patients showed no decrease in SCR relative to the HC group whereas a markedly diminished SCR was seen in the AN group.

Conclusion: Individuals with BN perform poorly on the IGT just like AN patients, but unlike the AN group, people with BN do not show diminished SCR. The divergence between SCR and the IGT performance is not consistent with the Somatic Marker Hypothesis. Impaired DM may be related to personality factors such as obsessive-compulsive traits.

Publications: Tchanturia, K., Liao, P., Uher, R., Lawrence, N., Treasure, J., & Campbell, I. C. (2007): An investigation of decision making in anorexia nervosa using the Iowa Gambling Task and skin conductance measurements. Journal of International, Neuropsychological Society13:1-7.
Liao, P., Uher R., Lawrence, N., Treasure, J., Schmidt, U., Campbell, I. C., Collier, D. A., & Tchanturia, K. (Submitted). An examination of decision-making ability in bulimia nervosa.

Keywords: Orbitofrontal Cortex, Iowa Gambling Task (IGT), Somatic Marker Hypiothesis, Anorexia Nervosa (AN) and Bulimia Nervosa (BN)

62/04 - "Developing a "Recipe" for success in ESP experimental research (Phase II): Testing and Improving a Protocol"

Instituição/*Institution*: Department of Psychology and Counselling, University of Greenwich, London - UK
Duração/*Duration*: 2005/01 - 2007/01
Investigador/*Researcher*: Dr. José M Pérez Navarro

Abstract: This project was aimed at testing and improving an experimental protocol for successful ESP research derived from a previous phase of research (Perez-Navarro, 2003). Two studies were conducted using the standard Ganzfeld sensory attenuation technique (see e. g. Bem and Honorton, 1994). In each experiment two participants were tested. One would act as a telepathic sender, trying to communicate the meaning and characteristics of a visual stimulus to the second participant (the receiver) who, under sensory attenuation in a distant room, reported his spontaneous mental imagery and subjective impressions. The first study (N=60) was conducted in order to explore a set of participants' traits, state, and environmental factors as predictors of the study success. Five variables showed significant associations with the participants' ESP scores at an α=.01. These were: sensory adaptation, concern on the external environment, absorption, and task disorientation during Ganzfeld stimulation as well as pre-session energetic arousal. A stepwise forward logistic regression analysis performed on the predictors with p-values of .05 or less showed a 3 variable solution. Thus, the probability of obtaining a hit in a given experiment was accounted by pre-session energetic arousal, concern about the external environment, and task disorientation during the Ganzfeld stimulation. The second study (N=90) showed a significant hit rate of 33% (z=1.86, p= 0.03, one tail). Only four of the predictors tested replicated both significance and direction from the previous study. These were neuroticism, sensory adaptation, absorption, and task disorientation during the Ganzfeld stimulation. Three further variables (practice of mental disciplines, pre-session arousal, and arousal during the Ganzfeld stimulation) replicated direction but did not reach statistical significance in this second series. It was concluded that operating simultaneously on three domains (participant selection, pre and on-session state, and post-hoc indicators of the occurrence of psi) screening for participants and/or weighting sessions on the basis of the successful predictors observed in the pilot series was an efficient strategy to increase the rate of success in the main study.

Publications: Pérez Navarro, J. M. (2007). The Role of Individual Differences, Mental State and Procedure in the Experimental Testing of the ESP Hypothesis. Submitted to the European Journal of Personality.; Pérez Navarro, J. M. Does Psi Exist? An Experimental Protocol for Successful ESP Research. In preparation.

Keywords: ganzfeld, ESP (extrasensory perception), telepathy

63/04 - "Attentional modulation in neural responses to faces"
Instituição/*Institution*: Universidad Autónoma de Madrid, Facultad de Psicologia - Spain
Duração prevista/*Estimated duration*: 2005/02 - 2008/03
Investigador/*Researcher*: Prof. Jaime Iglesias Dorado

Abstract: Adaptive social behavior requires perceiving and flexible processing of changing facial expressions that convey different socio-affective meanings. Although a more conscious processing and effortful interpretation of some facial expressions, such as disgust, may be required, certain facial expressions, such as fear, may be processed in a rapid, more automatic, way. To advance in this issue, event-related potentials were used to investigate the effects of attention and emotion expression on face processing in the brain. The emotion facial expressions that were examined were the prototypical of different basic emotions (fear, disgust, happiness, surprise, anger and sadness). Stimuli consisted of a house and a face transparently superimposed. Participants were instructed to attend to either the face or the house, in different emotion expression conditions, in order to signal consecutive repetitions of the same person or the same house in separate blocks of trials. The emotional nature of the faces was not relevant to the task. Different effects of attention and different spatio-temporal patterns of brain electrical activity were observed for faces with distinct emotion facial expressions. Results showed that the processing of distinct emotion from faces is gated by attention allocation at different latencies and associated with different neural responses. We conclude that different brain mechanisms underlie the perception of distinct basic emotion facial expressions.

Manuscripts in preparation or under review: Iglesias, J., Olivares, E.I., Santos, I.M., & Young, A.W (in preparation): Neural sources of attention effects on brain potentials to fearful and disgusted faces.; Iglesias, J., Olivares, E.I., Santos, I.M., & Young, A.W (in preparation): Brain areas and time course of attentional modulation on event-related potentials to angry and sadness faces.; Santos, I.M., Iglesias, J., Olivares' E.I., & Young, A.W. (under 2nd review): Differential effects of object-based attention on evoked potentials to fearful and disgusted faces.; Santos, I.M., Iglesias, J., Olivares, E.I., & Young, A.W. (in preparation): Neural correlates of attention effects on brain electric responses to happiness and surprised faces.

Keywords: Event-related potentials; emotion; attention; facial expression.

64/04 - "Degree of Meditation Attainment and Comparison of Type of Meditation in Relation to Awareness of Precognition Targets"
Instituição/*Institution*: Psi Research Centre, Glastonbury - UK
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Dr. Serena M. Roney-Dougal, Dr. Jerry Solfvin

Abstract:

Objectives: To test the hypothesis that meditation attainment correlates with psi and to explore the possibility that some meditation techniques facilitate this.

Methods: 1) Tibetan Psychic Beliefs **-** People from various Tibetan psychic disciplines were interviewed.
2) Yogic Attainment in Relation to Precognition - In two studies, 3 levels of yoga practitioners, students (ST), sanyassins (SN) and swamis (SW), meditated, followed by an awareness period in which they aimed to precognitively perceive a video clip.
3) Tibetan Buddhists' Meditation Attainment in Relation to Psi - 18 participants, Tibetan monks, Western Buddhist students and a nun, completed 8 sessions each, of meditation followed by psi awareness of a static target picture.
4) Tibetan Meditation Techniques in Relation to Precognition - 10 Tibetan monks, who had meditated for 5 years minimum, completed 8 sessions each: 4 visualisation, and 4 mantra. A Tibetan Stroop test assessed distractibility.

Results: 1) Tibetan psi traditions incorporate oracles, *Mo* divination, conscious reincarnation, astrology and attainment of psi abilities through meditation.
2) In the ashram studies, in 2003, with those who completed at least 3 sessions, SW scored significantly better than SN and ST.
3) Age and years of Buddhist meditation practice correlated significantly with psi. This is confounded by psi-missing from 3 monks who reported that, as children, they had previous-life memories.
4) Overall, the Lamas scored significantly. There was no significant difference between mantra versus visualization sessions.

Conclusion: These studies support the Yogic and Buddhist teachings that psi abilities arise as a result of meditation attainment. This conclusion is qualified by the psi-missing.

Publications: Roney – Dougal, S.M. (2006). Taboo and Belief in Tibetan Psychic Tradition, *J. Soc. Psych. Res.,* 70(4), 193-210.; Roney – Dougal, S.M. & Solfvin, J. (2006). Yogic Attainment in Relation to Awareness of Precognitive Targets, *J. Parapsych.,* 70(1), 91-120.; (in prep.**)** Two Tibetan Meditation Techniques in Relation to Psi.
Roney-Dougal, S.M., Solfvin, J. & Fox, J. (submitted). Tibetan Buddhists'.Meditation Attainment in Relation to Psi.; Solfvin, J. & Roney-Dougal, S.M. (in press) Meditation and ESP: A Study of Experienced Vs Novice Meditators, ICTW, India.

Keywords: Precognition, Meditation, Tibetan Buddhist, Yogic

65/04 - "An Investigation into the Possibility of a Stimulus-Response Causal Relationship in the Electronic Voice Phenomenon"

Instituição/*Institution*: Skylab, Portree, Scotland - UK
Duração/*Duration*: 2005/02 - 2007/03
Investigadores/*Researchers*: Dr. Alexander MacRae, Prof. Charl Vorster

Abstract:

Objective: A series of experiments were carried out during tests of the Electronic Voice Phenomenon (EVP) to check if there was any correlation between what the experimenter said and responses recorded at that time.

Method: To do this the experimenter would ask six standard questions, with a 30 second interval between each question. The EVP apparatus used was the Alpha Interface System (AIS).
After the 3 minute EVP session, each response would be selected out from the session record, and the resulting set of samples would be randomised so as to prevent any clues based on order within the overall session.
The set of samples were then sent to an independent Adjudicator, known to be an expert listener. The Adjudicator then decided which – if any – of the 6 questions each sample could be a response to.
The same set of randomised samples was sent to a listening group, each of whom – without conferring – carried out the same actions as the Adjudicator.
However the Adjudicator's judgement was taken as being correct and the sum of the panel's adjudications were simply used as a weighting factor applied to the Adjudicator's judgement in each individual case.
One experiment a week was carried out for a period of approximately two years.

Results: The results for the first month were excellent, 56% of the responses were within context and the nominal 30 second window. (Probability of a response being right, 0.56; by chance = 0.17).
However, by the end of month 3 the scores had fallen and another factor had entered in. Answers were being obtained before questions had been asked. Examining this, an Anticipation Index (AI) was computed.
Beyond the third month the increase in responses continued with a decrease in correlation between questions and responses. There was yet another factor – it was observed that correlations now tended to be between a response and a subsequent response or responses.
The original premise had been too facile. This was now not a matter of parapsychology but in fact addressed the very nature of what is a question and how does it find an answer.
On the basis of observed results a process of "reverse engineering" led to the postulation of functional block diagrams – which, in the future, may relate best to fmri scans.

Conclusions: That a correlation can exist in EVP between a question asked and a subsequent response. That there seems to be a correlation between EVP and the functioning of the Phonological Loop. That a correlation may exist between EVP and what is often referred to as the subconscious. That the functional block referred to (in electronics and IT) as a Comparator seems to be particularly relevant in this field of work.

Keywords: EVP AIS Stimlus/Response On submission to JSPR

66/04 - "Extrasensory Perception and Implicit Sequence Learning in a Computer Guessing Task"

Instituição/*Institution*: Neurology Clinic, University Hospital Zurich - Switzerland
Duração/*Duration*: 2005/04 - 2006/10
Investigadores/*Researchers*: Prof. John Palmer, Prof. Peter Brugger, Dr. Enrique Wintsch

Abstract:

Participants (Ps) (*N*=64), equally divided between strong believers in the paranormal and strong skeptics, guessed out loud which number (1-4) a pseudo-RNG would select for each trial while simultaneously clicking the mouse.
In the 1st 2 of 4 runs, the target sequences (*N*=81) were biased, reflecting either pure repetition avoidance (RA) or pure counting (CO), e.g., 2,3,4,1,2,3. As expected, scoring was above chance in both runs but significant only in the RA run. Although all Ps demonstrated marked RA, the deficit was only slightly greater for believers than skeptics. In the RA run, RA correlated negatively and significantly with hits for believers; the correlation reversed slightly for skeptics.
Between Runs 2 and 3, Ps completed a drawing task and questionnaires measuring tolerance of ambiguity and temporal lobe dysfunction (LIMBEX). Believers scored dramatically higher than skeptics on LIMBEX.
Targets for Run 3 (*N*=101) were random, except that if P clicked the mouse when a computer address contained a 1 rather than a 0 (1-state), which occurred randomly 20% of the time, their target for the next trial matched their personal response bias as calculated from the preceding 2 runs. As predicted from decision augmentation theory, believers clicked the mouse when the computer was in the 1-state significantly more often than chance expectation and significantly more often than did skeptics.
In the last run (*N*=100), Ps received either subliminal or supraliminal feedback of the preceding target. For half of each group, after trials 1-10 the targets repeated Ps' previous responses with a lag of 10 (pro-bias targets). The other Ps received a target sequence diametrically opposite to their response bias in Runs 1 and 2 (counter-bias targets). Contrary to expectation, only skeptics showed a greater increase in correct guesses from the 1st to the 2nd half of the run (implicit sequence learning, or ISL) with pro-bias than counter-bias targets. The subliminality manipulation had no effect. The ISL effect reversed slightly for high LIMBEX Ps; thus, temporal lobe instability seems to prevent ISL.
Runs 3 and 4 also tested the "anomalous anticipation effect." As predicted from the results of 2 previous experiments, skeptics correctly anticipated the nature of the bias (pro or counter) in Run 4 by manifesting the corresponding bias in Run 3, whereas believers anticipated incorrectly. However, this result occurred only if the Run 4 targets were subliminal.

Keywords: implicit sequence learning; extrasensory perception; response bias; decision augmentation theory; temporal lobe dysfunction

68/04 - "The emotional Stroop effect: Cognitive, emotional, and physiological aspects"
Instituição/*Institution*: University of Manchester and Birkbeck College, University of London - UK
Duração/*Duration*: 2005/05 - 2007/07
Investigadores/*Researchers*: Dr. Isabelle Blanchette, Dr. Anne Richards

Abstract:

Objectives: This project explores the interaction between emotion and cognition. In high anxious participants, emotional stimuli capture attention and cause interference. This is the emotional Stroop effect. In four experiments, we examine the correlates of emotional Stroop interference using supraliminal and subliminal presentations. We compare explicit (affective ratings, explicit memory) and implicit (EDA, facial EMG) measures of emotional processing.

Methodology: Using the Stroop paradigm, we examined reaction times (RT) to emotional and neutral stimuli, comparing high anxious and low anxious participants. We manipulated the emotional value of the stimuli using classical conditioning. Initially neutral non-words were repeatedly paired with either negative or neutral images. We presented the stimuli in the Stroop task either supraliminally or subliminally (using a sandwich masking procedure). We recorded changes in facial expressions (corrugator muscle) using electromyography (EMG), and electrodermal activity (EDA). Participants also rated the emotional value of the stimuli and we tested their memory for the type of images used in conditioning the stimuli.

Results: Higher levels of anxiety were related to increased interference from emotional stimuli (slower RTs to negatively- relative to neutrally conditioned stimuli). This was the case when stimuli were presented supraliminally but not when they were presented subliminally, with the exception of participants who were aware of the stimuli despite the masking in the subliminal task. Despite the emotion manipulation showing consistent effects on the Stroop task, the explicit affective ratings were not always sensitive to this manipulation. Facial EMG activity however was consistently affected by the emotional value of the stimuli, both in high and low anxious participants, and both when stimuli were presented supraliminally and subliminally. Similarly, emotional stimuli also led to increased EDA under subliminal presentations, especially for high anxious participants.

Conclusions: Overall, our results provide insight into the interaction between implicit and explicit processing of emotion. These different subsystems of emotion may operate independently. Specifically, we found instances where emotion was evidently processed through implicit channels (facial expressions, EDA) despite not showing an effect on explicit systems (affective ratings, emotional Stroop interference). Importantly, these interactions can be modulated by individual differences in anxiety.

Publications: Richards, A., Blanchette, I., Hamilton, V., & Lavda, A. (2007). Cognitive, emotional and physiological components of emotional Stroop using associative conditioning. In.: S. Vosniadou, D. Kayser and A. Protopapas (Eds), *Proceedings of the 2nd European Cognitive Science Conference*, pp. XX-XX. Taylor & Francis, UK.; Lavda, A., Blanchette, I., Richards, A., & Hamilton, V. (2006). Facial expressions are better predictors of the emotional Stroop effect than explicit emotional ratings. Poster presented at the *13th Annual Conference of the Cognitive Section of the British Psychological Association*, Lancaster, UK, September, 2006.; Richards, A., Blanchette, I., Hamilton, V., & Lavda, A. (under revision). Conscious and nonconscious components of anxiety using psychophysiological and behavioural measures. *Neuropsychologia*.; Blanchette, I., Richards, A., Lavda, A., & Hamilton, V. (in preparation). What is the best predictor of interference by emotional stimuli? Comparing facial expressions and subjective evaluations.

Keywords: Emotion, psychophysiology, Stroop, EDA, EMG

73/04 - "Spontaneous Brain Blood Flow During Guess - research with near infrared spectroscopy"
Instituição/*Institution*: Institute for Body Measurements, IRI, Schiba-shi - Japan
Duração/*Duration*: 2005/01 - 2006/07
Investigadores/*Researchers*: Dr. Mikio Yamamoto, Dr. Hideyuki Kokubo, Dr. Hideo Yoichi

Abstract:

Objective: To study brain activities of clairvoyance by measuring brain blood flow using fNIRS.
[Test 1] Brain blood flow was measured while a subject guessed a hidden figure (Zenar symbols) in a forced-choice test. 8 male and 6 female healthy volunteers (average age, 46.6 y) scored degree of formulation of visual images in 3 min trials. Results of 69 trials showed that spontaneous blood flow change (SBFC) often occurred at the temporal lobe, and at that time the images were formulated clearly. This was designated instantaneous highly activated state of awareness. However, SBFC did not relate to successful clairvoyant tasks.
[Test 2] Brain blood flow was measured for 5 male and 6 female healthy volunteers (average age, 39.7 y) in a free-response test to guess unhealthy areas inside the human body or a small item hidden in a dark box. Two subjects were famous psychics from Russia and China. The characteristic activated area of these psychics was the prefrontal area although other subjects showed activation of the right temporal lobe.

Conclusions: Brain activities of the famous psychics during clairvoyance were not similar to activities of other subjects. These psychics seemed to think, and not only formulate visual images.

Publications: Kokubo H et al. (2005a) Impression and spontaneous blood flow change at the temporal lobe while guessing for a hidden figure. *J. Intl. Soc. Life Info. Sci.,* **23**(2), 306-313.; Kokubo H et al. (2005b) Research on brain activities by functional near infrared spectroscopy while guessing for hidden figures. *Japanese Journal of Parapsychology,* **10**(1&2), 33-36.; Kokubo H et al. (2006a) Brain blood flow change with functional near infrared spectroscopy while guessing. *J. Intl. Soc. Life Info. Sci.,* **24**(1), 224-230.
Kokubo H et al. (2006b) Brain activity while guessing. *Proceedings of 3rd Psi Meeting*. Curitiba, Brazil.

Keywords: guess, clairvoyance, fNIRS, temporal lobe, prefrontal

75/04 - "Measurement of Event-related EEG correlations between two human subjects over a large distance"
Instituição/*Institution*: The University of Northampton - UK
Duração/*Duration*: 2006/01 - 2007/09
Investigadores/*Researchers*: Prof. Harald Walach, Dr. Christian Seiter, Dr. Thilo Hinterberger

Abstract:

Objectives: This highly elaborative study aimed on replicating a possible correlation in EEG and/or skin conductance responses in separated human participants which was found by Wackermann et al., 2004 and Hinterberger et al., in press. In order to prove the effect without the possibility of an electromagnetic or acoustic cross talk between the participants and with the assumption that telepathic communication is spatially independent, we arranged a setting with two far distant laboratories, one in Northampton/UK and one in Tübingen/Germany in which closely related pairs of participants were measured synchronously.

Methods: 28 sessions were conducted with 16 pairs of participants in which one of both (referred to as 'stimulated participant') had to view 360 pictures of different categories in five runs. Emotionally affective pictures, neutral pictures, black screen stimuli, and pictures of the co-participant were presented. Eight channels of EEG, eye movements, and skin conductance were recorded from both the stimulated and non-stimulated participant. The event-related responses in the EEG of the non-stimulated participant of three seconds after stimulus onset were used for the data analysis and additionally the response curves of the spectral power of seven frequency bands. A non-parametrical statistical approach was applied to those measures to identify possible correlations between the stimulus times and the EEG of the non stimulated participant. Therefore, a randomised selection of 10 000 possible but arbitrary stimulus sequences was applied to the EEG data for comparison with the actual one.

Results: The results for the entire group could not replicate the findings of the previous studies. The event-related potentials show no remarkable effect nor does the EOG reveal remarkable significances. Also the spectral analysis shows no exceptional significances in all categories. However, the significances seem not to be equally distributed over all participants. Three participants show extraordinary high significances for emotional, affective, or the co-participants pictures.

Conclusion: The data of the non-stimulated participants were used to search for correlations with the stimulation times of the stimulated participants to detect a possible telepathic effect measurable with physiology. This effect turned out to be, if present at all, very small. The SCPs and skin conductance level and response revealed the highest z-scores which is in line with the fact that both measures react highly sensitive on emotional changes and changes in the arousal level. Other measures such as the time series ERP and the frequency bands did not show exceptional significance values. However, extraordinary large values in some participants suggest the existence of 'gifted participants'.

References: Hinterberger, T., Studer, P., Jäger, M., and Walach, H., "Event-related correlations between brain electrical activities of separated human participants", International Journal of Neuroscience, in press.; Wackermann, J., Seiter, C., Keibel, H. & Walach, H. (2003). Correlations between brain electrical activities of two spatially separated human subjects. *Neuroscience Letters,* 336, 60-64.; Wackermann, J., Muradas, J.R.N. & Puetz, P. (2004). "Event-related correlations between brain electrical activities of separated human subjects: preliminary results of a replication study", *Proceedings of presented papers. The 47th Annual Convention of the Parapsychological Association,* 465-468.

Keywords: Electroencephalography (EEG), telepathy, correlation analysis

76/04 - "Remote staring detected by conscious and Psychophysiological variables - Combining and improving two successful paradigms"

Instituição/*Institution*: Department for Evaluation of Complementary and Alternative Medicine, Hospital Epidemiology, Freiburg - Germany

Duração/*Duration*: 2005/01 - 2006/12

Investigadores/*Researchers*: Dr. Stefan Schmidt, Dr. Susanne Müller, Prof. Harald Walach

Abstract: We conducted a remote staring study that was intended to overcome some of the methodological shortcomings of earlier and current studies. We combined the classical setting EDA as dependant variable (Braud et al, 1993) with the paradigm that takes the starees´ conscious guesses as the main outcome. Based on findings in the field of social psychology (e.g. Wegner et al, 1987, 1994) we supposed that the classical instruction for the starer "to think not about the staree" in the non-staring condition would be rather counterproductive by making the image of this person tend to return to mind. Moreover we hypothesized that a different operationalization of the control condition a variance between staring and non-staring situation could produce clearer effects in the outcome variable. Therefore we tried to distract the starers completely from the starees during the non-stare conditions by a demanding cognitive task in half of the sessions or we left them with just a blank screen and the classical instruction to "think about something else" in the other half – in order to make a comparison.

Fifty participants were invited to take part as starees. After completing questionnaires on mindfulness, mood, personality and paranormal belief they rested in a comfortable position in front of a video camera while their EDA was continuously monitored. According to a random schedule they were "stared at" through a closed circuit television system. Conscious guesses were not assessed in the classical forced-choice manner ("Have you been stared at? Yes / No?") but were replaced by an "open-response" one that allowed them to guess not just *when* but also *how long* they felt being stared at. To avoid any cognitive strategies or response bias tendencies starees were blind against the number of staring / non staring periods (10 / 10) and also against the duration of these.Our results were as follows: Overall we did not find any staring effect at all, not in the EDA data and not in the conscious guesses data. The difference between the two conditions (standard vs. distraction) was not significant ($p = .07$) whereas a medium effect size staring effect according to our hypothesis of $d = .43$ ($p = .085$) for the difference between staring and non staring epochs could be found for the "distracting condition".Because of the lack of any staring effect we could not demonstrate the advantages of our "distraction paradigm". The results pointed into this direction but they can be of course mere chance findings. We nevertheless recommend that any future investigations into the "sense of being stared at" phenomenon take similar precautions when operationalizing their experimental conditions.

Publications: Müller, S., Schmidt, S., Walach, H. (2006). Remote Staring detected by conscious and psychophysiological variables – combining and improving two successful paradigms. *Proceedings of Presented Papers of the 49th Annual Parapsychological Association Convention*.

Keywords: remote staring, EDA, experimental methodology, staring effect, distraction paradigm

77/04 - "Stress and the psyche: methodological innovations in psychoneuroimmunology"
Instituição/*Institution*: Department of Psychology, APU, Cambridge - UK
Duração/*Duration*: 2005/03 - 2007/06
Investigadores/*Researchers*: Dr. Matt Bristow, Dr. Rachel Cook

Abstract:

Objectives: There is an inconsistency within the literature concerning whether acute stress leads to an increase or decrease in mucosal immunity. One reason for the inconsistent findings is the use of laboratory 'stress' tasks that lack ecological validity. In addition, the majority of research has focussed on immune changes immediately before or after the stress-inducing task. In this research we used parachute jumping as an ecologically valid method of inducing acute stress coupled with psychological and physiological measures of stress on the day of the jump and seven days before and after it.

Methods: 28 novice tandem jumpers participated in this study along with 31 non-parachute controls. The parachutists completed a daily questionnaire assessing levels of stress and provided a 2-minute unstimulated saliva sample on each of the seven days before the parachute jump, the day of the jump and the seven days after the jump. The control participants also completed the daily stress questionnaire and provided a saliva sample for 15 consecutive days. A sub-group of 12 parachutists provided saliva samples before and after the parachute jump. Saliva samples were analysed for cortisol, a measure of physiological stress, and immunoglobulin A (IgA), a measure of mucosal immunity.

Results: There were significant and substantial increases in IgA and cortisol following the jump indicating that the parachutists found the experience stressful and that this lead to an increase in mucosal immunity. These increases seem transient as there was no indication of any physiological or psychological change in the evening measures on the day of the jump or the days that followed.

Conclusions: Using an ecologically valid acute stressor we found evidence of a substantial *increase* in mucosal immunity. This increase is brief and within an hour IgA levels are back to normal with no evidence of suppressed IgA in the days that follow. Acute stressful situations appear to provide a brief enhancement of the mucosal immune system with no evidence of any detrimental effects.

Keywords: Stress, mucosal immunity, cortisol, Salivette, saliva

81/04 - "Photon emission of living witness in human healing and cognitive experiences"
Instituição/*Institution*: International Institute of Biophysics, Neuss - Germany
Duração/*Duration*: 2005/01 - 2006/12
Investigadores/*Researchers*: Prof. Roeland Van Wijk, Prof. G. L. R. Godaert, Dr. E. P. A. Van Wijk, Prof. R. Bajpai

Abstract:

Introduction: Human subjects show ultra weak photon emission (UPE) in complete darkness. Dark-adapted subjects in darkness respond to a color filter at a few cm from the head. The response is an immediate increase of UPE. The response is systemic; it can be measured at body locations different from the site of exposure. Increase of UPE is commonly seen in stress conditions. It is hypothesized that changes in UPE are associated with sympathetic activation. This study tests the hypothesis that fluctuations in UPE and EEG (alpha suppression) patterns are correlated.

Materials and methods: Simultaneous recording of EEG (parietal left and right in resting state) and UPE (right hand dorsum) was in sitting position. Frequency spectra were computed of every 5 s of EEG while recording. UPE was counted every 0.05 s from the right hand dorsum. Each experiment consists of 15-20 cycles according to the following protocol. After 3 min recording, the subject was exposed to the filter for 20 s, after which recording of UPE and EEG continued for an additional 3 min. This cycle was immediately followed by a next cycle(s) of 3 min pre-, 20s during- and 3 min post-filter exposure.
Left and right brain alpha activity was calculated for 1 Hz bands in the 7-13Hz range. Laterality was calculated for every 5s. Photon count characteristics (mean, variance, skewness and kurtosis) were analyzed for each 5s epoch. Correlation between the photon and EEG parameters were computed both for the 3 min pre-exposure and 3 min post-exposure periods, using these 5s epochs.

Results: Eleven experiments with 204 trials were analysed. Significant correlations have been observed. Photon count distribution parameters (e.g., mean, variance, skewness, kurtosis) were correlated with alpha intensity in several bands (7-8 Hz, 8-9 Hz, 9-10 Hz, 10-11 Hz). The same photon count parameters were also correlated with laterality in the 7-8 Hz and 10-11Hz bands. The correlations occur predominantly in the period preceding the filter exposure.

Conclusion: Correlations between photon emission and brain wave activity suggest a degree of coupling between the spontaneous fluctuations in the photon field and the spontaneous fluctuations in alpha activity. Data also suggest that a stress event (i.e., exposure to filter) disturbs this coupling. This indicates that subtle effects may be observed only in systems with a high degree of coupling (coherence).

Keywords: Photon emission, EEG, laterality, coherence

82/04 - "Detecção de informação emocional e sua interferência no processamento neurocognitivo: um estudo em criminosos reincidentes" - "*Detection of emotional information and interference in neurocognitive processing: a study of recidivist offenders*"

Instituição/*Institution*: Centro de Ciências do Comportamento Desviante - Porto
Duração prevista/*Estimated duration*: 2005/01 - 2008/03
Investigadores/*Researchers*: Prof. João Eduardo Marques Teixeira, Prof. Manuel Fernando Santos Barbosa, Sr. Pedro Manuel Rocha Almeida

Abstract:

Objectives: this research project aimed to test several hypotheses including that recidivist offenders show lower sensitivity to the intensity of emotional stimuli than controls, and that emotional stimuli that elicit identical arousal in both groups produce higher interference on the neurocognitive processing of control subjects.

Methods: to test the aforementioned hypotheses, we put forward an experiment based on the Signal Detection Theory, in which 120 slides from the International Affective Picture System were exhibited to 38 male recidivist offenders and 30 non-criminal controls. Subjects were asked to rate each slide in a 9 point scale for the perceived arousal. Based on the above experiment, a subset of slides of identical emotional arousal was presented to 20 subjects from each group, with simultaneous ERP recordings by means of an auditory odd-ball paradigm.

Results: Receiver Operating Characteristic curves from the first experiment show that mean Az values for recidivist offenders are lower than for controls considering different categories of emotional arousal ($F_{(1,64)} = 9.84$, $p < .01$). Results from the second experiment show that when both groups are under emotional stimulation of equivalent arousal, the controls evidence a higher reduction of P300 amplitude ($F_{(1, 17)} = 8.857$, $p = .008$) than offenders (ns).

Conclusions: in this study we verified that recidivist offenders are less sensitive than controls for different categories of emotional intensity, requiring stimuli of increased intensity to perceive the same arousal as controls. Furthermore, even if groups are submitted to stimulation of matched arousal, the interference of such emotional stimuli on neurocognitive processes seems to be higher in controls. However, further analysis will be required to measure the single effects of the emotional stimulation, independently of mental resources involved on sensorial processing.

Publications: Almeida, P. R., Marques-Teixeira, J. & Barbosa, F. (2007). *Sensibilidade à estimulação emocional em reclusos reincidentes: uma abordagem à luz da Teoria de Detecção de Sinal. Proceedings of the 2º Encontro Nacional da APPE*. Porto: FPCEUP/APPE.; Almeida, P. R., Barbosa, F., Santos, F. R. & Marques-Teixeira, J. (under review). How Much Arousal do Antisocials Need to Get Aroused? An Experimental Study of the Emotional Sensitivity on Criminal Recidivists through SDT. *Cognition & Emotion*.; Marques-Teixeira, J., Barbosa, F. & Almeida, P. R. (under review). A SDT Based Framework for the Experimental Manipulation of Emotional States. *Methodology*.

Keywords: Antisocial; Emotion; Cognition; Event Related Potentials; Signal Detection Theory

87/04 - "Early neurophysiological correlates of autism: visual attention and EEG rhythms"
Instituição/*Institution*: Moscow University for Psychology and Education, Faculty of Abnormal Psychology, Moscow - Russia
Duração/*Duration*: 2005/01 - 2007/04
Investigadores/*Researchers*: Prof. Stroganova Tatiana Alexandrovna, Prof. Elam Mikael, Dr. Orekhova Elena, Dr. Tsetlin Mariana Mihailovna, Dr. Morozov Alexei Alexandrovich

Abstract: The study was focused on functional brain abnormalities associated with autism in 3-8 years-old boys . EEG was recorded 1) under controlled condition of sustained visual attention and 2) during sequential presentation of short novel visual stimuli in two independent samples of boys with autism (BWA) from Moscow (N=21) and Gothenburg (N=23) and a corresponding number of age-matched typically developing boys. EEG spectral power (SP), SP interhemispheric asymmetry, inter-regional coherence within delta, theta, alpha, beta and gamma bands and stimulus-induced EEG alpha oscillatory response were analyzed. The main distinctive features of ongoing EEG in BWA of both samples were the excess of high frequency activity (beta and gamma) and atypical hemispheric asymmetry of slower (delta, theta and alpha) EEG oscillations. The increased amount of fast brain oscillations in EEG of BWA correlated with the degree of developmental delay and may reflect genetically mediated abnormalities of GABA mediator system found in autism. Atypical leftward broadband EEG asymmetry in BWA with a maximum effect over the mid-temporal regions was associated with decreased coherence within the theta band at mid-temporal regions of right hemisphere. Alpha blocking response to novel visual stimuli in BWA was abnormally reduced at higher-order visual areas of right hemisphere. These findings point to a decreased capacity of right hemispheric neural circuits to generate EEG rhythms and may indicate altered regional specialization as well as altered information processing in autism. The concurrent lack of normal leftward asymmetry of mu rhythm suggests that abnormalities in EEG lateralization in autism are regionally/functionally specific.

Publications Orekhova EV, Stroganova TA, Posikera IN, Elam M EEG theta rhythm in infants and preschool children. Clin Neurophysiol, 2006;117:1047-1062.; Orekhova EV, Stroganova TA, Nygren G, Tsetlin MM, Posikera IN, Gillberg C, Elam M Excess of high frequency EEG oscillations in boys with autism. Biological Psychiatry, 2007;62(9):1022-9.; Stroganova TA, Nygren G, Tsetlin MM, Posikera IN, Gillberg Ch, Elam M, Orekhova EV Abnormal EEG lateralization in boys with autism. Clinical Neurophysiology Clinical Neurophysiology, 2007;118(8):1842-54; Stroganova TA, Orekhova, E. V.; Prokofyev, A. O.; Posikera, I N; Morozov, A A; Obukhov, Y V.; Morozov, VA. (2007). Inverted event-related potentials response to illusory contour in boys with autism. Neuroreport, 11;18(9), 931-935.; Orekhova EV, Stroganova TA, Nygren G, Posikera IN, Gillberg C, Elam M, High frequency activity in ongoing EEG from young children with autism: A two sample study. *International Journal of Psychophysiology,* 2006, 61 (3): 347-347 Sp. Iss.; Stroganova TA, Orekhova EV, Nygren G, Tcetlin MM, Posikera IN, Gillberg C, Elam M Atypical lateralization of spontaneous EEG in young children with autism: A two sample study. *Psychophysiology*, 2006, 43: S95-S95 Suppl. 1

Keywords: autism, EEG oscillations, brain asymmetry

88/04 - "A influência social na memória: Estilo conformista, falsas memórias e alterações psicofisiológicas periféricas" - "*Social influence on memory: Conformist styles, false memories and peripheral psychophysiological changes*"

Instituição/*Institution*: Centro de Investigação em Psicologia da Universidade do Minho - Braga

Duração/*Duration*: 2005/01 - 2007/04

Investigadores/*Researchers*: Prof. Emanuel Pedro Viana Barbas de Albuquerque, Prof. Teresa Margarida Moreira Freire

Abstract: Research on memory conformity shows that social remembering can influence people's memories. In fact, our memory is not as accurate as we thought. There are several factors that can distort our memory: stimuli association effects; interference; imagination; guessing processes; retrieval mechanisms; individual differences; and social constraints. In our study we decided to study social constrains, particularly, the influence of other's testimony in our memory traces.

Our participants, young adults, were involved in a social influence procedure (based on Asch's paradigm). In the encoding phase we presented a scene of a car accident and after a short retrieval interval the participants answered some questions about the scene they just viewed. The situation involved three participants each time (two of them were experimenters confederates and the other was a naïve participant). The naïve participant answered the questions related to the car accident scene after the other two, and the main experimental manipulation was that: for some of the questions the confederates gave answers that are clearly wrong (e.g., the colour of the cars was white but they answered pale yellow).

After one week the participant returned to the laboratory and individually filled a questionnaire about the scene previously seen – the retrieval phase

Results showed that at the retrieval phase: (1) the conformist situation produces less accurate memory, that is, the capacity to recall details decreased; (2) the memory for the wrong answers done by the confederates produced a large interference on the participants memory; (3) subjects that believe to be more influenced by others are more susceptible to alter their memory traces.

Publications: Albuquerque, P. B. (2005). *Mentira e memória: Um problema à procura de respostas.* Paper presented at the Jornadas de Psicologia e Ciências da Educação, Coimbra: Universidade de Coimbra, Portugal.; Albuquerque, P. B., & Freire, T. (2006, 5 a 7 Outubro). *Memória para emoções: Efeito do tempo e do tipo de emoção na consistência da resposta.* Paper presented at the XI Conferência Internacional de Avaliação Psicológica: Formas e Contextos, Braga, Universidade do Minho, Portugal.; Albuquerque, P. B., Pandeirada, J., & Sousa, C. (2005, 31 de Agosto a 3 de Setembro). *False memories and time to answer: Correctness, episodic access and certainty.* Paper presented at the XIVth ESCoP Conference, Leiden: University of Leiden, Holanda.; Albuquerque, P. B., & Sousa, C. (2006, 6-7 de Abril). *Contributos da psicologia da memória para a melhoria da recordação de acontecimentos: O papel da entrevista cognitiva.* Paper presented at the 1º Congresso Internacional de Psicologia Forense, Braga, Universidade do Minho, Portugal.; Sousa, C., & Albuquerque, P. B. (2005a, 31 de Agosto a 3 de Setembro). *The effects of emotion on memory: The contribute of the cognitive interview.* Paper presented at the XIVth ESCoP Conference, Leiden: University of Leiden, Holanda.; Sousa, C., & Albuquerque, P. B. (2005b, 31 de Outubro a 3 de Novembro). *Emoção e memória: Estudo do efeito dos processos de recuperação mnésica na capacidade de recordação.* Paper presented at the Psicologia e (in)justiça: Vítimas Crimes e Ofensores, Évora: Universidade de Évora, Portugal.; Sousa, C., & Albuquerque, P. B. (2006, 25-28 de Maio). *Remembering unexpected events.* Paper presented at the Annual Meeting of the Association for Psychological Science, APS, Nova Iorque, USA.

Keywords: memory, social influence; conformity; false recall.

93/04 - "An investigation of effects of dreams on physiological measures of stress"
Instituição/*Institution*: Psychopharmacology Unit, Bristol - UK
Duração/*Duration*: 2005/06 - 2007/09
Investigadores/*Researchers*: Dr. Sue Wilson, Prof. David Nutt, Prof. S. Lightman

Abstract:

Objectives: Part 1 - to compare morning salivary cortisol response, sleep questionnaires and dream reports between patients with parasomnias, normal subjects and patients with insomnia.
Part 2 – to pilot the use of automatic blood sampling overnight for cortisol assay synchronized with polysomnography in 6 normal subjects, to assess the minute by minute effect of sleep stage on cortisol measures, and to compare morning dream reports with plasma cortisol and salivary cortisol on awakening

Methods: Part 1 - patients with sleep disorders and healthy good sleepers were provided with a pack containing cotton swabs for saliva sampling and overnight sleep and dreaming questionnaires. Patients with parasomnias were sent sample kits for 2 nights, 1 with and 1 without an episode (eg night terror). 16 patients and 15 healthy good sleepers returned the packs and salivary cortisol concentration was measured in-house using radio-immunoassay.
Part 2 - 6 healthy volunteers slept in the sleep laboratory. An automated sampling machine has been developed at Bristol University to minimise interference with study subjects when taking blood samples. They were prepared for polysomnography (PSG) and had an indwelling cannula connected 'through the wall' to the sampling machine. Blood samples (1ml) were taken every 10 minutes, synchronised with the PSG recording. Samples were later assayed for cortisol. Sleep was scored and the cortisol levels related to different sleep stages

Results: Part 1- morning cortisol response was as expected in healthy normal sleepers with a rise between waking and 30 minutes later. Insomnia patients and parasomnia patients on a 'good' night had a similar response with both readings being slightly higher. On the 'bad' nights readings were very variable with no consistent rise between the 2 time periods. Waking cortisol levels correlated with complaints of waking too early. Dream report analysis will be presented.
Part 2 – synchronized hypnograms and cortisol profiles will be presented. Cortisol levels fell during the first few hours of sleep and then showed a rise independent of sleep stage about halfway through the night, consistent with the literature. In addition, both awakenings and REM sleep tended to increase cortisol level. Awakening cortisol response occurred from any stage of sleep and at any time of day.

Conclusions: Part 1 - Insomnia and parasomnia subjects had higher cortisol levels than controls but this was not statistically significant. However we demonstrated a significant relationship between cortisol levels and subjective measures of sleep quality and early awakening. Dreaming effects will be discussed.
Part 2 – The automatic sampling method was reliable and effective in obtaining frequent cortisol samples without interfering with sleep. There was evidence of both circadian and sleep-stage-dependent regulation of night-time cortisol level.

Keywords: Sleep, parasomnias, HPA axis, cortisol, stress

102/04 - "Interspecies communication and telepathy with a language-using Parrot" - only abstract available
Instituição/*Institution*: The N'Kisi Partnership for Interspecies Communication, New York - USA
Duração/*Duration*: 2005/05 - 2007/07
Investigadores/*Researchers*: Dr. Aimee Morgana, Prof. Ruppert Sheldrake, Prof. Jane Goodall

Abstract:

Objectives: Aimee Morgana has been teaching the understanding and usage of spoken human language to an African gray parrot, "N'Kisi", who is now one of the most gifted language-using animals in the world. He has also demonstrated possible telepathic abilities in a previous study. This project enabled the documentation of N'Kisi's communicative and telepathic abilities in the context of this bonded relationship, for various studies.

Methods: A new camera and audio set-up was acquired and installed to document N'Kisi's speech, after testing and trouble-shooting a range of equipment and software. New procedures for data acquisition and recording were devised, tested, improved, and implemented, and further research protocols were refined and prepared. An ongoing program of filming was then carried out.

Results: Research in interspecies communication and documentation of the language use and telepathic abilities of the parrot N'Kisi has continued. There have been more breakthroughs in N'Kisi's language skills and progress in various research studies. During the project term his contextual vocabulary increased from 1025 to 1286 words. He also created original sentences with complex grammatical structure. An extensive selection was captured with our new system, along with many notable inciden ts and possible spontaneous telepathy, which we are working to transcribe and analyze.

Conclusions: While N'Kisi's rate of learning language has been fairly stable, possible telepathic incidence is more variable. A preparatory analysis of incidents logged the first year showed it had declined, and was not sufficiently robust at this time for more controlled studies. However, a comprehensive analysis of spontaneous incidents was undertaken. 16 categories of potential telepathic response based on the type of stimulus were analyzed to study notable patterns. N'Kisi's utterances were also catalogued and analyzed by linguistic and cognitive criteria.

Publications: Morgana, Aimee; "Interspecies Communication: N'Kisi the Parrot", in *The Encyclopedia of Human-Animal Relationships* ed. Marc Bekoff, Greenwood Press, Westport, Connecticut**.**
Our work also appeared in several books and magazines, and an award-winning television special for Discovery International/Animal Planet, *Jane Goodall's When Animals Talk*.

Keywords: Interspecies Communication; Telepathy; Language; Parrot

104/04 - "Is psi a type of knowledge?"
Instituição/*Institution*: Institute of Noetic Sciences, California - USA
Duração/*Duration*: 2005/01 - 2006/11
Investigadores/*Researchers*: Prof. Dean Radin, Prof. Edwin May

Abstract:

Objectives: This study explored the hypothesis that in some cases intuitive knowledge arises from perceptions that are not mediated through the ordinary senses. The possibility of detecting such “nonlocal observation” was investigated in a pilot test based on the effects of observation on a quantum system.

Methods: Participants were asked to imagine that they could intuitively perceive a low intensity laser beam in a distant Michelson interferometer. If such observation were possible, it would theoretically perturb the photons’ quantum wave-functions and change the pattern of light produced by the interferometer. The optical apparatus was located inside a light-tight, double steel-walled shielded chamber. Participants sat quietly outside the chamber with eyes closed. The light patterns were recorded by a cooled CCD camera once per second, and average illumination levels of these images were compared in counterbalanced “mental blocking” vs. non-blocking conditions. Interference would produce a lower overall level of illumination, which was predicted to occur during the blocking condition.

Results: Based on a series of planned experimental sessions, the outcome was in accordance with the prediction ($z = -2.82$, $p = 0.002$). This result was primarily due to nine sessions involving experienced meditators (combined $z = -4.28$, $p = 9.4 \times 10-6$); the other nine sessions with non- meditators were not significant (combined $z = 0.29$, $p = 0.61$). The same experimental protocol run immediately after 15 of these test sessions, but with no one present, revealed no hardware or protocol artifacts that might have accounted for these results (control $z = 1.50$, $p = 0.93$). Conventional explanations for these results were considered and judged to be implausible.

Conclusions: This pilot study suggests the presence of a nonlocal perturbation effect which is consistent with traditional concepts of intuition as a direct means of gaining knowledge about the world, and with the predicted effects of observation on a quantum system.

Keywords: quantum observation, interferometer, intuition

112/04 - "Improvement of transcranial magnetic stimulation (TMS) coils for psychiatric applications"
Instituição/*Institution*: Instituto de Biofísica e Engenharia Biomédica, Faculdade de Ciências da Universidade de Lisboa - Lisboa
Duração/*Duration*: 2005/01 - 2007/11
Investigadores/*Researchers*: Prof. Pedro Cavaleiro Miranda, Mr. Yiftach Roth, Mr. Ludovic Correia, Mr. Ricardo Salvador

Abstract:

Objectives: To design and test new coils for transcranial magnetic stimulation of deep brain structures. Efficient stimulation of structures such as the nucleus accumbens and other limbic regions is necessary for the successful application of TMS in psychiatry.

Methods: TMS coils specially designed for deep stimulation (H1 and H2 coils) were tested on 31 normal subjects and on 50 drug resistant patients suffering from major depression. Numerical methods were used to predict the electric field induced by these coils and to investigate ways to improve their performance.

Results: In normal subjects rTMS stimulation at 1, 10 or 20 Hz was well tolerated with no major side effects. Auditory thresholds measured by audiograms indicated no hearing loss of any of the subjects. No evidence was found for a possible deterioration in cognitive performance due to rTMS. No epileptic convulsions were experienced.
TMS treatment 5 days per week for 4 consecutive weeks was well tolerated by the depressed subjects, with no major side effects or adverse physical outcomes. The average HAM-D scale dropped significantly from 31.3 ± 5.0 prior to TMS to 16.2 ± 9.9 on the day after completion of therapy. There was no significant difference between the coils, however the H1 coil tended to induce greater antidepressant effects. The CANTAB performed before, during and after the study indicated selective improvement in cognitive functions, especially spatial memory and executive function.
Numerical calculations based on 3D models of the H1 and H2 coils placed over the head phantom produced results in good agreement with measured values. Clear improvements in coil performance (stimulus intensity, depth and focality) were predicted only when iron cores were added to the coils.

Con**clusions:** The safety and effectiveness of the novel H1 and H2 coils were demonstrated. The use of high permeability cores is the best way to improve the performance of these coils.
Publications: Roth Y, Amir A, Levkovitz Y, Zangen A, “Three-dimensional distribution of the electric field induced in the brain by transcranial magnetic stimulation using figure-8 and deep H-coils”, J Clin Neurophysiol, 2007, **24**:31-8.; Salvador R, Miranda P C, Roth Y, Zangen A, “High-permeability core coils for Transcranial Magnetic Stimulation of deep brain regions”, 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Lyon, France, August 2007.

Keywords: TMS, stimulation, deep, depression, psychiatry

116/04 - "Comparing Conscious and Physiological Measurements in a Cogntive DMILS Study in Bali" - only abstract available

Instituição/*Institution*: College of Arts and Sciences, Rollins College, Florida - USA

Duração/*Duration*: 2005/03 - 2006/12

Investigadores/*Researchers:* Prof. Hoyt Edge, Prof. Luh Ketut Suryani, Dr. Niko Tiliopoulos, Dr. Annemieka Bikker

Abstract:

Objectives: This project aims at comparing physiological responses (heart rate variability) with conscious responses (button presses) to develop a more sensitive
measure of psi in a cognitive DMILS experiment in a cross-cultural setting.

Methods: In the cognitive DMILS protocol, a person (Helpee) focuses on a lit candle, and whenever his focus wanders, he presses a button. Meanwhile, a person in another room (Helper) intends to help the person focus during half of the randomly assigned two minute epochs; the other half serve as control. There are 8 counter-balanced epochs per session. Heart rate variability from the Helpee is also collected for each of the 16 epochs. HRV is compared in the help vs. the control epochs. Additionally, extensive interviews were conducted.

Results: Although on average HRV tended to be slightly lower in the Help condition in Study 1, this difference was not statistically significant, Control (M = 5.84, SD = 1.64), Help (M = 5.79, SD = 1.64), $t(59) = 0.46$, $p = .32$, one-tail, Cohen's $d = .06$, power = .07. In the Study 2, there was no statistically significant difference in the HRV between the two conditions, Control (M = 8.74, SD = 4.11), Help (M = 8.96, SD = 4.56), $t(42) = 0.65$, $p = .26$, one-tail, Cohen's $d = .09$, power = .16 .

Conclusions: HRV did not yield a more sensitive measure of psi influence. However, the interviews yielded significant phenomenal data, especially on what cultural factors caused significantly fewer button presses by the Helpee in Bali as opposed to studies in the US and in Edinburgh. We concluded that the Balinese see falling out of focus as a state; that is, the time from the instant of losing focus until they regain it is viewed as one state and is responded to as one event. Thus, they tend to press the button only once during this time. We believe, however, that other cultural factors may be at work, particularly the importance of ritual prayer in Bali.

Keywords: cognitive DMILS, HRV, meditation, cross-cultural differences

119/04 - "Event-related potentials of temperament traits in ADHD and conduct disorder"
Instituição/*Institution*: Dept. Child Adolescent Psychiatry, Institute of Psychiatry, London - UK
Duração/*Duration*: 2005/06 - 2007/11
Investigadores/*Researchers*: Dr. Katya Rubia, Dr. Alex Sumich, Dr. Philip Asherson, Prof. Eric Taylor

Abstract:

Objectives: Conduct Disorder (CD) is characterised by a persistent pattern of antisocial behaviour appearing during development. Affective disorders such as depression or psychopathic traits are more common in CD. Neurophysiological correlates of these features in CD are unknown. The current study investigates the relationship between the N200 event-related potential component and affect in adolescent boys with CD. Specifically we investigated (1) whether N200 alterations follow normal developmental patterns in CD; (2) whether N200 is associated with depression and/or anxiety in CD; (3) whether there are N200 ERP correlates of callous/unemotional or narcissism traits in CD.

Methods: 20 adolescent males with CD and 31 healthy controls completed a visual continuous performance task (CPT-XX) from an internationally standardised battery (see www.brainresource.com). Affective symptoms and psychopathic traits were assessed using Frick's antisocial process screening device and the depression, anxiety and stress scale respectively. N200 amplitudes were examined for effects of age and psychopathology.

Results: N200 failed to show typical age related reductions as seen in healthy controls. N200 amplitude decreased as a function of depression at left frontal sites and was inversely correlated with narcissism in the same areas. Narcissism was a more significant predictor of N200 (31.8% at F7; 44.6% at FC3) than depression. CU traits strongly correlated with the right anterior temporal lobe, where depression made additive contribution.

Conclusions: Normal development of N200 does not occur in adolescents with CD, and alterations to N200 seen during executive task-completion are linked to the frequently associated features of depression, CU traits and narcissism.

Keywords: Conduct Disorder, Event-related potentials, Affective disorder

128/04 - "Telepathic behaviour associated with biochemical and neuroendocrine parameters" - only abstract available

Instituição/*Institution*: Unidade de Biopatologia Vascular, Instituto de Medicina Molecular, Faculdade de Medicina de Lisboa - Lisboa

Duração prevista/*Estimated duration*: 2005/02 - 2008/03

Investigadores/*Researchers*: Prof. Maria Carlota Lopes Saldanha, Prof. Doutor Alberto Albino Granado Escalda, Dra. Teresa Raquel Duarte Pacheco, Dra. Ana Rosa Miranda dos Santos Silva

Abstract: Animal telepathy experiments with rabbits previously realized have shown maintenance of the erythrocyte integrity and a bradycardia effect followed by a significant decrease of plasma cortisol levels [1]. A feedback control mechanism by cortisol regulate this own synthesis and in consequence its plasma level is known. The aim of this work was to verify at hippocampus the amount of cortisol binding to glucocorticoid receptors of the rabbits submitted to telepathy.

The telepathy experiments were performed in 2 couples of rabbits with simultaneously arterial plethysmography monitorization for each couple; one scared with blow on the nose and other not scared. The arterial plethysmography monitorization, lactate and cortisol plasma concentrations were determined, as well as AChE erythrocyte activity as a marker of membrane integrity. Imunohistochemical analysis of rabbit hippocampus tissue sections for glucocorticoid receptors was performed in all rabbit's couples.

The results obtained by plethysmography were analysed by wavelet analysis in which by fast fourier transform we obtain the low frequency (LF) and high frequency (HF), respectively parasympathic and sympathic nervous system information [2, 3]. The telepathy experiments showed that the scare was efficient on the rabbit in which has been done besides no changes in the LF/HF ratio was observed in the respective not scared rabbit .Cortisol and lactate concentrations and AChE erythrocyte activity showed no significant differences between the scared and the not scared rabbit. The imunohistochemical analysis of rabbit hippocampus showed an increased amount of the cortisol receptor binding in the scared rabbits and no differences between the not scared rabbit and the control group.

In conclusion, besides the efficiency of the blowing as a scare, demonstrated by the differences in the LF/HF ratios and also by hippocampus cortisol binding receptor, our results don't show evidence of telepathy between rabbits in these experimental conditions.

References: [1] Saldanha C, Pacheco T, Silva AS, Martins e Silva J, Peoc'h R. Biochemical characteristics associated to rabbit telepathy. Poster present at 5º Simpósio da Fundação Bial Aquém e Além do Cérebro, 2004. [2] Postolache G, Rocha I, Silva-Carvalho L, Postolache O, Girio P. A wavelet-based approach for monitoring baroreceptors function test in rats. IMTC 2004-Instrumentation and measurements techonology conference; 844-849. [3] Postolache G, Silva-Carvalho L, Postolache O, Girio P, Rocha I. HRV and BPV neural network model with wavelet based algorithm calibration; International Measurements Confederation 2004.

Keywords: telepathy, cortisol, hypocampus, acetylcholinestrase

135/04 - "Telepresence and telepathy in immersive virtual reality"
Instituição/*Institution*: Manchester University - UK
Duração/*Duration*: 2005/11 - 2007/04
Investigadores/*Researchers*: Dr. Craig Murray, Dr. Christine Simmonds, Dr. Jezz Fox

Abstract:

Objectives: We developed an immersive virtual reality (IVR) application as an experimental environment and medium for the study of telepathy. Our own Telepathy Immersive Virtual Environment (TIVE) uses three-dimensional computer graphics technology to generate artificial environments that afford real-time interaction and exploration in conjunction with head mounted displays (HMDs), sound, instrumented data gloves that allow participants to interact with virtual objects.

Methods: We conducted two telepathy studies using TIVE. Study 1 included 100 participant pairs who each completed a trial as a sender and receiver, 200 trials in total. In Study 2 30 participant pairs took part in four further trials without changing roles, a total of 120 trials.

Results: Neither of the above studies showed evidence in support for the psi hypothesis, either in terms of directional hitting or in a post hoc magnitude analysis, where the outcomes were no different from what would be expected by chance.

Conclusions: Future analyses will explore correlates of psi performance within the same studies. This approach takes the view that the psi process may function differentially according to state of consciousness and personality factors. The null effect overall reported here may therefore reflect a systematic balance of psi hitting and psi missing.

Publications: Murray, C.D., Simmonds, C. and Fox, J. (2005) Telepathy and telepresence in immersive virtual reality. *Proceedings of the Parapsychological Association, 48th Annual Convention*. Pp.236-241.; Murray, C.D., Howard, T., Fox, J., Caillette, F., Simmonds-Moore, C. and Wilde, D. (2006) The design and implementation of the telepathic immersive virtual reality system. In C. Simmonds-Moore, editor, *Proceedings of The Parapsychological Association 49th Annual Convention*, pages 100-114, Stockholm, August 2006.; Murray, C.D., Wilde, D., Simmonds-Moore, C., Fox, J. and Howard, T. (2006) Observations of the embodied use of target objects in the telepathy virtual environment. Paper presented at the *30th International Conference of the Society for Psychical Research*, Liverpool.; Murray, C.D., Fox, J., Wilde, D., Simmonds-Moore, C., and Howard, T. (2007) Testing for telepathy using an immersive virtual environment. Paper presented at the *31st International Conference of the Society for Psychical Research*, Cardiff.; Murray, C.D., Howard, T., Fox, J., Caillette, F., Simmonds-Moore, C. and Wilde, D. (in press) The design and implementation of the telepathic immersive virtual reality system. *International Journal of Parapsychology*, 13.; Murray, C.D., Simmonds-Moore, C., Howard, T., Wilde, D. and Fox, J. (in press) Testing for Telepathy Using an Immersive Virtual Environment. *Journal of Parapsychology*

Keywords: Immersive virtual reality, Telepathy

140/04 - "The CinEgg project: Assessing the relationship between group consciousness and Random Event Generators"
Instituição/*Institution*: Institut Métapsychique International, Paris - France
Duração/*Duration*: 2005/02 - 2006/10
Investigadores/*Researchers*: Prof. Mario Varvoglis, Prof. Jean-Philipe Basuyaux, Dr. Pierre Macias

Abstract: This study builds upon previous research with hardware Random-Event-Generators (REGs), which suggests that the simultaneous focus of many individuals upon an emotionally charged event can provoke anomalous statistical fluctuations in the REGs. If validated, such results may point to a collective, tacit form of PK that affects objects in an indiscriminate, field-like manner, independently of anyone's intentions vis-à-vis those objects. Alternatively, however, the data may simply point to psi-mediated experimenter effects which are, by definition, goal-oriented.

Objective: The CinEgg study sought to assess the hypothesis of fieldlike PK, by running concealed field-REGs in movie theatres, and determining whether REG outputs fluctuate in relation to the film's "intensity", i.e. in relation to its impact upon movie-goers.

Method: The basic protocol involved two steps:
Film evaluation: a judge watched the target film and, using a time-coding program, parsed the film into *intense* vs. *neutral* periods.
Data sampling: the field-REG was placed in the movie theatre for several weeks, and, unknown to spectators, was sampled over the course of many film seances. *Control* data were collected from the field-REG when the movie theatre was closed, and from a second, *off-site* REG.
Hypotheses: To explore whether REGs "react" to the emotional or attentional fluctuations of spectators watching a film, two predictions were made, :
1. REG datasets corresponding specifically to *intense* film sequences would show significant departures from randomness in terms of mean and variance.
2. REG datasets, synchronized across multiple sessions of a given film, would be correlated

Results: Usable data were collected for three films, with 15-25 sessions per film. No significant shifts were observed in REG means and variance for either experimental or control conditions, and no significant correlations were obtained between field REG outputs when comparing across synchronized film sessions.

Conclusion: Among other possibilities, these null results may suggest that:
a. fieldlike PK does not exist
b. given the effect size associated with field-REG research, the study may have lacked adequate statistical power to detect patterns in the data
c. the emotional intensity of an experience triggered by a film is not comparable to what happens in "real life", and thus cannot induce detectable field-REG effects.

Keywords: psi, Random-Event-Generator (REG), field REG, fieldlike psychokinesis (PK)

150/04 - "Electrocortical activity during deep hypnosis experiences"
Instituição/*Institution*: Department of Psychology, University of Lund - Sweden
Duração/*Duration*: 2005/11 - 2007/02
Investigadores/*Researchers*: Prof. Etzel Cardeña, Prof. Dietrich Lehmann, Prof. Mark Winkel

Abstract:

Objectives: Very hypnotizable individuals commonly report a variety of anomalous experiences after a hypnotic induction, however, there has been no previous research on the neurophenomenology of spontaneous hypnotic experiences, which this research focused on.

Methods: We used a stratified sample (*N* = 40) of high, medium, and low hypnotizable participants. In session 1, cortical activity was measured using qEEG during an eyes-closed sitting-quietly period and while voluntarily lifting an arm prior to and following a hypnotic induction. In session 2, participants' spontaneous mentation was obtained in reference to a baseline period and multiple prompts following a hypnotic induction, which consisted of the suggestion for participants to go into their "deepest" state. Participants also completed the Phenomenology of Consciousness Inventory (PCI) for baseline and hypnosis periods, and gave reports of hypnotic depth for different periods.

Results: There were main effects of hypnotizability, condition (baseline and hypnosis) and an interaction between them. Although the groups did not exhibit different hypnotic depth reports at baseline, hypnotic depth was found to increase in medium and high hypnotizables during hypnosis. With regard to the PCI, hypnotizability was related to having an altered experience, and various other alterations. Participants' deepest hypnotic state, relative to baseline, was also associated with altered experience and various other alterations, and there was a significant interaction between these variables. Alterations in consciousness were more common in medium and high hypnotizables than lows, especially after hypnosis. Verbal reports were content analyzed according to experiential categories. The experience of low hypnotizables was characterized by "normal" mentation, that of medium hypnotizables was centered more on vestibular and similar sensations, and that of high hypnotizables contained imagery, positive affect and mystical-like phenomena. Spectral and source localization EEG analyses corroborated various patterns of differential brain functioning across levels of hypnotizability and during different conditions. Among the most salient findings were a positive correlation between a global measure of brain functioning complexity (omega complexity) and hypnotizability, and a positive correlation between omega complexity and 2 types of experiences: positive affect/mystical-like phenomena, and imagery. The induction of hypnosis had different effects on low and high hypnotizables: whereas frontal cortical activity increased from baseline to hypnosis in the former, it decreased in the latter.

Conclusions: Results suggest that a hypnotic procedure can effect significant alterations in consciousness, and it show a clear correspondence between phenomenological reports and EEG activity.

Publications: Cardeña, E., Lehmann, D., Jönsson, P, Terhune, D., & Farber, P. (2007). The neurophenomenology of hypnosis. *Proceedings of the 50th Annual Conventions of the Parapsychological Association,* 17-30. Cardeña, E., Kallio, S., Terhune, D., Buratti, S., & Lööf, A. (2007). The effect of translation and sex on hypnotizability testing. *Contemporary Hypnosis*, http://www3.interscience.wiley.com/cgi-bin/fulltext/116840768/PDFSTART. *Cardeña, E., Terhune, D., Lööf, A., & Buratti, S. (in press). Hypnotic experience is related to emotional contagion. International Journal of Clinical and Experimental Hypnosis.*

Keywords: Hypnosis, EEG, neurophenomenology, depth

152/04- “Relating psi to a theory of intuition: using precognition habituation to improve ganzfeld scores”
Instituição/*Institution*: Psychology Department, Gothenburg University - Sweden
Duração prevista/*Estimated duration*: 2006/09 - 2008/03
Investigadores/*Researchers*: Prof. Adrian Parker, Dr. Torbjorn Fagerberg

Abstract: The study was aimed seeing if it possible to the manipulate the content of imagery that is obtained during an altered state of consciousness (the ganzfeld). Specifically, we investigated the degree to which the prior exposure to subliminally presented film clips might re-emerge as later imagery in the ganzfeld.
Pairs of volunteers were selected on the basis of having reported prior experiences of and beliefs in psychic phenomena. The participants were briefly exposed to a rapid presentation of the sets of film clips which would be later used as psi-targets in one half of the experiment. This method developed here, which we call “speed viewing”, is at threshold for subliminal perception (60 ms). The experiment was pre-set to 60 trials which were carried out. Each session consisted of two trials, that is two target selections of film clips to used in a psi-ganzfeld experiment. For one of these two trails, a target film clip was randomly selected by the computer program from the target set of films that had been primed while for the other trial a target film clip was randomly selected from the non-primed sets of targets. The order of these two trials, primed and non-primed (each with P = .25), was for this purpose also randomised.
Testing followed the usual ganzfeld procedure of matching the ganzfeld imagery to the target and decoy films. The procedure however allowed us to evaluate the degree to which the primed subliminal film material re-emerged as imagery in the altered state and to note additional elements that might appear beyond those reported in the normal state of consciousness. However contrary to the hypothesis, scoring was below chance expectancy for the primed targets and close to the chance expectancy for the non primed targets. Further analyses are being carried out on emotional impact of the various films used in the film library.

Keywords: psi, ganzfeld, subliminal perception, priming.

155/04 - "Creativity, schizotypy, paranormal experiences and mental health: developing a new cognitive-parapsychological paradigm for the assessment of PSI performance in the laboratory"

Instituição/*Institution*: University College Northampton - UK
Duração prevista/*Estimated duration*: 2006/06 - 2008/03
Investigadores/*Researchers*: Dr. Christine Anne Simmonds, Dr. Nicola J. Holt

Abstract: Filter theories of psi postulate that psi-mediated information operates as a 'weak stimulus' that is likely to be filtered out of conscious awareness (Bergson, 1913; Stanford, 1990). This poster presents a study in which an experimental paradigm developed to examine the efficacy of filtering mechanisms of awareness, Latent Inhibition (LI), was adapted to include a psi component. LI assesses the processing of irrelevant stimuli, an unconscious process that adaptively reduces the load on working memory, ignoring irrelevant stimuli (Lubow, 1989). This is typically measured in a learning paradigm, where the effect of exposure (to an inconsequential stimulus) upon the future ability to learn an association between this stimulus and another, is tested. In the current study, it was examined whether psi-mediated information might be processed akin to the irrelevant stimulus in LI, testing whether subsequent associability of an irrelevant 'telepathic stimulus' would be affected. As reduced LI has been associated with creativity and positive schizotypy, indicating looser attentional filters (Carson, Peterson & Higgins, 2003; Gray et al., 2002), it was hypothesised that these same variables would also modulate the processing of psi-mediated information. Additionally, the predictive value of belief in the paranormal was examined, following work suggesting that creative, paranormal and schizotypal ideation fall on an associative continuum (Gianotti, et al., 2001), termed 'transliminality' (Thalbourne, 2000). In Study One a significant LI effect was obtained, but no overall psi effect. 'Transliminality' variables did not modulate the LI effect as hypothesised. This was interpreted in terms of possible interactions between trait, gender and attentional demands (Lubow & Gewirtz, 1995). However, meeting hypotheses, a significant psi-LI-like effect was obtained with highly transliminal participants. This sub-sample appeared to process psi-mediated information in a way analogous to LI. This suggests that amongst certain profiles, the representation of psi-mediated information might be inhibited from conscious awareness, when not needed, nevertheless, unconsciously affecting cognitive processing. Data is currently being collected, which will be presented in the poster, manipulating the attentional demands of tasks in both LI and psi conditions in order to further assess whether the LI model is appropriate for the modelling of psi-mediated information.

Keywords: psi, latent inhibition, awareness, transliminality

168/04 - "Electrocortical studies of the hippocampal-parahippocampal (HP) structures in humans: Foramen ovale (FO) electrodes, as a research tool in human cognition and epilepsy"

Instituição/*Institution*: National Institute of Psychiatry and Neurology, Department of Neurology, Epilepsy Center, Budapest - Hungary
Duração/*Duration*: 2005/02 - 2007/07
Investigadores/*Researchers*: Prof. Péter Halász, Dr. Zsófia Clemens, Dr. Csaba Borbély, Dr. Dániel Fabó

Abstract: Ripples are high-frequency oscillation bursts in the mammalian hippocampus mainly present during Non-REM sleep. In rodents they occur in association with sharp waves and are grouped by the cortical slow oscillation such that, in parallel with sleep spindles, ripple activity is suppressed during the hyperpolarized down-state and enhanced during the depolarized up-state. The temporal coupling between these oscillations has been suggested to serve a hippocampo-neocortical dialogue underlying memory consolidation during sleep. Here we examined whether a similar coupling exists between these oscillatory phenomena in humans. We based our investigations on epilepsy patients undergoing presurgical evaluation implanted with foramen ovale electrodes. Recording with foramen ovale electrodes is a unique technique allowing parahippocampal electrocorticography in a semi-invasive way. In sleep recordings from seven epileptic patients, scalp-recorded slow oscillations and spindles as well as parahippocampal ripples recorded from foramen ovale electrodes were identified by automatic algorithms. Additionally, ripple and spindle root mean square activity was determined for relevant frequency bands. Ripple activity distinctly decreased time-locked to slow oscillation negative half-waves in the three patients without temporal structural alterations, whereas in the four patients with severe mesiotemporal structural alterations this coupling was obscure. Generally, in the patients ripple activity was increased before spindle peaks and distinctly decreased after the peak. Ripples were consistently associated with interictal spikes suggesting that spike/ripple complexes represent an epileptic transformation of sharp wave/ripple complexes in the epileptic hippocampus. Our findings are consistent with the notion of a hippocampo-to-neocortical information transfer during sleep that is linked to coordinate ripple and spindle activity, and that in the intact temporal lobe is synchronized to cortical slow oscillations.

Publications: Clemens Z, Mölle M, Erőss L, Barsi P, Halász P, Born J. Temporal coupling of parahippocampal ripples, sleep spindles and slow oscillations in humans. 2007 Brain, 130:2868-2878.

Keywords: hippocampus, oscillations, memory consolidation

2006

71/06 - "Ultra-weak photon emission and EEG in a study on color perception in the dark"
Instituição/*Institution*: International Institute of Biophysics, Neus - Germany
Duração prevista/*Estimated Duration*: 2007/03 - 2008/02
Investigadores/*Researchers*: Prof. Roeland Van Wijk, Prof. R. Bajpai, Dr. E.P.A. Van Wijk, Dr. S. Bosman, Dr. J.M. Acherman

Abstract:

Introduction: Photon emission of algae *A. acetabulum* was proposed as a sensitive measure for recording changes by an "intensional healing field" resulting from healer-healee bonding in a therapeutic relationship (Van Wijk & Van Wijk 2003; 2004). The current research objective was a.) to replicate the study with more healers and in different settings and b.) to improve data analysis by characterizing photon emission distribution.

Materials and methods: Experiments were conducted in cooperation with three experienced "laying on of hands" healers. Photon counting devices were installed in an office room of the healer's practice or in an office newly selected for experimentation.
Approximately 50 *A. acetabulum* cells were placed in a container and positioned for 18 h in the complete darkness of the measuring chamber of the photomultiplier device to eliminate delayed luminescence. The recording of *A. acetabulum*'s photon emission was initiated approximately 20 min before the experimental session began.
A recording session consisted of 12000 registrations of 100 ms. Then, the healing encounter took place while recording (12000 of 100 ms) was continued. After the encounter, recording continued for a period (24000 of 100 ms), without any healing encounter.
Photon signals were analysed for Q values:
$Q = [((n^2) – (n)^2 / (n)] – 1$, wherein (n^2) is the mean of the square of the counts and (n) is the mean of counts in the distribution.

Results: Data from this study were derived from 45 sessions in which three healers participated. Photon emission of *A. acetabulum* demonstrated remarkable alterations during the ritual of the healer-healee encounters resulting in increased Q values. One-way ANOVA on treatment stages (independent variable) and photon count distribution parameter Q (dependent variable) demonstrated highly significant effects (p=0.000000). A post-hoc (Fischer LSD) test demonstrates that the increase in Q is already almost significant during treatment, and it became significant (p=0.01) during the first post-healing period.

Conclusion: The data confirm the initial 2003 study suggesting that a healing ritual resulted in a change in the quantum character of photon signals of *A. acetabulum* that were cultured in or close by the room where the ritual took place. It suggests that living subjects are sensitive witness for healing rituals.

Keywords: Photon emission, Acetabularia acetabulum, psychic healing, quantum state

181/06 - "Brain Activity During Psychokinetic Task - Research with Near Infrared Spectroscopy"
Instituição/Institution: Institute for Living Body Measurements, International Research Institute, Chiba - Japan
Duração prevista/Estimated duration: 2007/02 - 2008/03
Investigadores/Researchers: Dr. Mikio Yamamoto, Dr. Hideyuki Kokubo

Abstract:

Objectives: To test teleportation phenomenon by a famous Chinese psychic and study brain blood flow change during teleportation tasks.

Methods: Subject was a Chinese female W004. Targets were vitamin C pills of Chocola (Eisai) on an electric balance or in a bottle. W004 tried to teleport pills in free style tests. One trial was 30-45 min. All tests were monitored by video cameras.
[Physiological Measurements] Brain blood flow was measured by fNIRS; OMM-3000 (Shimadzu) which uses 3 NIR lasers of 780, 805 and 830nm. Respiration, electrodermal activity and photoplethysmograms were measured by MP150 (Biopack Systems).
[Physical Measurements] Pill weights were measured with an analytical semi-micro balance (GH-252, A&D) every second at 0.01 mg accuracy. Two RNGs (Orion) were set symmetrically beside the balance. A thermograph (TH3104MR, NEC) monitored the balance. An electrostatic voltmeter (FR-211C, Fujimaru) was set in front of the balance. An original detector, Sekigaisen 4-Gouki, was made to detect anomalous photon signals around the target. It had 3 IR ray sensors: 6.4-14, 0.28-4.8 and 3.4-3.5μm. Those sensors were packaged in an aluminum dark case. The detector was set near the balance.
[Psychological Tests] W004 was given a profile questionnaire and 5 questionnaires on character traits. Uchida-Kraepelin Psychodiagnostic test was also done.
[Cognitive Test] To get usual activities for W004, she was given facial recognition tests using photos of a young Japanese woman's face as stimuli; six basic emotions were laughter, surprise, fear, anger, dislike and contempt, and 10 intermediate faces.

Results: Good results on teleportation have not been obtained yet. Brain blood flow increased at her right hemisphere during teleportation tasks. Activated areas were similar to those during facial recognition tests. More analyses are being done.

Keywords: psychokiness, teleportation, fNIRS