When rejection hurts: Probing the neural basis of childhood social exclusion with a dense-array EEG

ABSTRACT:

Background
We examined the neural basis for social exclusion with a computer-based ball-tossing game called Cyberball to elicit social distress. Our ERP version of Cyberball documents its feasibility for studying social exclusion events in real time among adults and children. We examined the neural basis of childhood social exclusion with a dense-array EEG and extended the paradigm to a personally meaningful peer relationship.

Aims of the study
1) Explore the neural correlates of social exclusion of a child by two hypothetical peers; 2) Examine the neural correlates of social exclusion when one player is a childhood friend.

Results
Study 1 found that social exclusion elicits a more negative frontal slow wave mainly reflected in theta oscillations. Greater frontal slow wave and theta power (400-800 ms) predict greater distress. Neural source modeling for rejection events was localized to the subgenual cortex, ventral anterior cingulate cortex, and insula. Study 2 found showed that stranger rejection was associated with larger P2 and positive slow wave ERP responses compared to exclusion by a best friend. Psychological distress prior to exclusion differentially moderated the effects of friend and stranger exclusion. Children with greater psychological distress were observed to have larger neural responses (larger P2 and slow wave) to exclusion by a stranger compared to exclusion by a friend. Psychological distress within the dyad differentially predicted the P2 and slow wave response.

Conclusions
Slow wave theta power for rejection events may be a neural signature of social exclusion by strangers. Familiarity changes the nature of Cyberball, engaging greater monitoring of a stranger among youth with greater distress.

Keywords
ERP, Theta, Social exclusion, Children, Friends

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Published Work:

Baddam, S., Laws, H., Crawford, J.L., Wu, J., Bolling, D.Z., Mayes, L.C., Crowley, M.J. (2016). What they bring: Baseline psychological distress differentially predicts neural response in social exclusion by children's friends and strangers in best friend dyads. Social Cognitive and Affective Neuroscience.

Bolling, D., Pitskel, N., Deen, B., Crowley, M., Mayes, L., Pelphrey, K. (2011). Development of Neural Systems for Processing Social Exclusion from Childhood to Adolescence. *Developmental Science, 14*(6), 1431-1444. doi: 10.1111/j.1467-7687.2011.01087.x

Bolling, D., Pitskel, N., Deen, B., Crowley, M., McPartland, J., Kaiser, M. D., …, Pelphrey, K. (2011). Enhanced neural responses to rule violation in children with autism: A comparison to social exclusion. *Developmental Cognitive Neuroscience, 1*(3), 280-294. doi: 10.1016/j.dcn.2011.02.002

Bolling, D., Pitskel, N., Deen, B., Crowley, M., Mayes, L., Pelphrey, K. (2011). Dissociable brain mechanisms for processing social exclusion and rule violation. *Neuroimage, 54*(3), 2462-2471. doi: 10.1016/j.neuroimage.2010.10.049

Crowley, M., Wu, J., McCarty, E., David, D., Bailey, C., Mayes, L. (2009). Exclusion and micro-rejection: event-related potential response predicts mitigated distress. *Neuroreport, 20*(17), 1518-1522. doi: 10.1097/WNR.0b013e328330377a

McPartland, J., Crowley, M., Perszyk, D., Naples, A., Mukerji, C., Wu, J. … Mayes, L. (2011). Temporal dynamics reveal atypical brain response to social exclusion in autism. *Developmental Cognitive Neuroscience, 1*(3), 271-279. doi: 10.1016/j.dcn.2011.02.003

Sreekrishnan, A., Herrera, T. A., Wu, J., Borelli, J. L., White, L., Rutherford, H., Mayes, L., & Crowley, M. (2014). Kin rejection: Social signals, neural response and perceived distress during social exclusion. *Developmental Science, 17*(6), 1029-1041. doi: 10.1111/desc.12191

van Noordt, S., White, L., Wu, J., Mayes, L., & Crowley, M. (2015). Social exclusion modulates event-related frontal theta and tracks ostracism distress in children. *NeuroImage, 118*, 248-255. doi: 10.1016/j.neuroimage.2015.05.085

White, L., Wu, J., Borelli, J., Mayes, L., & Crowley, L. (2013). Play it again: neural responses to reunion with excluders predicted by attachment patterns. *Developmental Science, 16*(6), 850-863. doi: 10.1111/desc.12035

White, L. O., Wu, J., Borelli, J. L., Rutherford, H. J., David, D. H., Kim-Cohen, J., … Crowley, M. J. (2012). Attachment dismissal predicts frontal slow-wave ERPs during rejection by unfamiliar peers. *Emotion, 12*(4), 690-700

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