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The Evolution of Social Pain: Understanding the Neural Network of Social Ostracism through Electroencephalogram Waves

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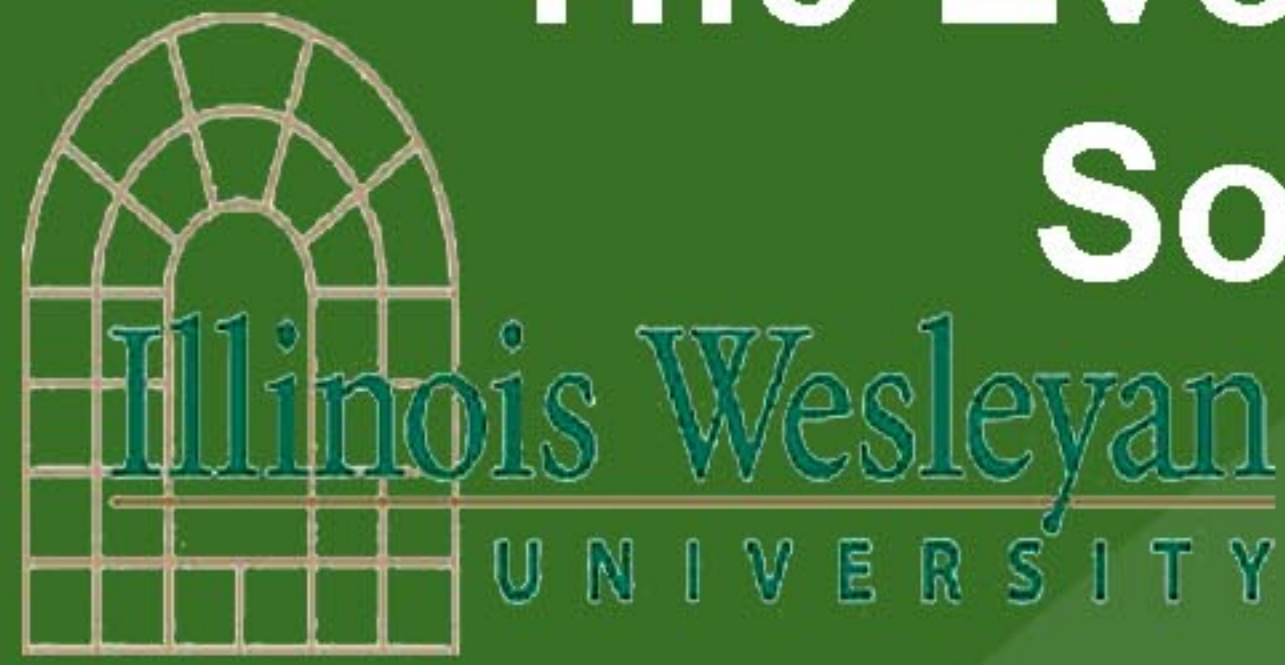


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The Evolution of Social Pain: Understanding the Neural Network of Social Ostracism through Electroencephalogram Waves

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Abstract

The lack of belonging or frequent exposure to social ostracism has maladaptive psychological and physical consequences. However, little is known about the mechanisms underlying the neural processes of social ostracism. Previously, Williams (2009) showed a decrease in theta power in the frontal lobe when female participants were ostracized in a virtual chat-room. Using male and female Illinois Wesleyan college students, this study manipulated two powerful social cues (biological sex and attractiveness level) to determine their effect on prefrontal brain activity in response to social ostracism in a virtual chat-room environment. Using EEG technology, frontal theta power (4-8Hz) was measured using three cortical electrodes (the F3, F4, and Fz sites). Using a similar procedure to Williams (2009), social ostracism was elicited using a well-established chat-room paradigm that involved 4 phases, in which participants talked to research confederates acting as students from Illinois State and University of Illinois. In the introduction, inclusion, and re-inclusion phases, participants were actively involved in the conversation, in contrast to being actively ignored during the exclusionary phase. During the exclusionary phase of the experiment, we hypothesize a significant decrease in theta power across gender and attractiveness levels in the frontal lobe.

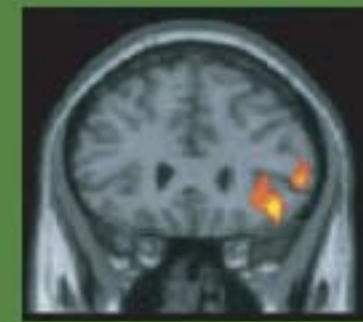
Introduction

Psychological Effects of Social Ostracism:

- Adoption of Self-defeating Behavior:
- Decrease in emotional Well-being

A Common Neural Network:

- Social Attachment Theory: Specific social experiences are controlled by the same neural structures as the physical pain system to serve as a strong foundation in the protection and regulation of the evolved attachment system seen in humans



Physical Pain-RVMPFC



Social Pain-RVMPFC

(Eisenberger & Lieberman, 2004)

Structures Involved in Regulation:

Dorsal Anterior Cingulate Cortex:

- Monitors environment for social threats or discrepancies
- Regulates the distressing feelings of pain

The Ventral Medial Prefrontal Cortex:

- Pain Mediator : Regulation of pain sensation
- Coordination of complex behaviors: Interpretation of environmental stimuli, Self-regulation

Sex Differences in Social Ostracism

- Normative Guidelines:
- Preferential Emotional Processing:
- Nonverbal Communication Detection:

Attractiveness Levels in Social Ostracism:

Advantageous Social Implications

- "What is Beautiful is Good"
- Attractive students are stereotypically rated friendlier, more attentive, more popular, smarter, and more outgoing

Procedure

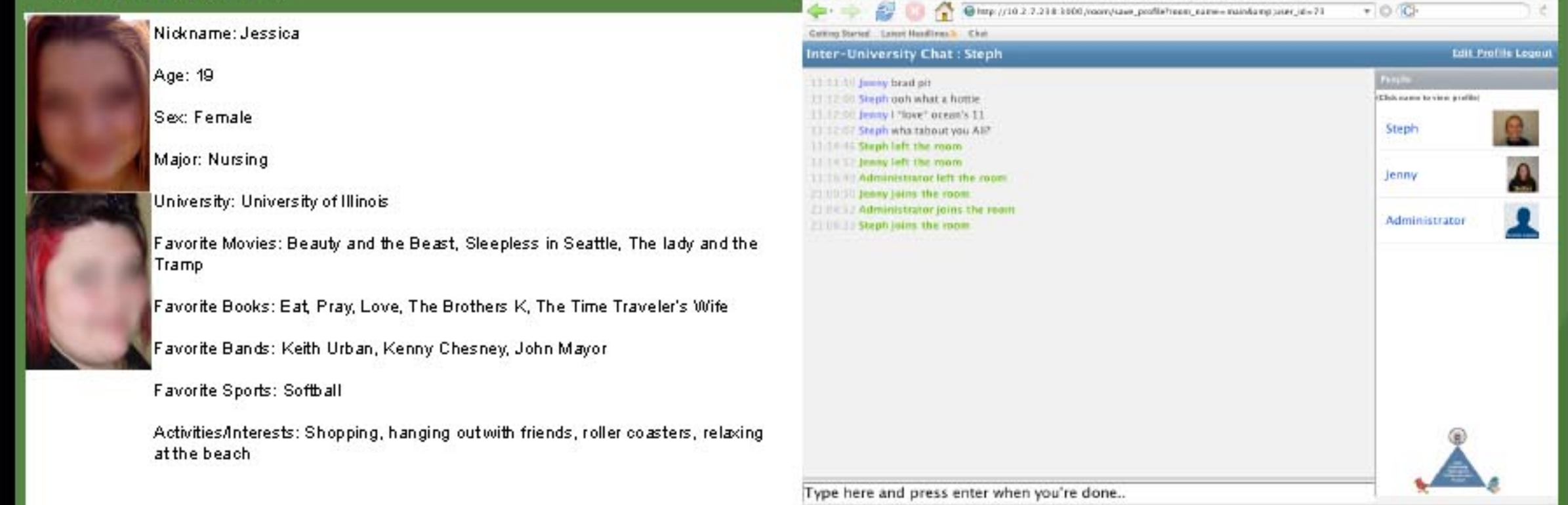
Social Ostracism Manipulation:

- Simulated chat room paradigm
- Participants were given a fictitious cover story and told they would be conversing with two other students from Illinois State University and University of Illinois, who in reality were two research confederates

Procedure:

- Upon entering the laboratory, participants had their picture taken with a digital camera that uploaded to their online profiles
- Using EEG technology, frontal theta power (4-8Hz) was measured using three cortical electrodes (the F3, F4, and Fz sites)
- Conversed in virtual chat-room for four 8 minute trials.
 - Introduction (actively engaged) - Concurrent measure 1
 - Inclusion (actively engaged) - Concurrent measure 2
 - Exclusion (actively ignored) - Concurrent measure 3
 - Re-inclusion (actively engaged) - Concurrent measure 4
- Completion of final questionnaire

Chat Room:

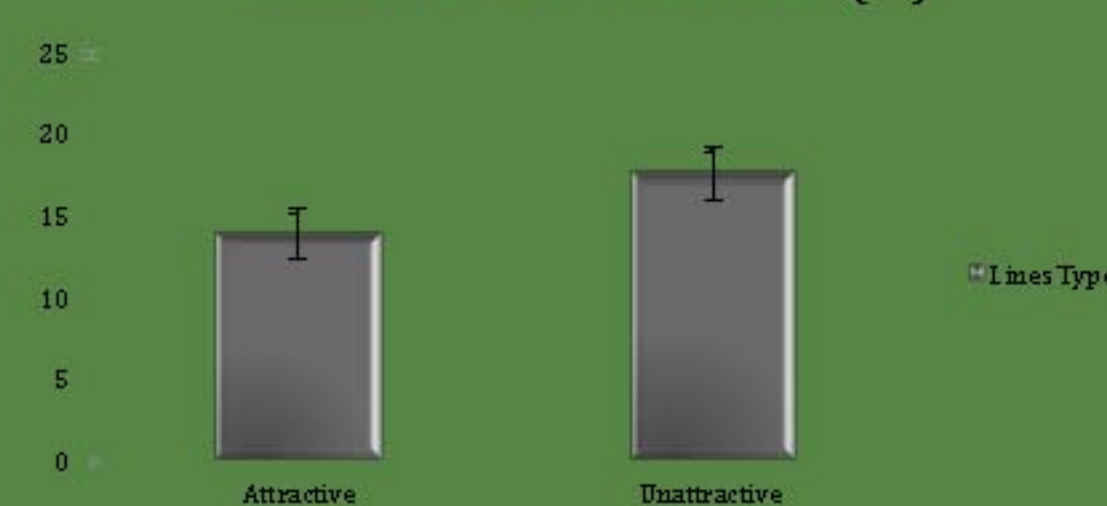


Results

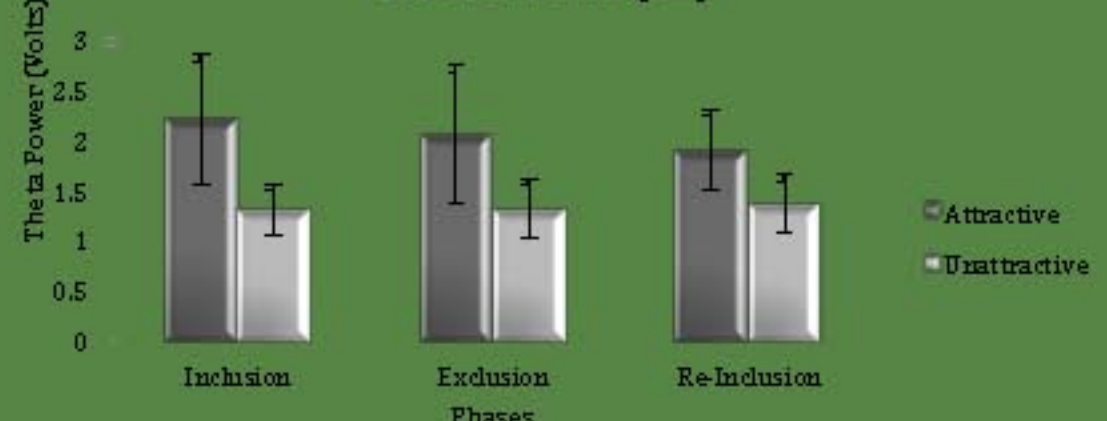
A Significant Decrease in Lines Typed During the Exclusionary Phase



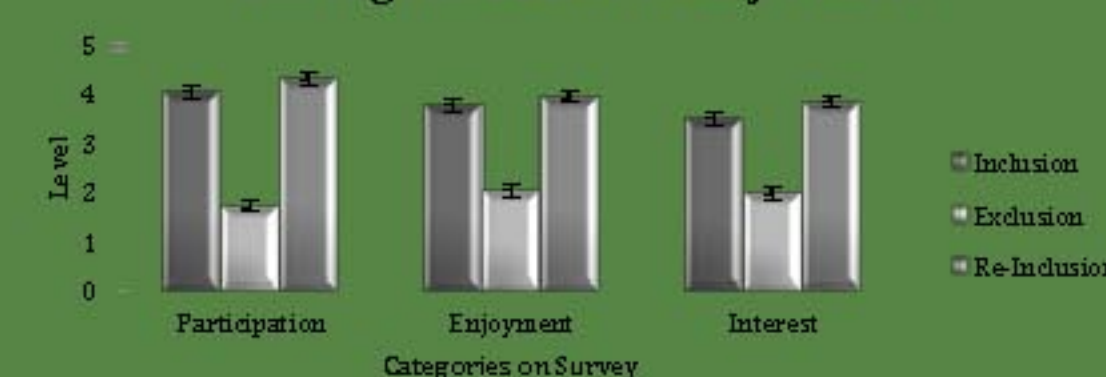
Participants Typed More to Unattractive Members in the Chat-Room (ns)



Participants' Showed Increased Theta Power to Attractive Members in the Chat-Room (ns)



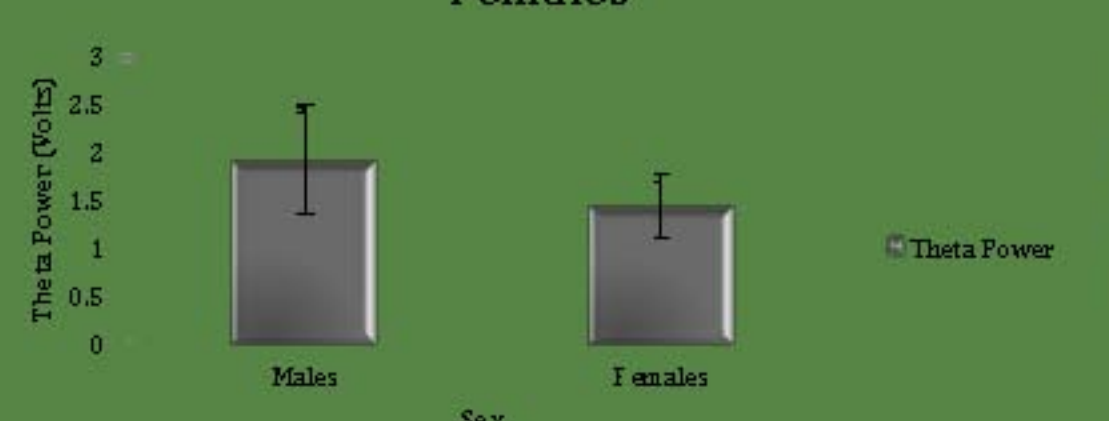
A Significant Decrease in Participant Interest, Enjoyment, & Participation During the Exclusionary Phase



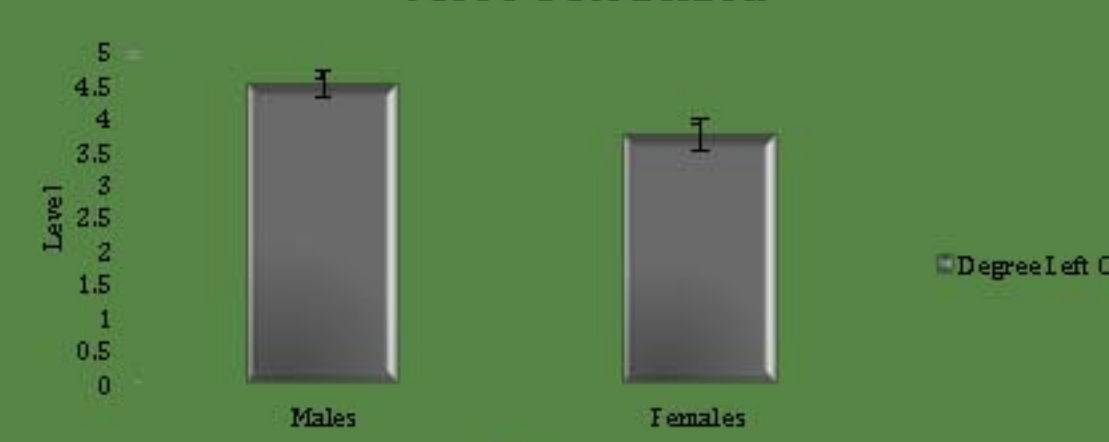
Participants' Participation, Enjoyment, and Interest were Higher among Unattractive Members in the Chat-Room (ns)



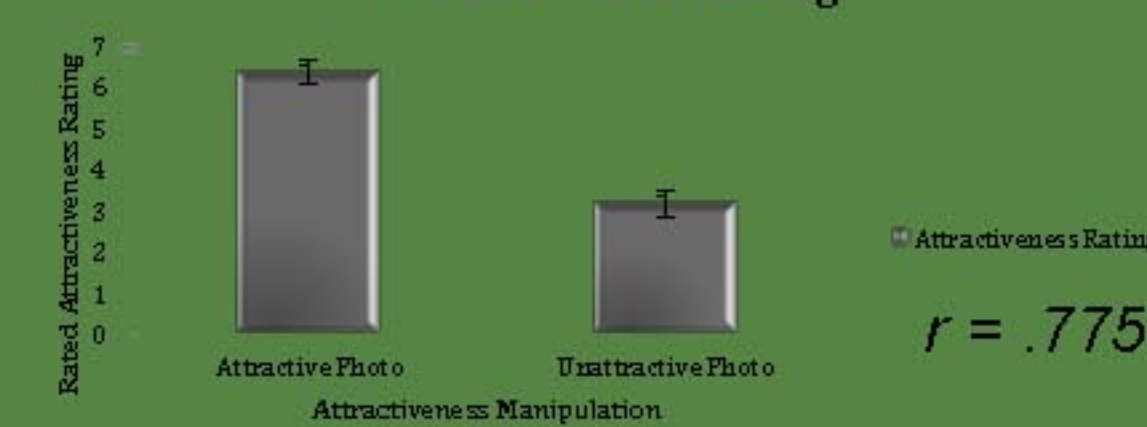
Males showed a Marginally Significant Increase in Theta Power Compared to Females



Males Significantly Reported Feeling More Ostracized



Attractiveness Manipulation Positively Correlated with Participant Attractiveness Rating



Sex Differences in Theta Power to Attractive Members in the Chat-Room (ns)



Sex Differences in Theta Power to Unattractive Members in the Chat-Room (ns)



Discussion

Success of Chat-room Paradigm :

- Behavioral measures indicate feelings of social ostracism were successfully administered to participants (Significant)

Theta Power:

- Theta power was higher when participants interacted with unattractive confederates (Insignificant)
- Theta power was lower in females in all phases and areas (Insignificant)

Sex Differences:

- Males reported feeling more ostracized than females during the exclusionary phase of the chat room (Significant)
- During the entire chat-room, males participated less than females (Insignificant)

Attractiveness Levels:

- Participants reported conversations with "unattractive" chat room members as more enjoyable and interesting (Insignificant)
- Participants interacted more with the "unattractive" chat room members (Insignificant)
- Attractiveness manipulation was successful (Significant)

Future Research:

- Effects of being in a relationship on social ostracism
- Larger Participant Sample and Pool