"Neural Correlates of Theory of Mind Abilities in Blind Subjects - Implications for Autism"
Ryan Borek – CNST Summer Research Presentation 12.18.2009

Introduction

Theory of Mind:
- Is the ability to attribute mental states—beliefs, intents, desires, pretending, knowledge, etc.—to oneself and others and to understand that others have beliefs, desires and intentions that are different from one's own.
- It is thought that autism has a delay in ToM

Differences in brain activation were found by S. Baron-Cohen et. al during ToM tasks.
- Of note is the complete lack of amygdala activation in autistic subjects

Why Blind Subjects?
- Congenitally blind children show similar behavioral characteristics to those with Autism Spectrum Disorder (ASD)
- Much controversy as to the correlation
  - IQ
  - Lebers amusarous
  - Perinatal brain insults

Hobson's Theory
- Many etiologies leading to the “final common pathway to autism”
  - Limited interpersonal communication
  - Difficulty interpreting emotions in others
  - Can’t interpret “Shared World”
- No imaging or electrophysiological data has been collected for study

Methods

- Use fMRI to focus on a ToM paradigm and an affective prosody (emotion behind words)
- Suspect hypoactivity in relevant brain areas
  - Amygdala
  - Superior Temporal Sulcus
  - Inferior Frontal Gyrus

Prosody

- Definition:
  - “by which is meant the melody of speech, its intonation, inflection, and pauses, all of which have emotional overtones”
- Subjects listen to pseudo words
  - 2 syllables
  - Man or woman
  - Neutral, Happy, Sad, Fearful, Disgusted, Angry
- Subjects select the emotion they interpret

Control Experiment

- Subjects
  - Daycare investigation:
    - Tested 13 children aged 5 – 9
- Analysis of results
  - Results will be used to determine what "normal" children can accomplish
  - This will then be our comparison for Autistic and Blind Children

Results and Future Direction

- % Correct for Each Emotion By Gender
  - % Correct

Analysis

- Analysis of Data
  - Decided that 6 emotions was too difficult
  - Happy and Angry were the most easily recognized.
  - Do Children pick a default if they don’t know?
  - Girls chose Happy Female most
  - Boys chose Angry Man most
- Future Work:
  - Analyze the incorrect choices
  - "Thin" the number of emotions
  - New Trials:
    - "Happy vs. Non-Happy"

Other Activities

- fMRI Presentation coding
- Medical School tour
- Shadowing of other researchers
- Subject in fMRI calibration study

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Benefits of RISE Internship

- International medicine and research
- Bioethics exposure (Dachau)
- If interested in dual degree
- Travel
  - Amsterdam, Munich, Cologne, Heidelberg
- 100’s of other interns from U.S., Canada, and the U.K.

Suggestions for Summer Research Projects...

- Ask potential PhD mentors for a copy of their proposal
- Ask where in their schedule they are at
- Have realistic expectations
- This may not be the best for “bench” research

RISE Internship (Sponsored by DAAD)

- Research Internships in Science and Engineering
- Application process is 12/7/09 – 1/31/10
- Funding:
  - Stipend
  - 5 day German rail pass
  - Weekend education conference in Heidelberg
  - Housing assistance through the host institution (Aachen in my case)