ADHD AND DEFICIT IN SENSOMOTOR GATING

- Current theoretical perspectives on ADHD focus on deficit of attention, inhibition or both.
- Despite important differences among these models, all acknowledge that ADHD likely involves poor inhibition.
- Neither attention nor inhibition has a single operational definition, and many tasks likely involve elements of both processes.
- Consequently, it has been suggested that investigators choose measures that exist simply and directly assess the construct of interest (Douglas 1999; Seidman et al. 1999).

SENSORY MOTOR GATING?

- Screening (gating-out of awareness) of sensory stimuli in order to prevent a stimulus to be properly processed.

PP4: DEFINITION

- Reduction in amplitude of the response to a strong stimulus, when preceded by a relatively weak sensory event.

DEFICIT IN SENSMOTOR GATING IN ADHD

- Startle response: contraction of facial skeletal muscles in response to a stimulus.
- Defensive response
- Translational
- Plasticity:
  - PP1/PS1
  - Habituation
  - Fear potentiation

Startle reflex modulation
ENDOPHENOTYPE?

- Consistently abnormal in schizophrenic patients and in their clinically first degree relatives.

References:
  - Priming gating deficits in audition in patients with schizoaffective and paranoid disorders.

  - Abnormal in patients with conditions linked to a deficit in the cortico-striato-pallido-globus pallidus circuit.

ENDOPHENOTYPE?

  - "Prepulse inhibition of acoustic startle in spontaneously hypertensive rats."

References:
- van den Boeve M.
  - Behavioral Neuroscience Laboratory, Mental Health Research Institute (VU) Australia.
ENDOPHENOTYPE?

- **Biol Psychiatry. 2000 Jun 1;47(11):989-77.**
  "The P50 auditory event-related potential in adult attention-deficit disorder: comparison with normal controls".  
  *Classe MD, Hass KG, Hass KS, Young DA, McFadden MA, Caine E, McPhee RA, Bulkan W, Adler LE, Fossella F.*  
  Department of Psychiatry, University of Colorado Health Sciences Center, Denver.

- **Psychopharmacology (2003) 165:116-127**
  "The effects of methylphenidate on prepulse inhibition during attention-deficit hyperactivity among boys with attention-deficit hyperactivity disorder".  
  *Hawx J, L, Yergey A R, Pelham W E, Eck T M.*  
  Department of Psychology and Psychiatry, Slipher Laboratory of New York.

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Sensorimotor Gating in Boys with Tourette’s Syndrome and ADHD: Preliminary Results

F. Xavier Castellanos, Edward J. Fine, Detra Kayen, Wendy L. Marsh, Judith L. Rapoport, and Mark Hallett

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MATERIAL AND METHODS

- 23 Children (12M/11F) with ADHD and internalizing disorders
- 23 Children with ADHD “alone”
- 25 Controls matched for age and sex
- All patients are aged 9 to 14 years and are diagnosed according to DSM-IV criteria for ADHD and received clinical questionnaires for ADHD and comorbid conditions
- All patients are drug free at moment of PPI study

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MATERIAL AND METHODS

- Stimuli: broad-band (250 Hz – 50 kHz) square wave 1 msec duration 85 dB SPL
- Binaural presentation
- S1-S2 (SOA) intervals 500 msec
- Three blocks of twenty click pairs
- Intertrial interval: 8 sec
RESULTS

<table>
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<th>PPI %</th>
<th>ADHD</th>
<th>CONTROLS</th>
<th>ADHD/INT</th>
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ADHD: Attention Deficit Hyperactivity Disorder
CONTROLS: Healthy controls
ADHD/INT: ADHD with comorbidities

DISCUSSION

Our patients did not differ significantly in the amplitude of pulse
stimulus differences in PPI can be attributed to deficiencies in inhibition
of the responses to the presentation of probes.

This finding suggests that the amygdala is also involved in
certain subcortical emotional processing and may be involved
in the mediation of stress-related behaviors.

State (due to hyperactivity) or trait (trait condition)?
Correlation with dysfunction of amygdala circuit in this subgroup (with
PSG data)?

fMRI studies of the amygdala regions are needed to understanding
neuroanatomical differences in these group of patients.

Conclusions

- In summary, we consider these findings preliminary
due to the limited size of our sample

- If independently replicated, these results might reflect
a psychophysiological substrate in a subgroup of
patients

- This correlation could also represent an important
biological marker, increasing our understanding of
the differences in responses to a pharmacological
treatment and to monitoring clinical follow-up

THANK YOU FOR ATTENTION