Fear-Potentiated Startle and Fear Inhibition in a Sample of Trauma-Exposed Undergraduate Women

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THANK YOU!

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Some background first...

- Dr. Orcutt received NIH's R15 grant to study fear-potentiated startle (FPS) and fear inhibition in her sample of women exposed to the mass shooting (NTS)
- We also have been collecting FPS data from current PSYC 102 students since Fall 2012

What is fear-potentiated startle (FPS)?

- Originally studied in rodents (Davis, 1992; Grillon & Baas, 2003)
  - Ideal paradigm for translational research
- FPS builds upon classical conditioning principles
- FPS is defined by the relative increase in the amplitude of the acoustic startle reflex when a subject sees a conditioned stimulus (CS+) that predicts an aversive unconditioned stimulus (US; Jovanovic et al., 2011)
  - This is compared to startle amplitude elicited in the absence of that cue
What is fear-potentiated startle (FPS)?

• Myers and Davis (2004) developed a discrimination procedure in rats that allowed for an independent evaluation of fear acquisition and inhibition of fear
  • Conditional discrimination (AX+/BX-)

What is fear inhibition?

• Fear inhibition involves learning safety signals, i.e. the ability to discriminate between danger and safety cues and suppressing fear responses in the presence of safety cues
  – In the lab, this is usually measured by pairing one cue with a fearful event and another that signals the absence of that event

How is fear potentiation and fear inhibition related to PTSD?

• A dysregulated fear response is one of the hallmark clinical presentations of PTSD
  – Over-generalization of fear/inability to inhibit fear responses in the presence of safety
• “Exaggerated startle response”
  – Unlike other symptoms of PTSD, this can be measured experimentally
Jovanovic et al. (2009) assessed fear potentiation and fear inhibition in male Vietnam veterans with and without PTSD

- 31 healthy controls
- 33 PTSD patients (i.e., Vietnam veterans seeking treatment)

Findings:
- Subjects with a history of PTSD, but with low current symptoms, responded similarly to healthy controls, showing both fear potentiation to the danger cue and the ability to discriminate between the danger and safety cues.
- PTSD patients with high current symptoms showed strong fear potentiation to danger, but no significant difference in discrimination between the danger and safety cues.
- This impairment appeared to be related mostly to high re-experiencing symptoms rather than the hyperarousal symptoms.
- May be surprising at first because the exaggerated startle response is part of the hyperarousal cluster.

Norrholm et al. (2010) investigated FPS in trauma exposed individuals with and without PTSD living in inner-city Atlanta, Georgia

- 127 total participants (78 PTSD−; 49 PTSD+)
- Found that the PTSD group showed increased FPS to both the CS+ (with the airblast) and the CS− (without the airblast) compared to the non-PTSD group.
- The PTSD+ group showed increased FPS to the previously reinforced CS+ compared with the PTSD− group during early and middle stages of Extinction.
- Individuals with higher re-experiencing symptoms showed increased FPS to the previously reinforced CS+ compared with the low re-experiencing group during extinction.

Pole et al. (2009) assessed FPS longitudinally in police officers
- 138 police academy cadets exposed to sound bursts under increasing (low, medium, high) threat of mild electric shock.
- Following 1 year of exposure to police-related trauma, participants assessed for PTSD symptom severity.
- Found that more severe PTSD symptoms were prospectively predicted by greater subjective fear under low threat.
- Under low and medium threat of electric shock, officers with greater PTSD symptoms reacted as if they were under high threat.
- Pole and colleagues concluded that heightened sensitivity to contextual threat (evidenced by greater fear under low threat) is a unique preexisting vulnerability factor for greater PTSD symptom severity following a potentially traumatic event.
Previous research...

• Jovanovic et al. (2009) investigated whether history of childhood abuse was associated with increased startle reactivity in adulthood
  • 60 participants total (ages ranged from 18-63; 47% female; majority were African American)
  • History of CPA and CSA was associated with increased baseline startle
  • CEA had no impact on baseline startle
  • Childhood abuse did not affect the degree of FPS or fear inhibition
    • Subjects reporting high levels of child abuse had intact inhibition
  • Suggests that the effects of perceived abuse may not parallel the effects of PTSD, but rather have unique effect on physiology

Summary of Research...

• Many individuals with PTSD have elevated FPS and greater inability to inhibit fear responses in the presence of safety signals
  • Safety signal learning (or lack thereof) may be a specific marker of vulnerability for developing PTSD
  • May not be the case for individuals with a history of childhood abuse ➔ much more research is needed

The Current Study

• The current study is investigating FPS and fear inhibition in a sample of undergraduate women
  • Hypothesis 1:
    • Women with current probable PTSD will have significantly greater FPS than women without probable levels of PTSD
  • Hypothesis 2:
    • Women with current probable PTSD will not show fear inhibition in response to the safety signal
  • Hypothesis 3:
    • Women with current probable PTSD will show increased FPS to the previously reinforced CS+ compared with the PTSD- group during early and middle stages of Extinction

Methods

• To be eligible for the study, participants were required to be female, 18 years of age or older, and fluent in English (trauma history was not a requirement)
• All participants completed a pre-survey online prior to the FPS session (mental health, trauma exposure, etc.)
• Participants were granted credits for their 102 course
• Data was collected during the 2012/2013 academic year
Methods

- Some of the measures in the pre-survey
  - Traumatic Life Events Questionnaire (TLEQ)
  - Posttraumatic Stress Diagnostic Scale (PSS)
  - Rand Short Form Health Survey (SF-12)
  - Perceived Stress Scale (PSS)
  - Positive and Negative Affect Scale (PANAS)
  - Depression and Anxiety Stress Scale (DASS)
  - Difficulties in Emotion Regulation Scale (DERS)
  - Acceptance and Action Questionnaire (AAQ-II)

Methods

- Upon arrival at the CSFVSA: informed consent and auditory screening
- Vision and stimulant questionnaire
- Participants are then seated in a soundproof chamber where physiological equipment is attached

Methods

- Heart rate
  - Left forearm and right clavicle

Methods

- Skin conductance
  - First and third fingers

- Respiration
Methods

- EMG response of right orbicularis oculi
- Headphones for sound burst (108-dB for 40ms)
- Camelbak for airblast (140 psi for 250ms)

Methods

- Instructions given for computer stimuli

Methods

- Acknowledge file

Methods

- Dark-enhanced session (5 minutes)
  - Habituation phase: noise alone (NA), one minute (light)
  - Two light and two dark phases, each lasting one minute
  - 3 startle probes in each phase
  - Counterbalanced order
- Acquisition session (20 minutes)
  - Habituation phase: noise alone (NA)
  - 3 blocks of four trials of each type: NA, CS+, CS- (i.e., 12 total trials in each block)
  - CS+ paired with UCS (airblast)
- Extinction session (25 minutes)
  - 5 blocks of four trials of each type
  - CS+ no longer paired with UCS
Methods

• Following the Extinction session, participants are debriefed and given information about local resources in the event that they were distressed by the experiment
• Acquisition and Extinction data files are edited and prepared for transfer from Acknowledge to Mindware
• EMG data are cleaned in Mindware (looking for double blinks, etc.) and then transferred to Excel and SPSS for analyses

Results

• Participants
  • 28 undergraduate women enrolled in Psych 102 at NIU (M\(_{\text{age}}\) = 21.89, SD = 5.83)
  • 82.1% self-identified as White, 7.1% as "other," 3.6% as African-American, 3.6% as Asian or South-Asian, and 3.6% preferred not to respond
  • 85.7% self-identified as non-Hispanic/Latina; 14.3% self-identified as Hispanic/Latina

• With regard to PTSD symptoms:
  • Scores on the PSDS ranged from 0 to 64
  • Mean score on PSDS was 15.84 (SD = 16.55)
    • According to Kubany et al. (2004), the cutoff score for probable PTSD among women is 18
  • 10 participants (35.7%) met criteria for probable PTSD (≥18 on PSDS)
  • 18 participants (64.3%) did not meet criteria for probable PTSD (<18 on PSDS)

• Data analysis
  • Mixed ANOVA design with the within-subject factor of Block (4 levels for Acquisition/4 levels for Extinction), trial type (3 levels: NA, CS+, CS−), and the between-groups factor of diagnosis (2 levels: PTSD+ and PTSD−)
Results: Acquisition

- In acquisition, the test of between-subjects (PTSD vs. no PTSD) is trending ($p = .07$)
- With more participants, this effect may reach significance
- In acquisition, the within-subject test of stimuli (NA, BS, PT) was significant
- No significant findings in extinction . . . Yet!
- Many of these women endorsed a greater number of avoidance symptoms than re-experiencing symptoms – this may partially explain our insignificant results in extinction
- We will be continuing to collect data throughout the year
- Future studies should continue to assess the relationship between FPS, fear inhibition, and PTSD in diverse populations

Questions?
Comments?

Thank you!