Attential Control, Attential Threat Bias, and Posttraumatic Stress Symptomatology

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Lifetime prevalence estimates for PTSD are about 8%; however, the majority of Americans experience a traumatic event in their lifetimes (Kessler et al., 1995: NCS). Hypervigilance towards threatening information, a symptom of PTSD, has been suggested as one factor leading to the maintenance and exacerbation of PTSD symptoms (e.g., intrusive thoughts, flashbacks, physiological reactivity, avoidance behaviors, heightened arousal; Constans, 2005; Elzinga & Bremner, 2002).

Research emphasis on understanding the attentional processing of threat-related information in PTSD. Facilitated threat detection (i.e., hypervigilance) became synonymous with PTSD-related attentional threat bias.

Consensus among researchers that an attentional bias for threat information in PTSD is a phenomenon with an overabundance of support in the extant literature (e.g., Buckley, Galovski, Blanchard, & Hickling, 2003; Constans, 2005; McNally, 1998).

“What does the modified Stroop effect exist in PTSD? Evidence from dissertation abstracts and the peer reviewed literature” (Kimble, Frueh, & Marks, 2009).

Reviewed published literature and dissertation abstracts.

Results: Only 8% of studies from dissertations, and 44% of studies from published literature found delayed reaction times to trauma-specific words in participants with PTSD.

Author’s conclude that the common assertion that individuals with PTSD have an underlying, automatic attentional bias for attending to trauma-relevant stimuli may be incorrect.

There are multiple components of attention (i.e., orienting towards, disengaging, shifting) and the Stroop task fails to discriminate between these different components. Blocked format = RT’s are a combination of all components. Random format = RT’s only account for “fast” components (i.e., orienting towards) (McKenna & Sharma, 2004).

Recent meta-analysis 172 studies used modified Stroop task to examine threat-related attentional biases in anxiety, found evidence of the modified Stroop effect, but only when a blocked presentation format was used (Bar-Haim, Lars, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). Thus, observed effects are likely the result of slower, higher order regulatory processing modified Stroop task, which does not provide an independent measure of these effects, inappropriate for examining attentional threat bias in PTSD.

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Vigilance-Avoidance: facilitated engagement (orienting towards stimuli) followed by avoidance.

Attention-Maintenance: no difference in engagement; instead, once threat stimuli are attended to, there is difficulty disengaging from such stimuli.

Attentional Control Theory suggests that impaired Attentional Control (AC: ability to use higher level executive attention to regulate, or override, bottom-up emotional responses) accounts for attentional threat bias (difficulty disengaging).

Anxiety impairs disengaging and shifting functions (e.g., Graydon & Eysenck, 1989; Lavie, Hirst, de Fockert, & Viding, 2004).

The anxiety literature has supported the notion that attending to threat stimuli longer is not the result of faster shifting towards stimuli, but the inability to disengage and shift attention away from such stimuli (e.g., Amir, Elias, Klumpp, & Przeworski, 2003; Derryberry and Reed, 2002; Fox, Russo, & Dutton, 2002).

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AC is positively correlated with indices of positive emotionality and inversely related to aspects of negative emotionality (Derryberry & Reed, 2002).

Shifting attention to safe or novel stimuli helps to reduce negative affect (Harman, Rothbart, & Posner, 1997; Nolen-Hoeksema & Morrow, 1993).

Trauma-exposed individuals with high AC recover faster from trauma re-telling induced negative mood than individuals low in AC (Sharma & Bradt, 2016).

Mild distraction may help to expedite fear reduction during exposure therapy (Antelman & Page, 2001).

Foa & Kozak (1986) suggest emotional processing, a necessary component of successful exposure therapy for PTSD, is unlikely when a client’s level of fear is too high.

AC may aid individuals with PTSD during exposure therapy by decreasing their level of fear during treatment, thus making treatment tolerable and increasing session attendance.

Demographics (N = 97; 56 women)
- 88% White, 24% Black, 9% Hispanic or Latino, 5% Asian, 4% “other”
- The majority were freshmen (53%)
- Average Age = 19.2 (1.9)

Self-Report Measures
- Attentional Control Scale
- Traumatic Life Events Questionnaire
- PTSD Checklist
- State Trait Anxiety Inventory

Method

Participants received equal trials of each condition (i.e., 150ms and 500ms) with order of conditions randomized (timing, image type).

Calculating Attentional Bias:
- \( AB = (T_pN - T_Np) \)
- Positive scores indicate attention toward threat images
- Negative scores indicate attention toward neutral images (Frewin et al., 2007)

Dot-Probe Task

Why use the Dot-Probe?
- Unlike the modified Stroop task, the dot-probe can provide snapshots of attention at various time points, thus making it possible to differentiate between initial orienting and subsequent disengaging.
- Unfortunately, in the majority of studies in which the dot-probe was used, only one stimulus presentation duration (i.e., 500ms) was used (Yiend, 2010).
- 500ms provides ample time for disengaging and shifting (Mogg & Bradley, 1998).
- Two stimulus presentations were used in the present study (150 & 500ms).

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Dot-Probe Task

20 Neutral-Neutral and 40 Neutral-Threat Images from the International Affective Picture System (IAPS) (Lang, Bradley, & Cuthbert, 1997).
- Neutral Images: Valence (M = 5.12), Arousal (M = 2.96)
- Threat Images: Valence (M = 2.17), Arousal (M = 6.32)

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Data Analysis

Means, standard deviations, and bivariate correlations were calculated.

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Hypothesis 2 confirmed: inverse relationship between PTSS and AC.

Hierarchical multiple regression repeated 2x (3 DV's [attentional bias at 150ms and 500ms, state anxiety, and interaction term (AC x PTSS)]).

- Step 1: Add State Anxiety
- Step 2: Add PTSS
- Step 3: Add AC

AC predicted an attentional bias for threat information when enough time for controlled processing was given (i.e., 500ms).

Association between PTSS and the ability to disengage from threat stimuli was significant after accounting for state anxiety.

Data Analysis: Hypothesis 1 Confirmed

PTSS predicted an attentional bias for threat information when enough time for controlled processing was given (i.e., 500ms). Suggests difficulty disengaging from threat stimuli among those with higher PTSS.

Data Analysis: Confirming Hypothesis 3

The interaction term (AC x PTSS) was probed using simple slopes analysis.

- No association between AC and attentional bias at 150ms SOA for participants with low PTSS (B = .20, p = .05).
- Significant positive association between AC and attentional bias at 150ms SOA for participants with high PTSS (B = -.19, p < .05).

Significant positive association between AC and attentional bias at 500ms SOA for participants with high PTSS (B = -.46, p < .05).
Hypothesis #3: AC would moderate the relationship between PTSS and attention to threat stimuli, with individuals high in PTSS and high in AC disengaging and shifting attention significantly faster from threat stimuli than those with high PTSS and low AC.

We expected this effect to occur at the longer presentation duration of 500ms, under the presumption that more controlled, higher order attentional processes would take longer than 150ms to be employed.

These results suggest that AC can affect responding as early 150ms (this is a relatively new area of research, and thus, the speed with which executive attentional processes are able to be employed is unknown).

Although this finding confirms our initial hypothesis, we are unable to firmly conclude that PTSS are not associated with facilitated threat engagement because we did not use a short enough presentation duration (before controlled processing could be employed).

Summary of Findings

1. Individuals with higher PTSS had a relative deficit in their ability to disengage attention from threat images.
2. PTSS were found to be inversely related to AC.
3. AC moderated the relationship between PTSS and attentional threat bias when the stimulus presentation duration was 150ms.
   - Use of a presentation duration of 150ms provided enough time for disengaging and shifting functions of AC to occur, impossible to determine whether PTSS are associated with facilitated threat engagement.

Data Analysis: Confirming Hypothesis 3

Interpreting the Interaction Effect

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Discussion

Findings support conceptualization in which there is competition between bottom-up and top-down attentional processes and a limited capacity of attentional resources, which can be exhausted under conditions of high perceptual load (Bishop, 2008).

Competition between bottom-up and top-down attentional systems is not solely affected by general level of distress (e.g., PTSS).

- Additional factors: stimulus presentation time, the saliency or intensity of threat (stimulus valence), competition with other stimuli for processing resources (Mack, 1998).
- Perceptual load is likely greater among susceptible individuals (i.e., high PTSS) at longer presentation durations, as threat stimuli are likely more salient at these longer presentation durations (i.e., 500ms) when the saliency of threat stimuli was determined, participants high in AC and high in PTSS were able to disengage and shift attention from threat stimuli.

In exposure therapy, emotional processing is less likely to occur when fear level is too high.

- Individuals with PTSD and higher AC abilities may fare better in exposure therapy because they are better able to regulate negative affective states through a process of attentional disengagement and reengagement.
- Individuals low in AC may be at greater risk for the development of PTSD following a traumatic event; further, individuals with low AC and PTSD may be less likely to recover from PTSD.

Attention training interventions have been shown to be effective in significantly reducing social anxiety (Schmidt, Richer, Busacker & Tepavac, 2009) and anxiety and depression (Neufeld, Brown, & Berliner, 2005).

- Attention training interventions may benefit from incorporating attention based components.
- The degree of match between stimuli present during the traumatic event and those presented during exposure therapy may be less important for accomplishing therapeutic outcomes than previously thought.

Implications

- In exposure therapy, emotional processing is less likely to occur when fear level is too high.
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Challenges idea that it is vitally important to replicate trauma-specific sensory input in order to activate trauma memory nodes in the fear network during exposure therapy (Lev & Klein, 2006).

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Limitations and Future Directions

Limitations:
- College sample vs. clinical population
- Cannot be generalized to individuals with PTSD
- Dot-Prob Methodology: 150ms too much time to determine whether PTSS are associated with facilitated threat engagement

Future directions:
- PTSD Sample (PTSD vs. Non-PTSD)
- Additional temporal snapshots (75ms, 750ms)
- Longitudinal designs would allow for an understanding of executive attention in the etiology of PTSD

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- Dr. Holly Orcutt
- Dr. Julie Crouch
- Dr. Joel Milner
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Questions or thoughts on improving methodology