Individual Attention Shifting Difference Moderation Attention Bias Modification Training Effects Among Formerly Depressed Persons.

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Introduction

- Biased information processing is a core component of many cognitive models of depression wherein at-risk and depressed persons preferentially attend to mood-congruent information from which they have difficulty disengaging.[1,2,3]
- Bias modification efforts involve behavioral interventions via reaction-time and eye-tracking methods that draw visual attention away from negatively-valenced stimuli towards neutrally-valenced or positively-valenced stimuli (e.g., words and images) (Attention Bias Modification Training, ABM) [4,5]
- However, empirical findings are mixed concerning ABM outcomes within depressed clinical and analog samples, which may reflect methodological differences (e.g., reaction time- vs. eye-tracking-based attention measurement), and individual attention-control differences (e.g., attention shifting).
- This study tests attention-shifting's moderating role on ABM outcomes among adults with depression histories via reaction-time and eye-tracking-based paradigms.

Hypothesis

H_1: Active ABM relative to the sham training condition (SHAM-ABM) will predict reduced behavioral reaction time- and eye-tracking based attentional bias indices across the treatment period.

H_2: Pre-training attention-shifting differences will moderate ABM outcomes.

H_3: Eye-tracking-based indices will evidence stronger effects than their behavioral counterparts.

Method

- Participants & Procedures
  - N = 197 adults with depression histories (46% female, *M* = 26.83 years old, *n* = 28 depressed) randomized to Dot-Probe-Based[6] ABM (*n* = 126) and SHAM-ABM (*n* = 71) training conditions.
  - Training occurred in 3 sessions across 1 week for most (89%; 98% completed training within 2 weeks).
    - Respondents viewed sad-neutral same-actor forward-facing face pairs drawn from the Radboud Faces Database with incongruent trials (i.e., the dot probe following the neutral face) occurring 85% in ABM vs. 50% in SHAM-ABM conditions.
- Procedures & Measures
  - Psychiatric Interview – Structured Clinical Interview for DSM-5 Disorders
  - Behavioral reaction time and eye-tracking measures were collected through E-prime 3.0 and Tobii x2-60 systems, respectively.
  - Behavioral Reaction Time Measures
    - Attentional bias reflects the averaged differences between valid (i.e., correctly keyed responses in the 201 - 999ms interval) incongruent and congruent trial reaction times (n = 48) within the dot probe task[7] wherein the probe had an equal probability of following neutral and sad valenced face.

Method

- Procedures & Measures
  - Eye-tracking Measures (see *Figure 1*)
    - Valence-free attention shifting, engagement, and disengagement indices reflect the average time-to-first-fixation to visual probes (circle vs. square frame) that were superimposed on the valenced face during engagement trials and on the neutral face during the disengagement trials[9]; the neutral attention switching index reflects average time-to-first-fixation between same-actor neutral-neutral face pairs.[8]

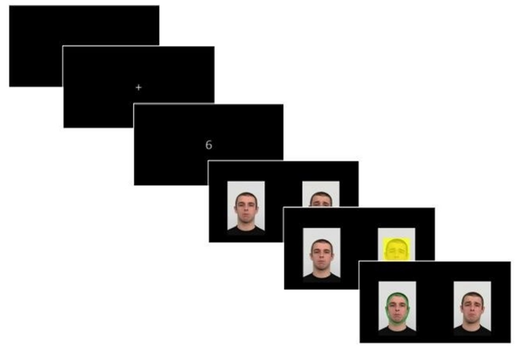

Figure 1. Eye-tracking Task.

- Each trial began with a black screen (500ms) that was followed by a central fixation cross (500ms) and replaced with a random digit (i.e., 1-9) (1,000ms) that participants read aloud so as to orient their attention to the center of the screen prior to the face pair presentation. Face pairs were then presented during a "free viewing" period (3,000ms) that served as the conclusion for one-third of the trials. The remaining trials assessed participants' capacity to shift visual attention towards valenced faces (engagement) and away from valenced towards neutral faces (disengagement). Following "free viewing", participants' fixation for at least 100ms on the neutral face (engagement trials) or valenced face (disengagement trials) triggered a rectangular or oval probe to appear around the valenced face in the engagement trials, while the reverse occurred for disengagement trials. Participants keyed a corresponding response to the frame type ('z' for a "rectangle" and 'm' for an "oval") while their reaction times were collected.[8]

Table 1. Descriptive statistics and bivariate correlation of study variables.

Variables	*M* (*SD*)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Age	26.83 (2.636)	---									
2. Sex (female)	---	.17*	---								
3. ABM	---	-.04	-.09	---							
4. N.Swtch	.352 (.068)	-.06	.10	-.02	---						
5. DP.pre	3.700 (29.547)	.07	.02	.03	-.08	---					
6. DP.po	-2.727 (34.014)	.01	.03	-.03	-.19*	-.01	---				
7. Dis.pre	.366 (.092)	-.08	-.04	.04	.66***	-.02	-.03	---			
8. Dis.pro	.363 (.078)	.02	.11	-.04	.51***	.14	.06	.35***	---		
9. Eng.pre	.375 (.095)	-.04	.12	-.03	.51***	.04	.14	.51***	.33***	---	
10. Eng.po	.365 (.076)	-.01	.13	.00	.52***	.03	-.09	.36***	.57***	.36***	---

Note. ABM = (0=ABM, 1=SHAM-ABM), N.Swtch = pre-training neutral attention switching, DP = dot-probe task bias scores towards sad faces, Dis = time-to-first visual fixation on the neutral-valenced face relative to sad face, Eng = time-to-first visual fixation on the sad-valenced face relative to the neutral face, pre = pre-training, po = post-training.
***$p \leq .001$, *$p \leq .05$

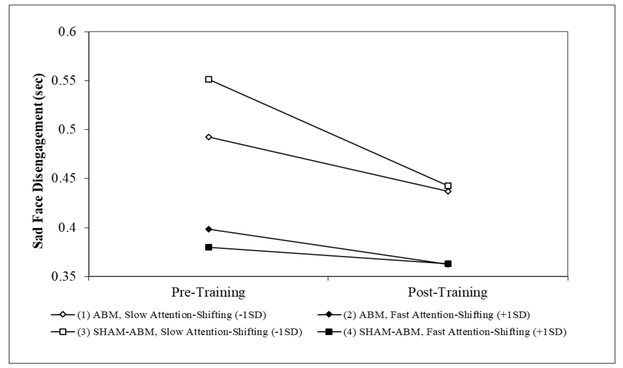

Figure 2. Pre-training Neutral Attention Switching moderation of ABM training effects on sad face disengagement.

Results

- Slower pre-training visual neutral attention shifting times were negatively correlated with post-training behavioral reaction time bias scores and positively with slower valenced eye-tracking disengagement and engagement times.
- Eye-tracking based engagement and disengagement indices were intercorrelated, but unrelated to their behavioral reaction time counterparts.
- H_1 In contrast to expectation, no differences emerged between ABM and SHAM-ABM training conditions across behavioral and eye-tracking based indices.
- H_2 In support, pre-training attention shifting differences moderated training effects when shifting visual attention away (but not towards) sad faces (F=3.98, p=.047): slow attention shifting (-1SD) predicted rapid sad-face disengagement (i.e., slower times to first fixation) for those in SHAM-ABM (ΔM=-61ms, F=7.96, p=.005), but not ABM conditions (see *Figure 2*).
- H_3 As hypothesized, eye-tracking-based indices evidenced greater sensitivity to training effects relative to reaction-time based indices.

Discussion

- Findings support the utility of measuring attention processes via eye-tracking methods, and the need to account for individual attention-shifting differences.

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