

## INTRODUCTION

- Anxiety disorders are among the most common, debilitating mental health diagnoses (Kessler et al., 2005).
- Gold standard clinical interventions, such as cognitive behavioral therapy, ameliorate anxiety in about a third of cases (e.g., Bystritsky, 2006). However, it remains difficult to predict who is most likely to benefit from treatment.
- One potential indicator of both short- and long-term therapeutic outcomes is the presence of sudden gains and losses (i.e., large changes in symptoms between two consecutive sessions of a therapy) that appear in *early* therapy sessions (Gaynor et al., 2003; Olthof et al., 2019; Tang et al., 2002).
- Yet, the predictive power of early sudden gains and losses in the context of attention bias modification (ABM) for anxiety is largely untested.
- ABM is a cognitive training technique designed to remediate attentional biases (AB) towards threat, and shows early efficacy in reducing anxiety (e.g., Hakamata et al., 2010).

## GOALS

- Compare different approaches in *quantifying* sudden changes across training sessions.
- Establish criteria of sudden changes (i.e., gains and losses) in the context of ABM.
- Test whether the presence of sudden changes in the first training session during ABM predict remediation of AB and anxiety severity.

## METHOD

### Participants

- Participants were 83 adults, aged 18-41 ( $M = 25.12$ ,  $SD = 6.33$ ). There were 54 females (65.1%) and 29 males (34.9%). Participants were randomly assigned to the ABM ( $n = 40$ ) or Placebo ( $n = 43$ ) group.

### Procedure

- The study consisted of a pre-training visit, four weekly training visits, and a three-month follow-up. Each training visit consisted of four blocks for a total of 16 blocks of 160 trials each.

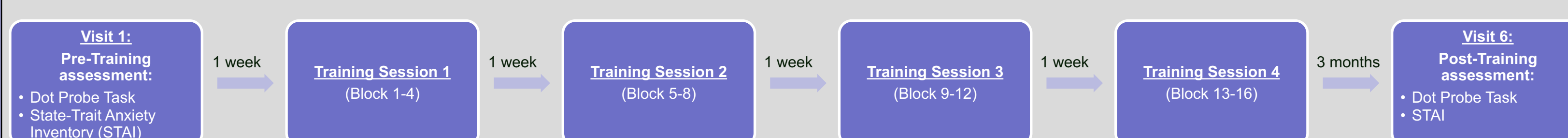


Figure 1. Study timeline.

### Quantification of AB

- The dot probe task consisted of 80 neutral-threat (NT) trials and 40 neutral-neutral (NN) trials. Three AB scores were generated at each AB assessment:

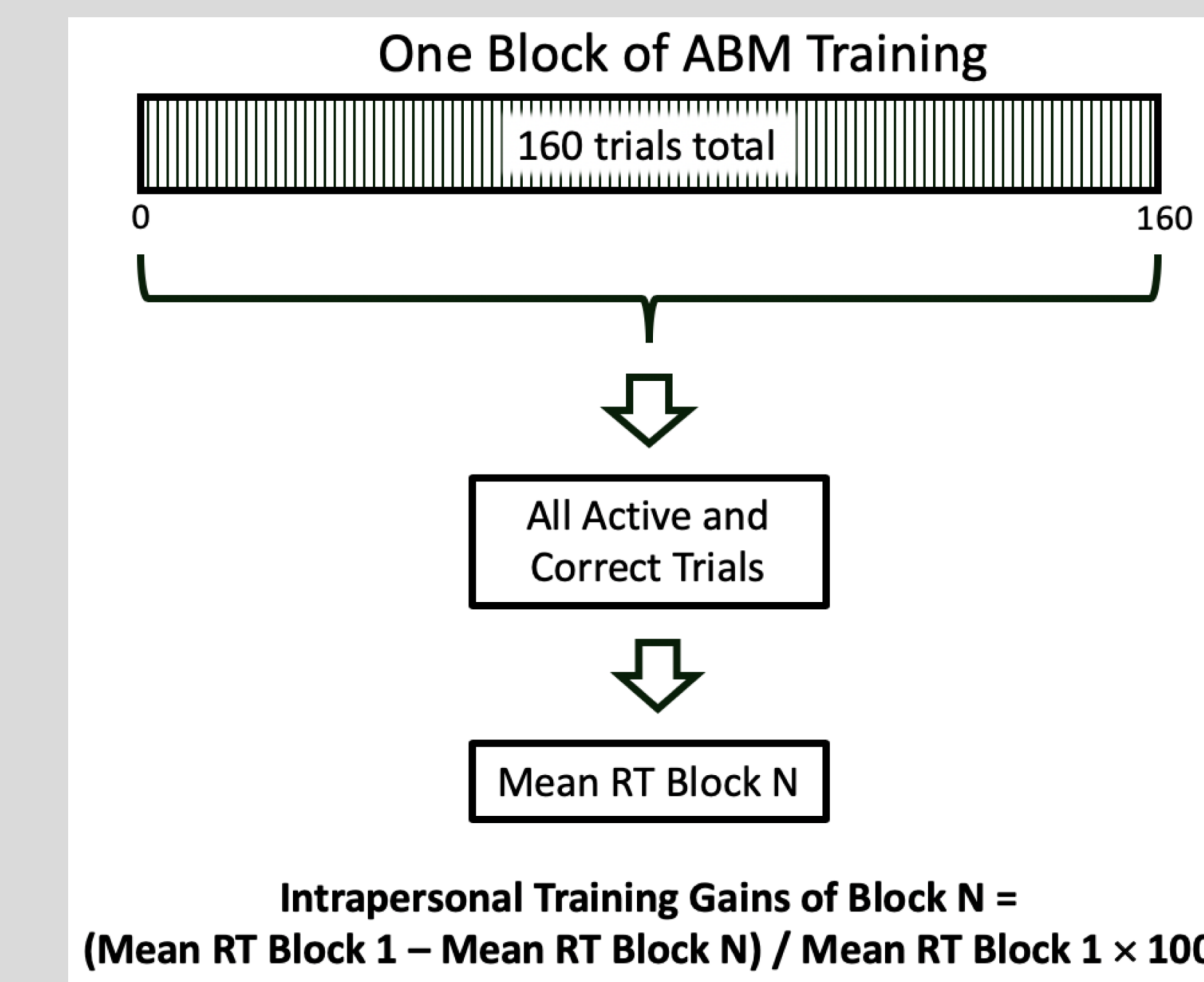
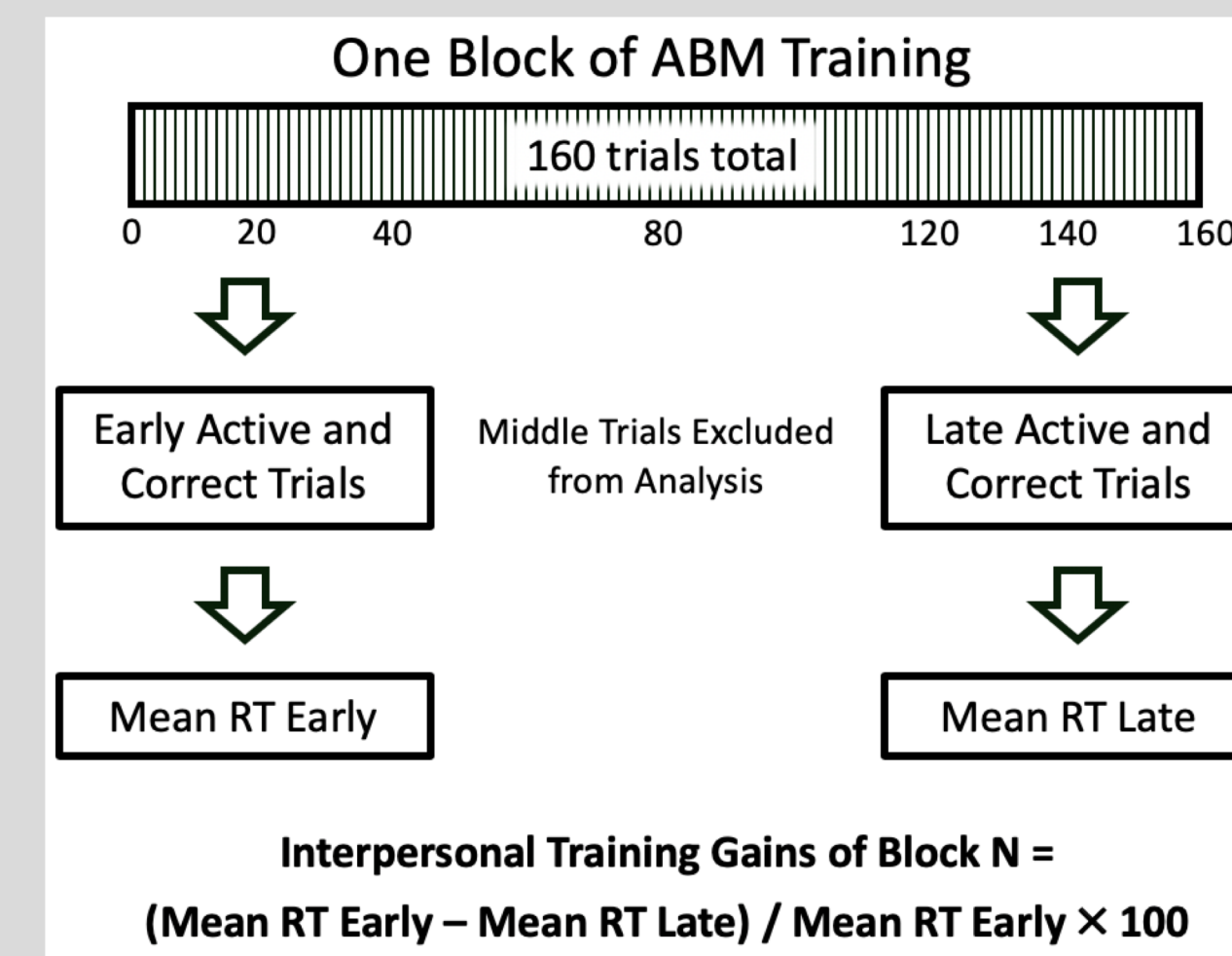


Figure 2. An example of a NT-neutral trial of the dot probe task.

AB Scores	Measurement
Threat bias	Mean RT probe replacing neutral – Mean RT probe replacing threat.
Vigilance	Mean RT baseline (NN) – Mean RT probe replacing threat
Dot Probe Disengagement	Mean RT probe replacing neutral – Mean RT baseline (NN)

## Quantifying Training Gains

- Interpersonal approach** (Heeren, Philippot, & Koster, 2015)
- Intrapersonal approach** (Abend et al., 2013)



## Sudden Gains/Losses Criteria

- The criteria were based on **interpersonal approach** of calculating training gains. Gains and losses were calculated only during Training Session 1, between training Block 1 and 2 (**first half**), and training Block 3 and 4 (**second half**).

- Sudden Gains: top 25th percentile for all gains across all participants
- Sudden losses: bottom 25th percentile for the sample

## RESULTS

### Training Performance

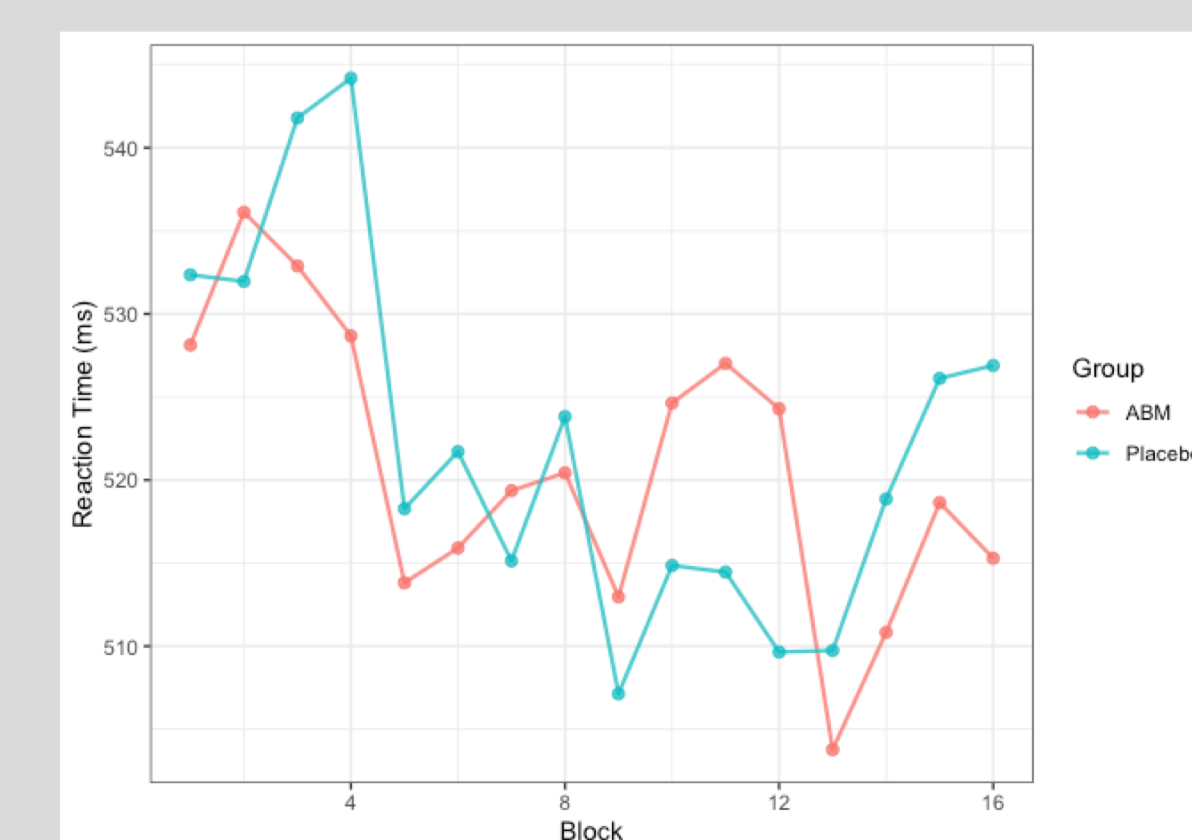


Figure 3. Training reaction time plotted by group for each of the 16 training blocks.

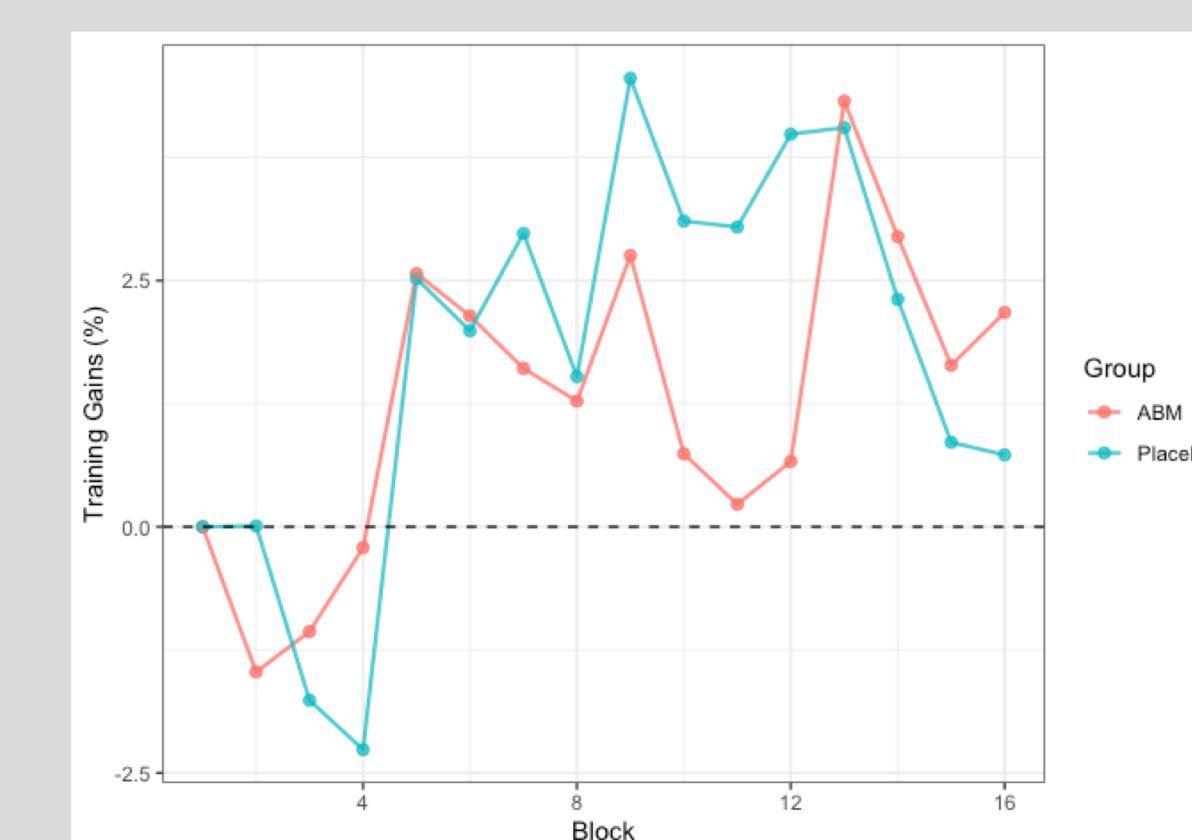


Figure 4. Training performance (intrapersonal approach) plotted by group for each of the 16 training blocks.

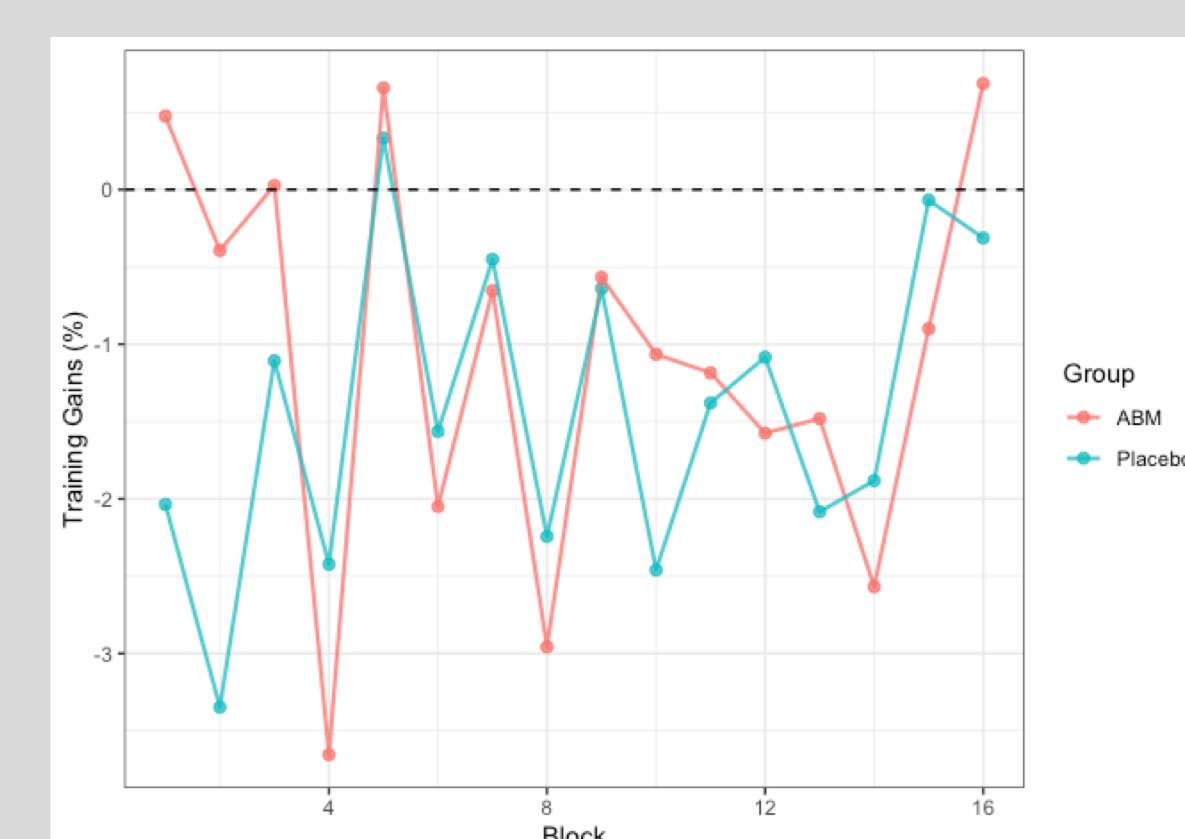


Figure 5. Training performance (interpersonal approach) plotted by group for each of the 16 training blocks.

### Interpersonal Difference of the First Half of Training Session 1

- A 2 (Groups: ABM and Placebo) x 2 (Sudden Gains: Gains and No Gains) and a 2 (Group: ABM and Placebo) x 2 (Sudden Losses: Losses and No Losses) between-subject ANOVA were conducted separately for Threat Bias (TB), Disengagement, Vigilance, and subjective anxiety as dependent variables.

- Counterintuitively, across groups, participants who experienced sudden gains reported higher anxiety levels than those who did not experience sudden gains.

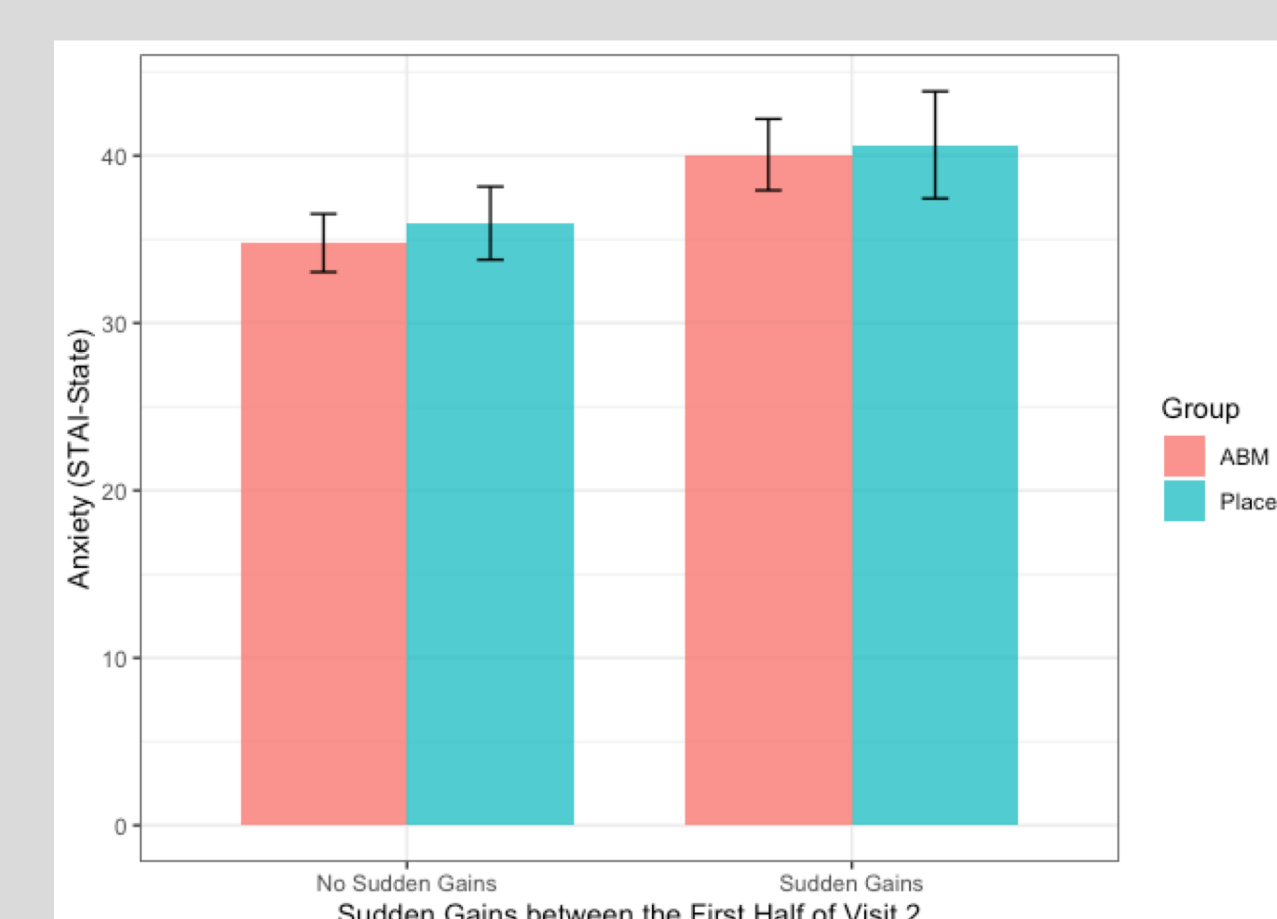


Figure 6. Self-reported anxiety comparison for sudden gains in the first half of Training Session 1 for each group. Error bars signify  $\pm 1$  SE.  $F(1, 79) = 4.42$ ,  $p = .039$ , partial  $\eta^2 = .05$ .

### Interpersonal Difference of the Second Half of Training Session 1

- Across groups, participants who experienced sudden gains showed **lower TB** compared to those who did not experience sudden gains, while those who experienced sudden losses showed **higher TB** compared to those who did not experience sudden losses. In addition, there were Sudden Gains x Group interactions, such that in **ABM group**, participants who experienced sudden gains showed **less difficulty disengaging** from threat cues and **higher**

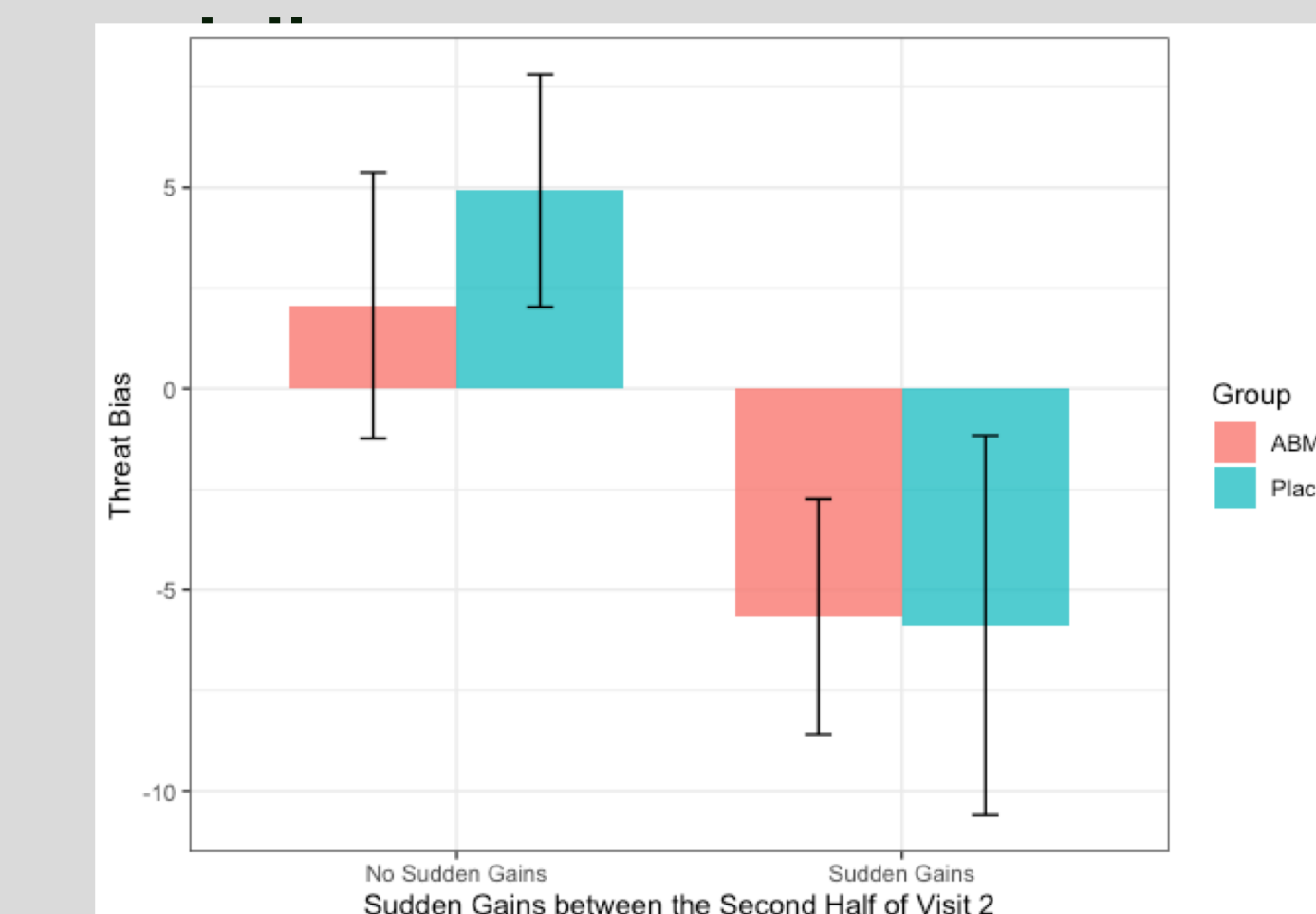


Figure 7. Threat Bias for sudden gains in the second half of Training Session 1 for each group. Error bars signify  $\pm 1$  SE.  $F(1, 79) = 6.01$ ,  $p = .016$ , partial  $\eta^2 = .07$ .

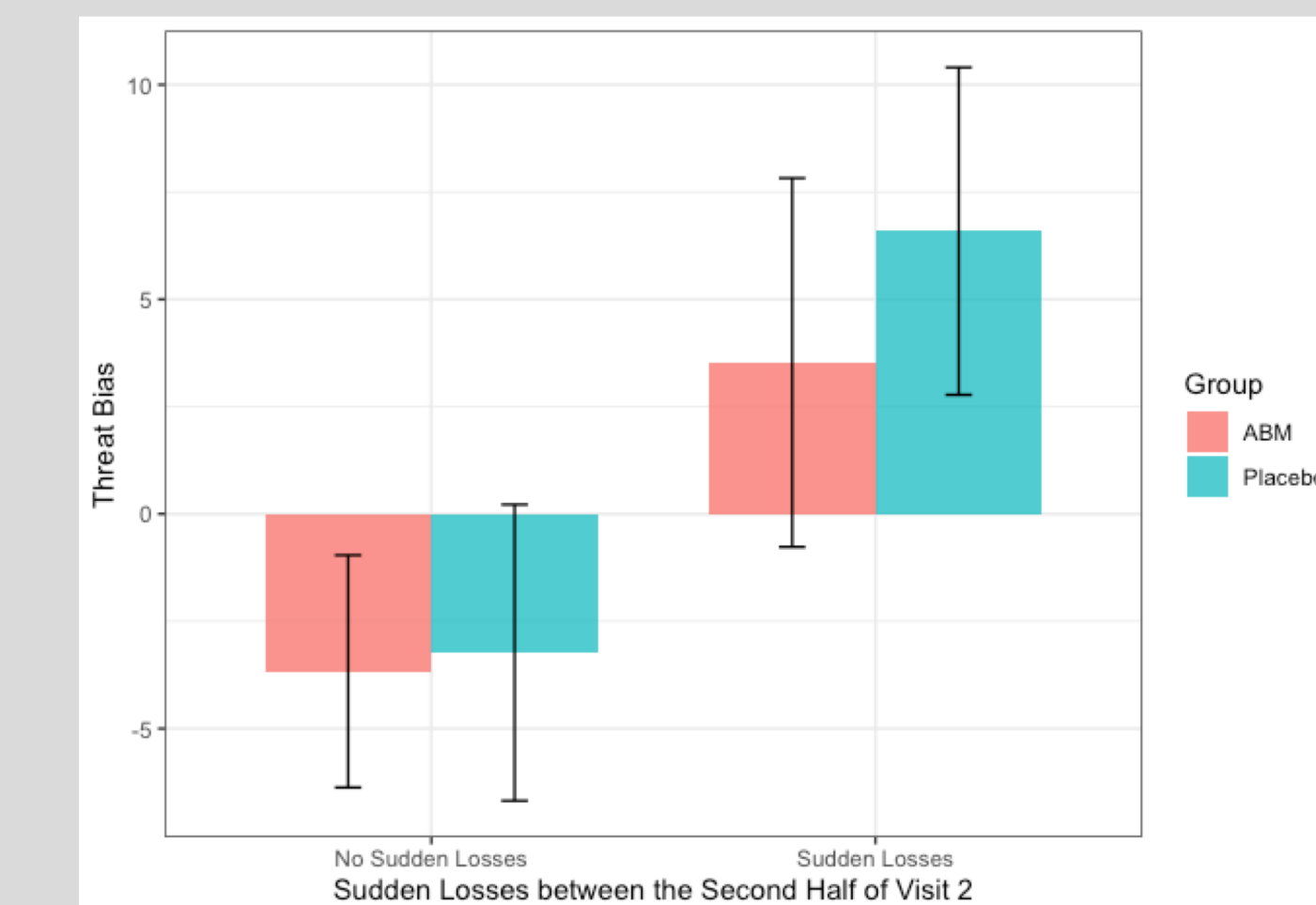


Figure 8. Threat Bias for sudden losses in the second half of Training Session 1 for each group. Error bars signify  $\pm 1$  SE.  $F(1, 79) = 5.49$ ,  $p = .022$ , partial  $\eta^2 = .07$ .

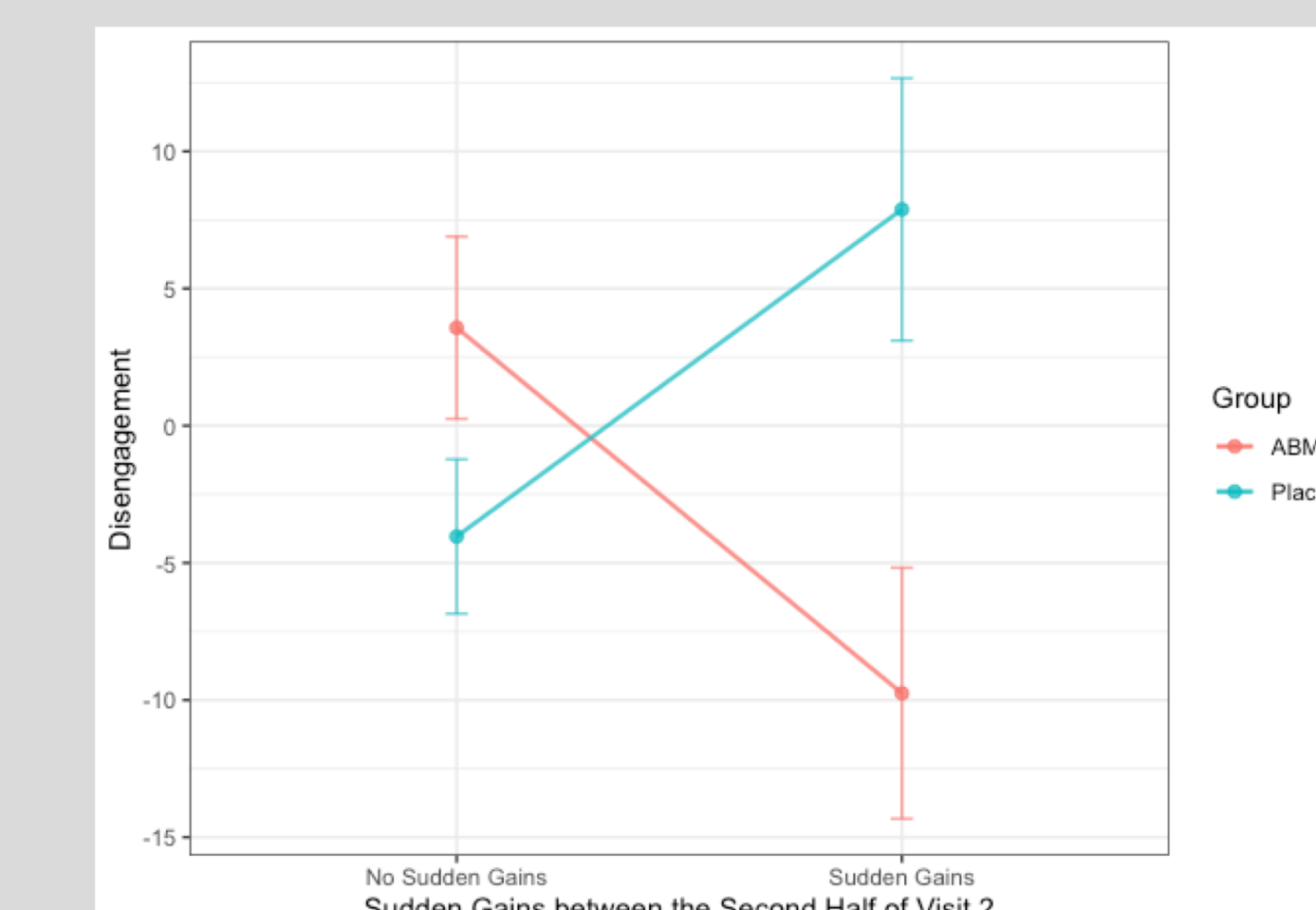


Figure 9. Disengagement scores for sudden gains in the second half of Training Session 1 for each group. Error bars signify  $\pm 1$  SE.  $F(1, 79) = 10.36$ ,  $p = .002$ , partial  $\eta^2 = .17$ .

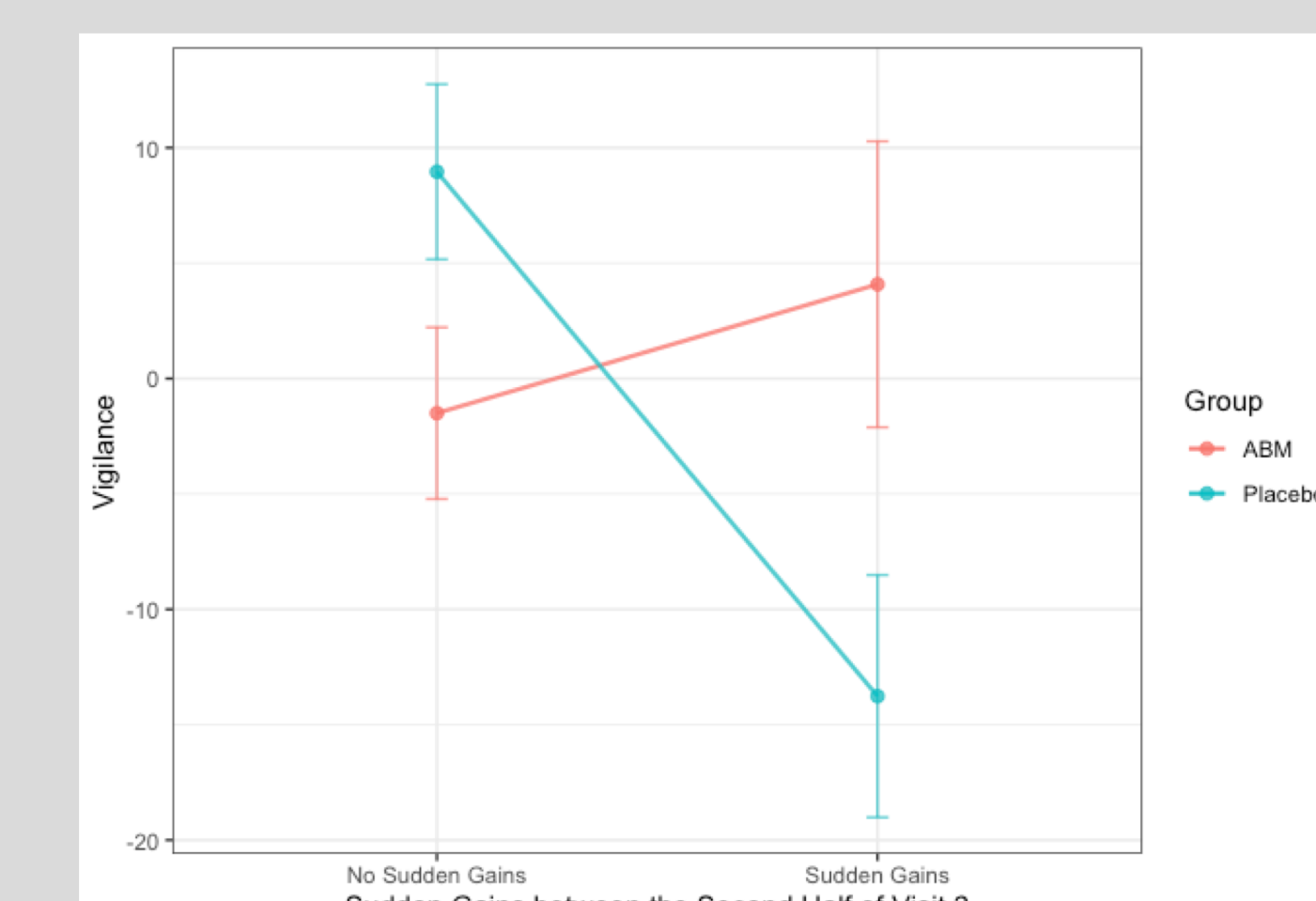


Figure 10. Vigilance scores for sudden gains in the second half of Training Session 1 for each group. Error bars signify  $\pm 1$  SE.  $F(1, 79) = 9.04$ ,  $p = .004$ , partial  $\eta^2 = .10$ .

## DISCUSSION

- The current study used innovative methods to quantify gains and losses during ABM.
- The results indicated that the presence of **sudden gains** in the second half of Training Session 1 predicted **lower attention bias** but not subjective anxiety three months after ABM. On the other hand, **sudden losses** in the second half of Training Session 1 predicted **higher threat bias** across groups.
- The results suggest that early sudden gains and losses can be used as unique factors that may influence the impact of ABM on AB and subjective anxiety.
- The current study has potentials for identifying individuals who may benefit most from ABM by detecting early warning signals predicting treatment outcomes.

## REFERENCES

- Abend, R., Kami, A., Sadeh, A., Fox, N. A., Pine, D. S., & Bar-Haim, Y. (2013). Learning to attend to threat accelerates and enhances memory consolidation. *PLOS ONE*, 8(4), e62501.
- Bystritsky, A. (2006). Treatment-resistant anxiety disorders. *Molecular Psychiatry*, 11(9), 805-814.
- Gaynor, S. T., Weersing, V. R., Kolko, D. J., Birmaher, B., Heo, J., & Brent, D. A. (2003). The prevalence and impact of large sudden improvements during adolescent therapy for depression: A comparison across cognitive-behavioral, family, and supportive therapy. *Journal of Consulting and Clinical Psychology*, 71(2), 386-393.
- Hakamata, Y., Lissek, S., Bar-Haim, Y., Britton, J. C., Fox, N. A., Leibenluft, E., . . . Pine, D. S. (2010). Attention bias modification treatment: a meta-analysis toward the establishment of novel treatment for anxiety. *Biological Psychiatry*, 68(11), 982-990.
- Heeren, A., Philippot, P., & Koster, E. H. W. (2015). Impact of the temporal stability of preexistent attentional bias for threat on its alteration through attention bias modification. *Journal of Behavior Therapy and Experimental Psychiatry*, 49, 69-75.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 593-602.
- Olthof, M., Hasselman, F., Strunk, G., van Rooij, M., Aas, B., Helmich, M. A., . . . Lichtwark-Aschoff, A. (2019). Critical fluctuations as an early-warning signal for sudden gains and losses in patients receiving psychotherapy for mood disorders. *Clinical Psychological Science*, 8(1), 25-35.
- Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Tang, T. Z., Luborsky, L., & Andrusyna, T. (2002). Sudden gains in recovering from depression: Are they also found in psychotherapies other than cognitive-behavioral therapy? *Journal of Consulting and Clinical Psychology*, 70(2), 444-447.