



Attention bias to threat:

What do we know so far and how is it relevant to therapeutics?

Tomer Shechner, Ph.D.

Section on Developmental Affective Neuroscience
National Institute of Mental Health

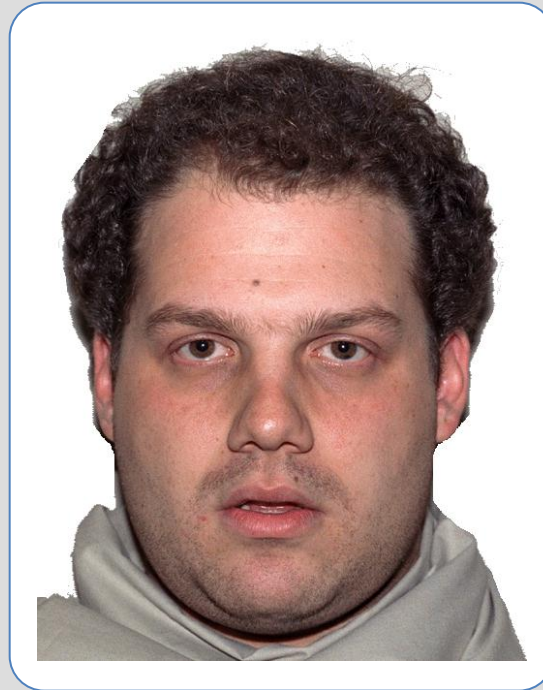
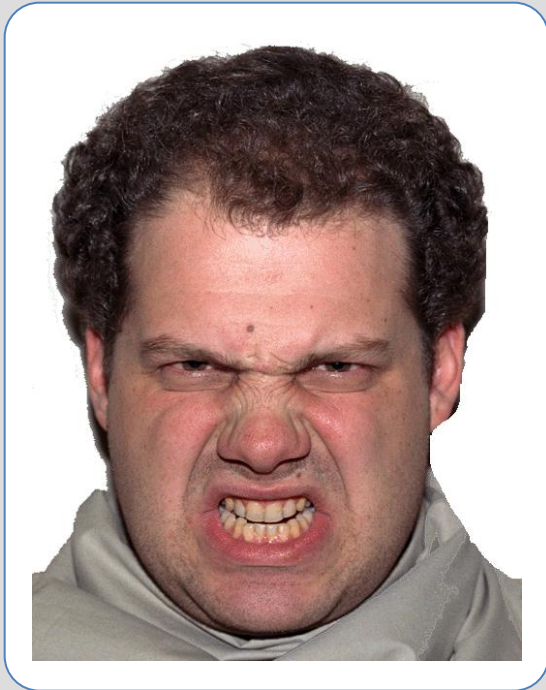
Disclosure

- Nothing to disclose.

Talk outline

- Attention biases in anxious youth
- Attention biases as early markers of anxiety
- Manipulating attention biases

Biased threat processing in anxiety



- Fast engagement with threat-related stimuli
- Difficult to disengage attention from threat
- No threat bias in healthy non-anxious adults

Measuring

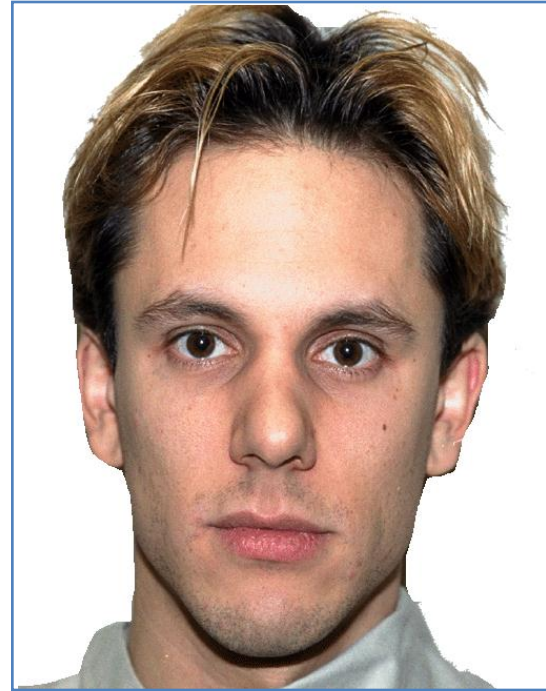
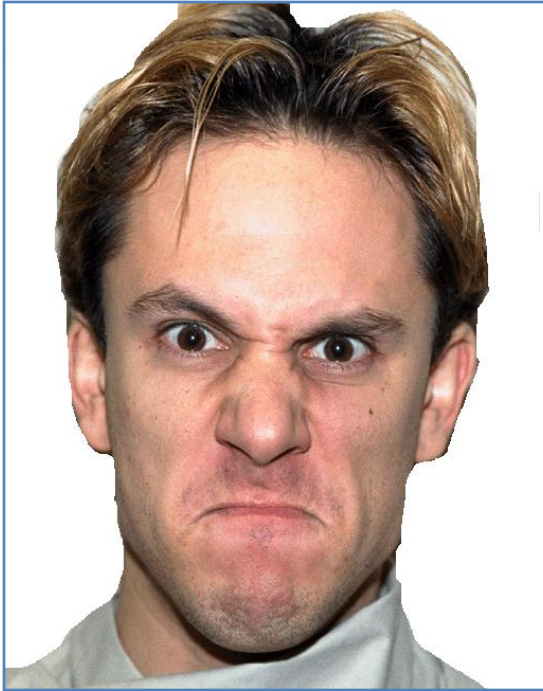
Measuring threat-related attention bias

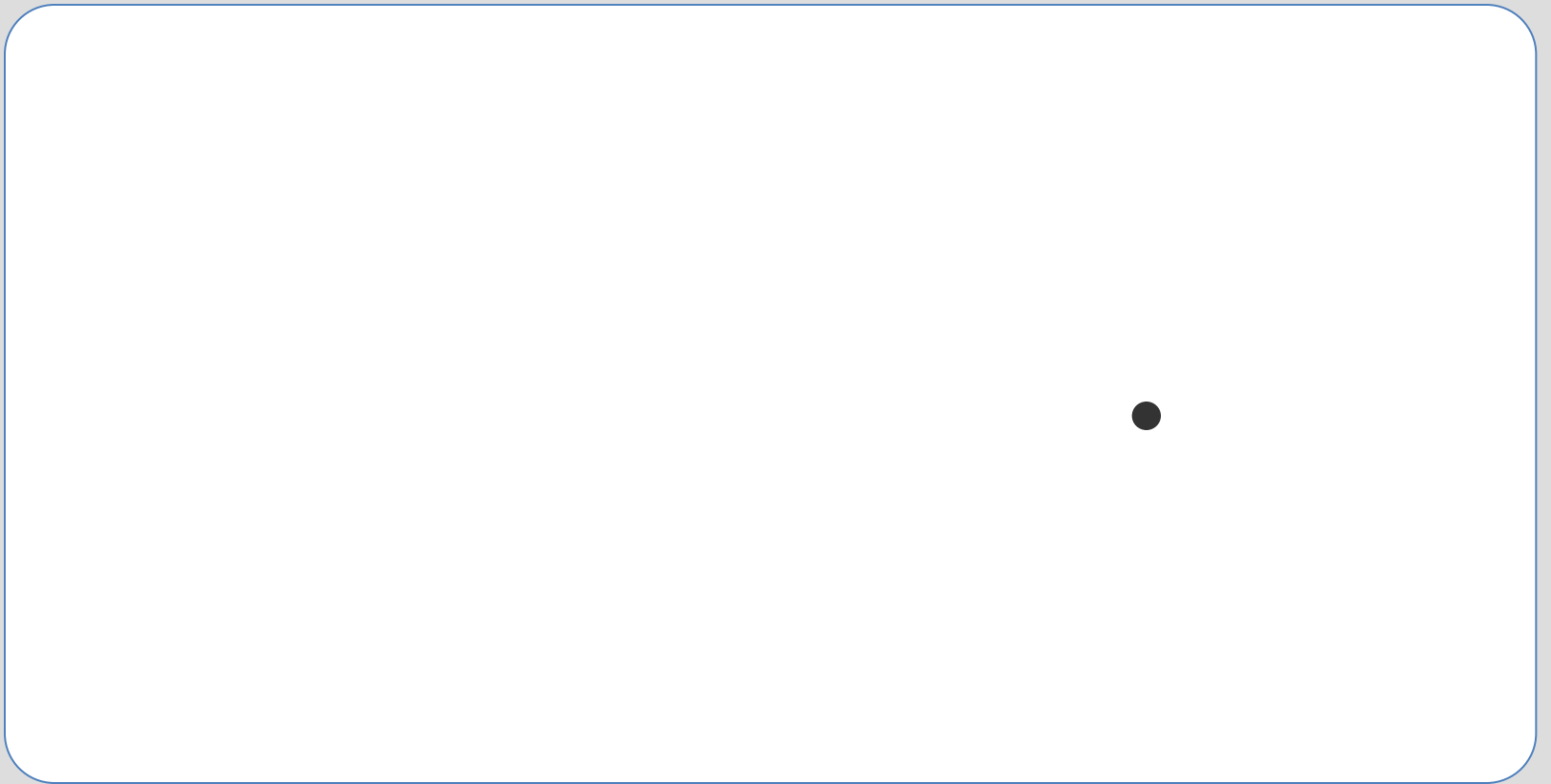
+





+






Measuring attention bias

Threat congruent
 RT_c


+



•

Threat incongruent
 RT_i

+



••

$$\text{Bias score} = RT_i - RT_c$$

- (+) bias towards threat
- (0) no bias
- (-) bias away from threat

Literature summary

- Attention biases to threat are associated with anxiety
- Most dot-probe studies show a bias to threat but:
 - Some studies show a bias away from threat
 - Longer stimuli presentation affect the bias

The vigilance - avoidance cognitive model

Several levels of control involved in attention allocation:

- Initial rapid engagement to threat
- Subsequent avoidance of threat

Dot probe shortcomings

- Attention is measured only at one time point
- Indirect measure of attention
- Motor responses are a potential confound

Eye tracking study

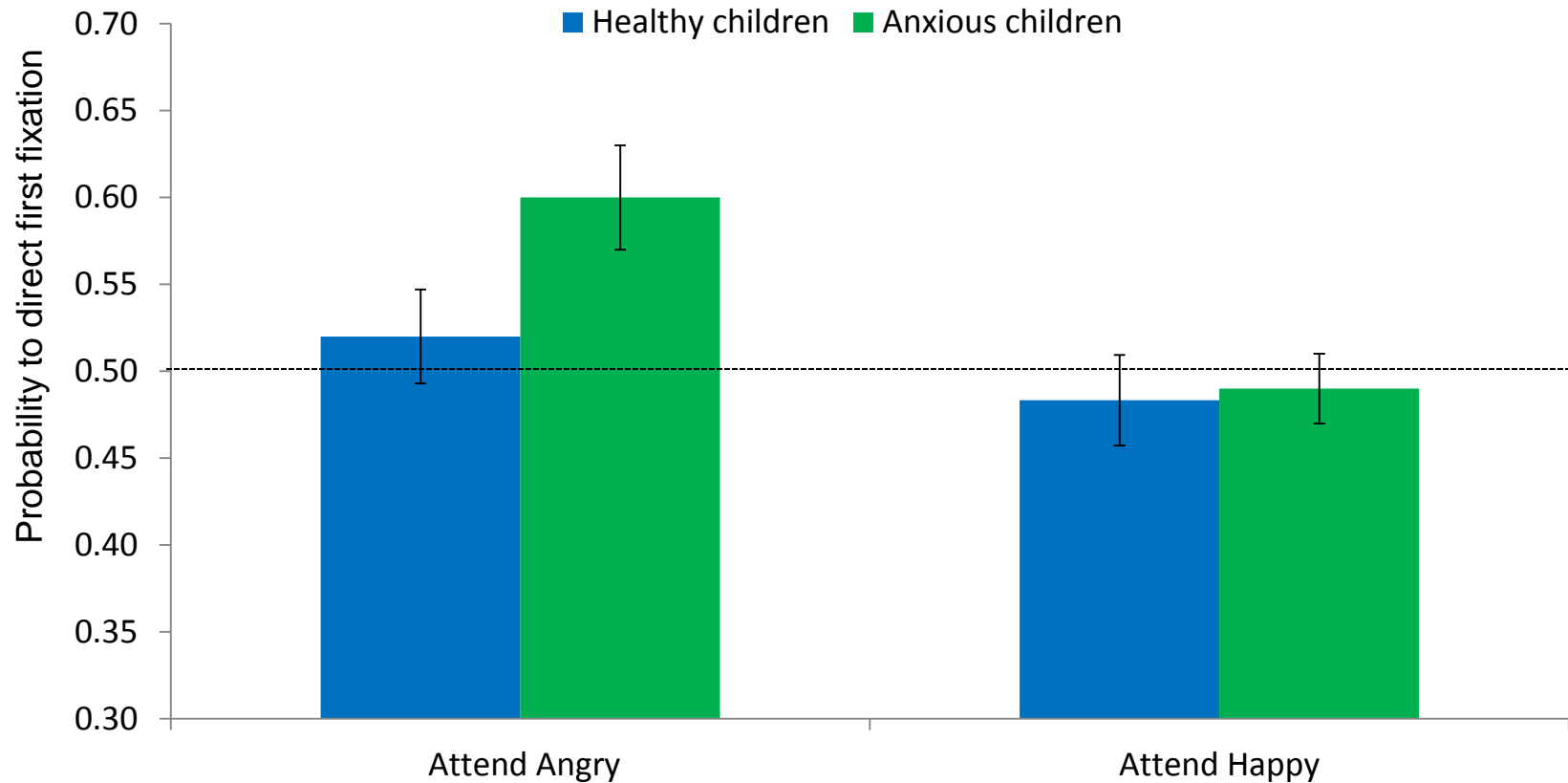
Study hypotheses

- Anxious children will attend to threat more than non-anxious children
- In line with the vigilance – avoidance cognitive model, anxious children will initially attend to threat and then avoid it



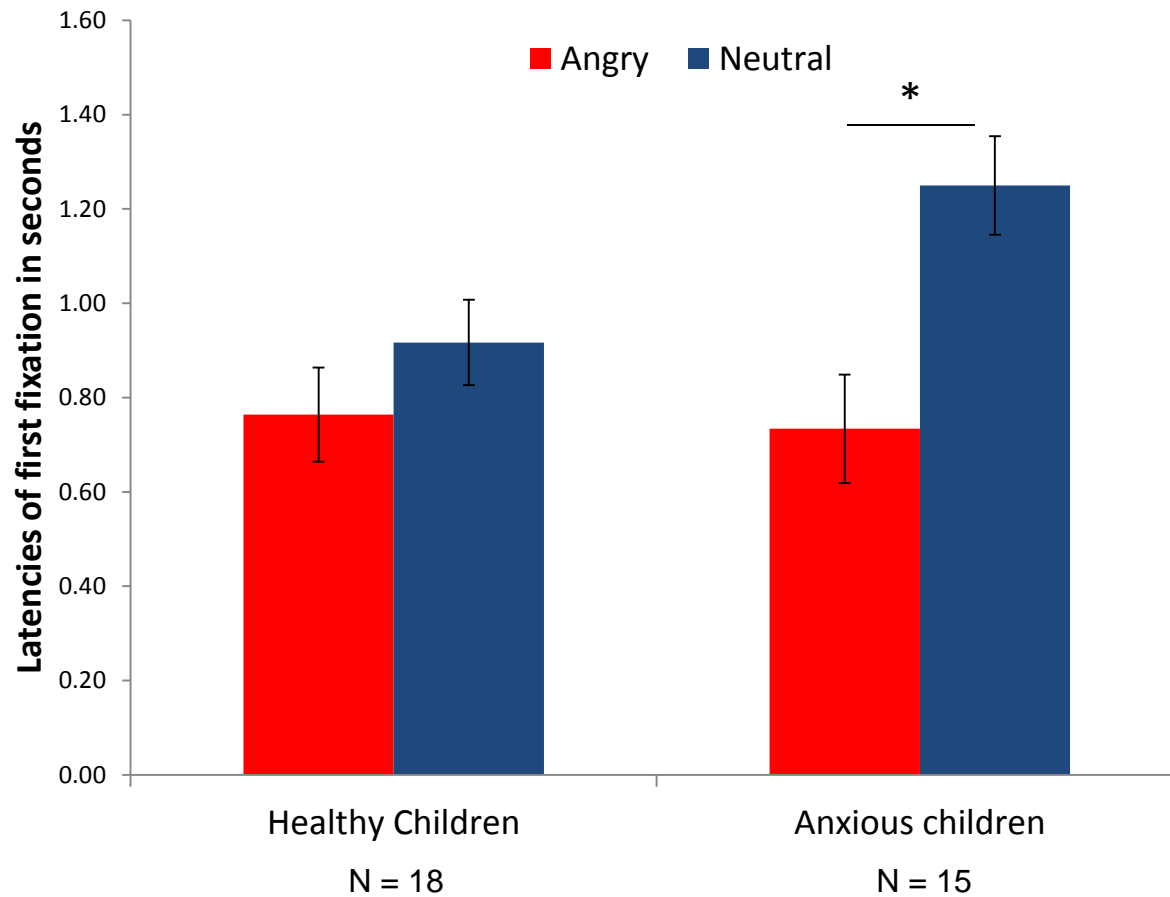


Where did they look first?



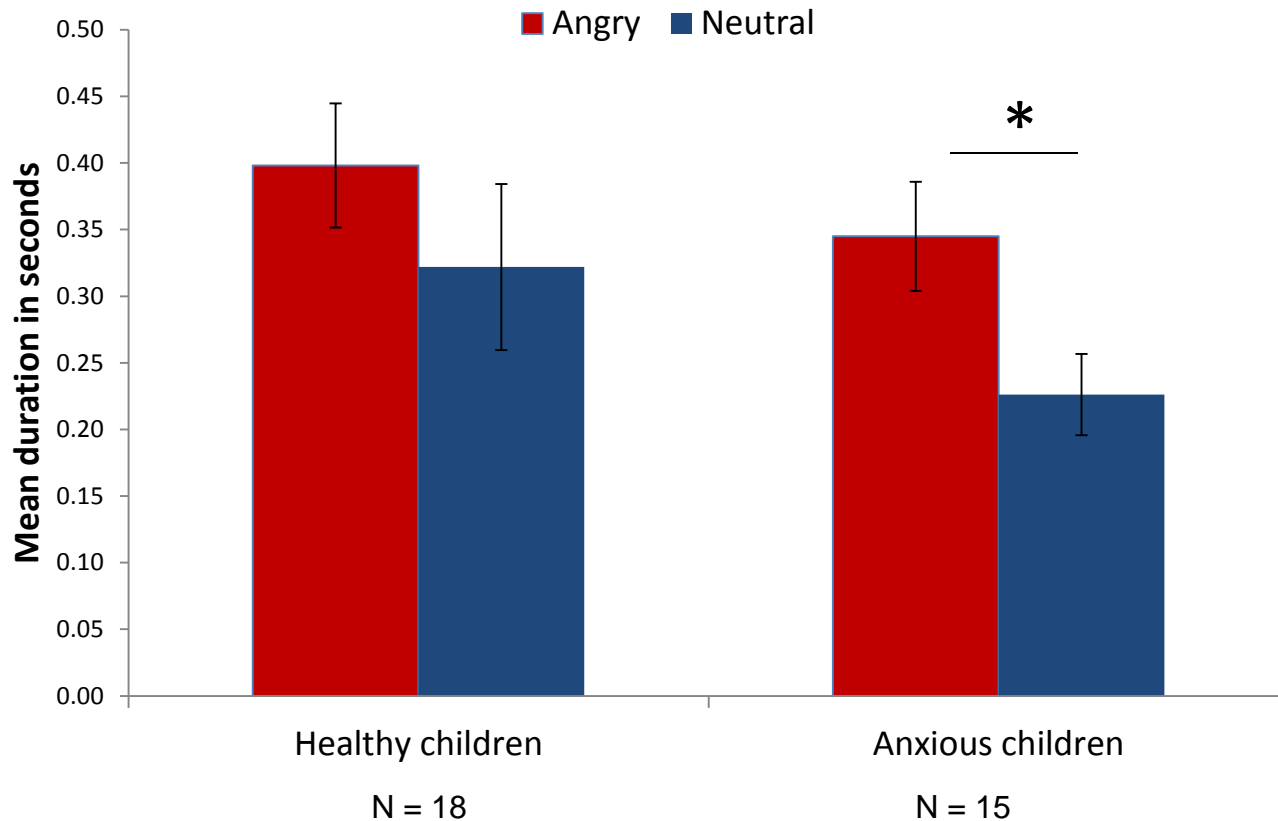
$t(30) = 2.35, p < .05$ for angry faces, n.s. for happy

How fast did they look at each stimulus type?



Stimulus x Group interaction, $F(1, 29) = 4.33, p < .05$

How long did they look at each stimulus type (during first 500 ms)?



Time bin x Stimulus x Group, $F(19, 589) = 1.608, p < .05$

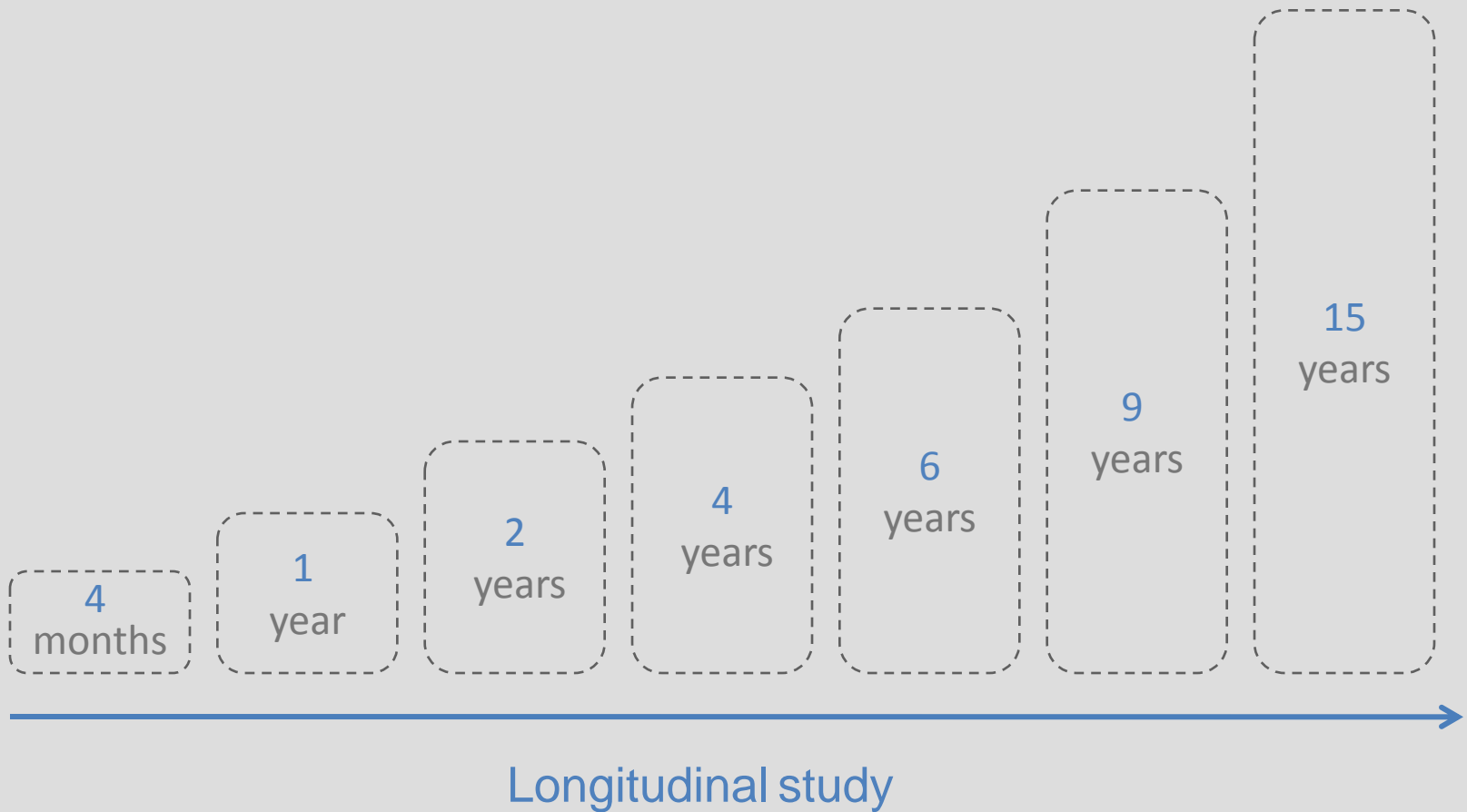
At risk populations

- Studying the developmental trajectory
- Studying at risk population - longitudinally
- Temperament

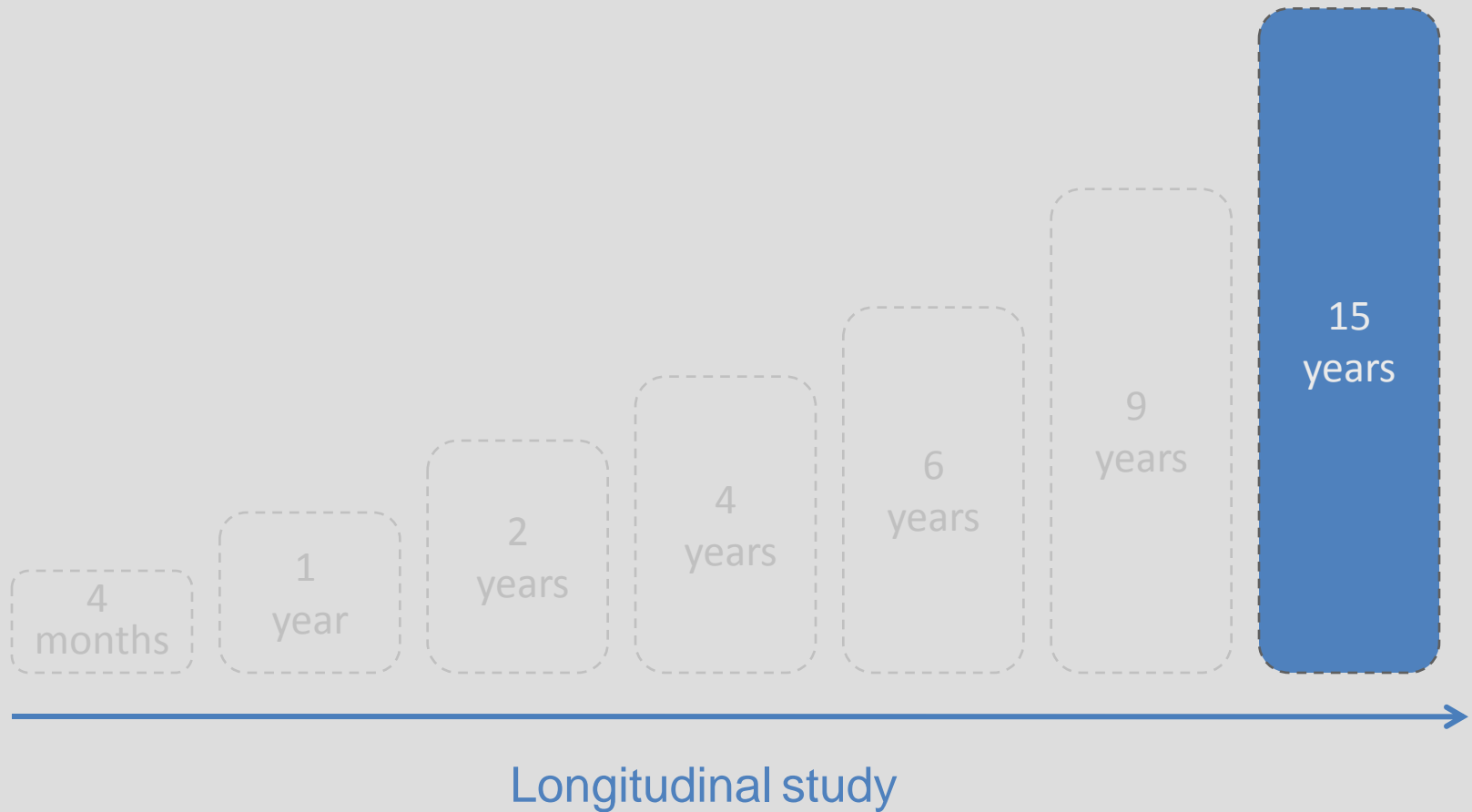
Temperament and Anxiety

- Children at risk for later anxiety can be identified early
- Behavioral inhibition:
Infants react with distress to novelty and as toddlers show excessive fear in novel social situations
- Stable and predicts increase in risk for anxiety disorder in adolescents

Behaviorally inhibited children



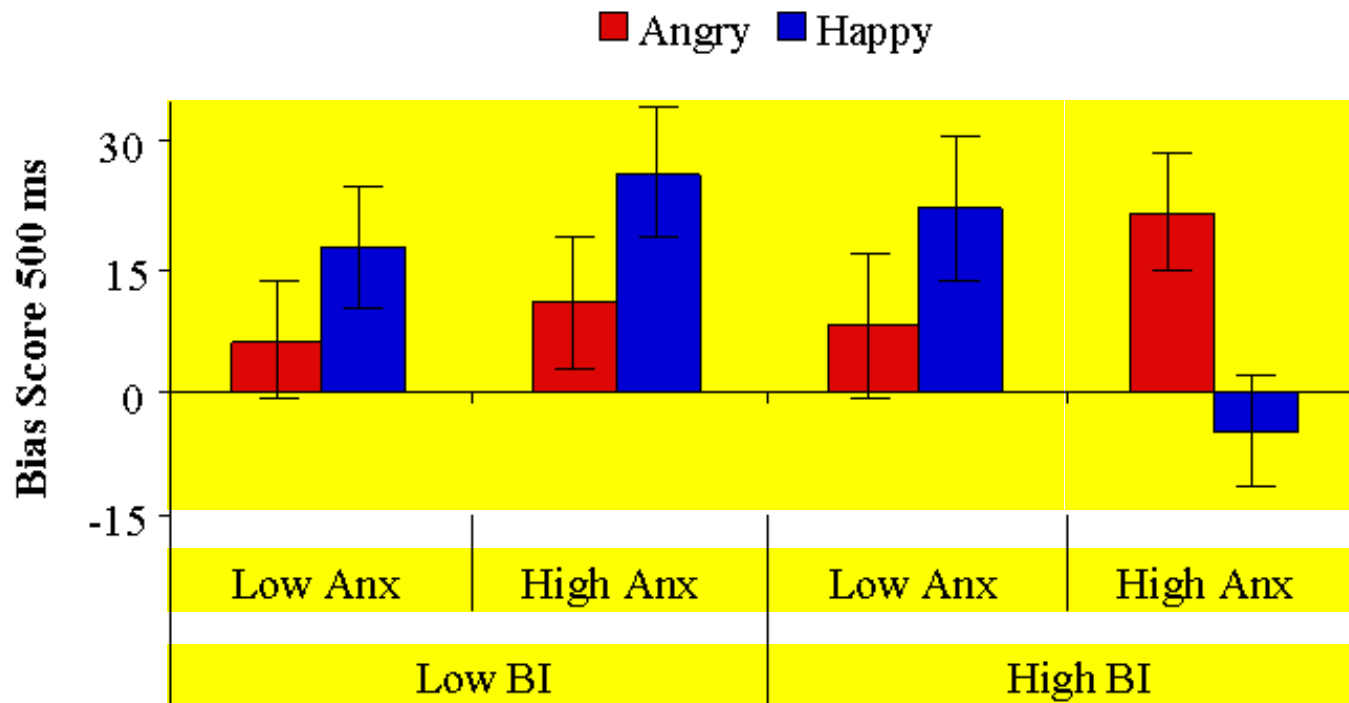
Behaviorally inhibited children



Behavioral inhibition & attention bias

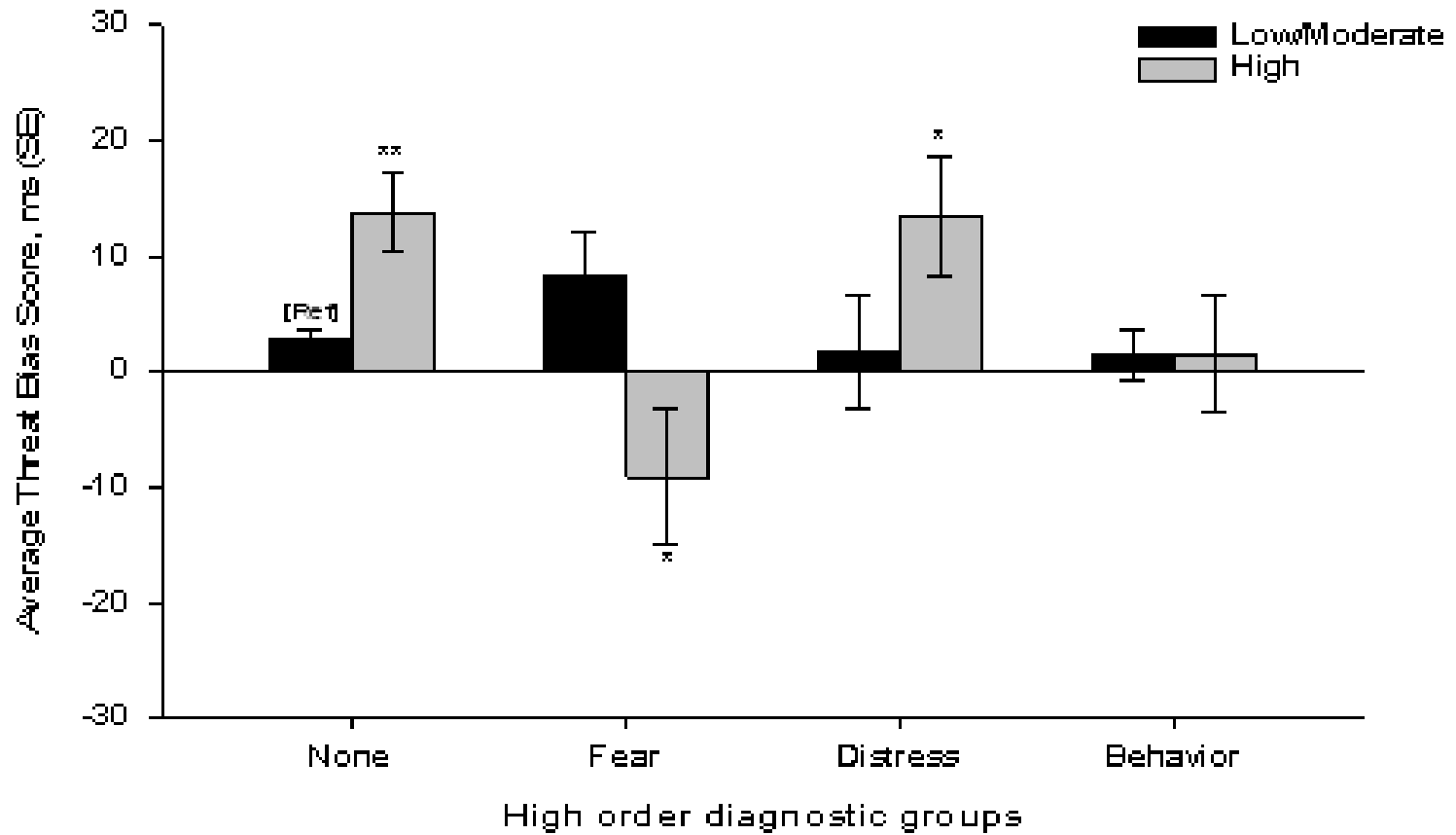
Absence of happy bias and large attention bias

Only in high BI and high anxiety adolescents



Direction of bias

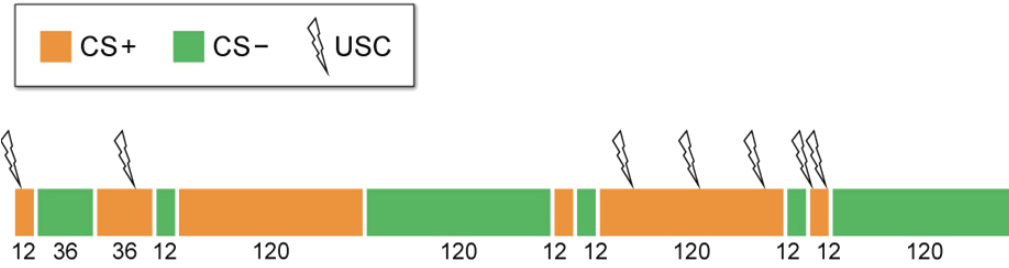
Attention bias and diagnosis



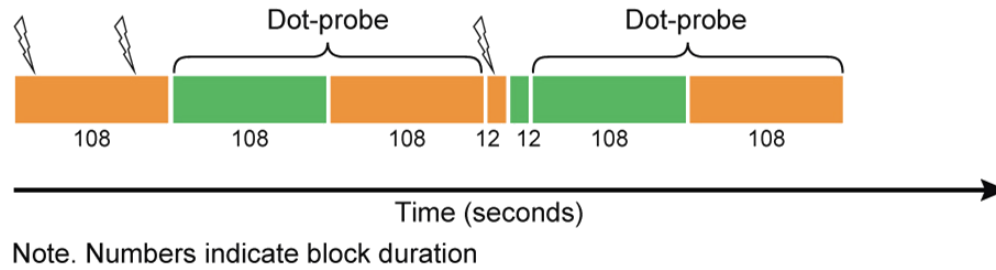
Direction of bias

- No threat related bias among non anxious adult
- Not the case in extreme and dangerous context
- Attention bias away from threat

A



B

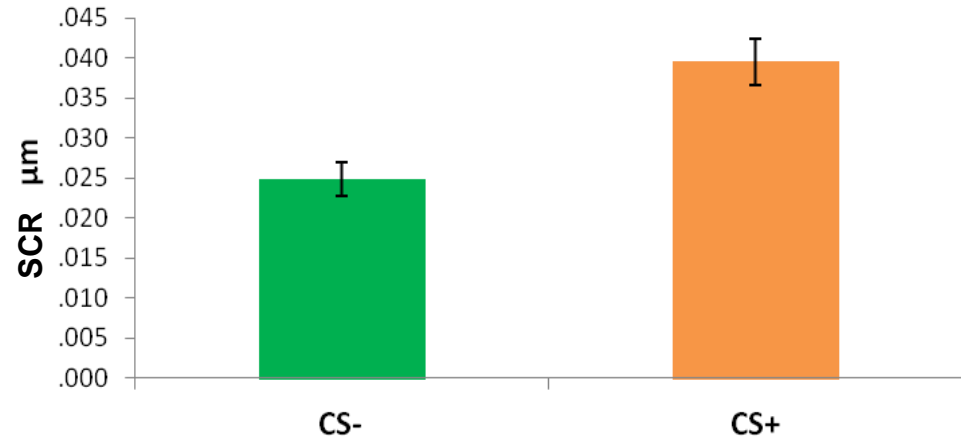


C



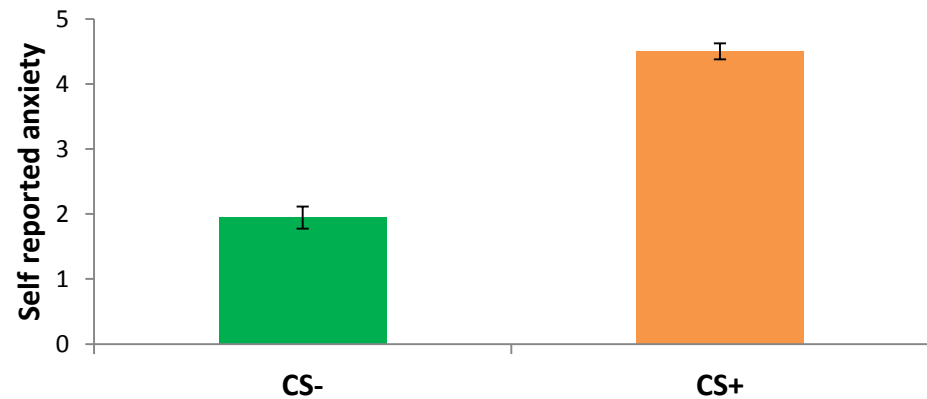
SCR onset levels across the experimental blocks

$F(1, 15) = 32.26, p < 0.001$

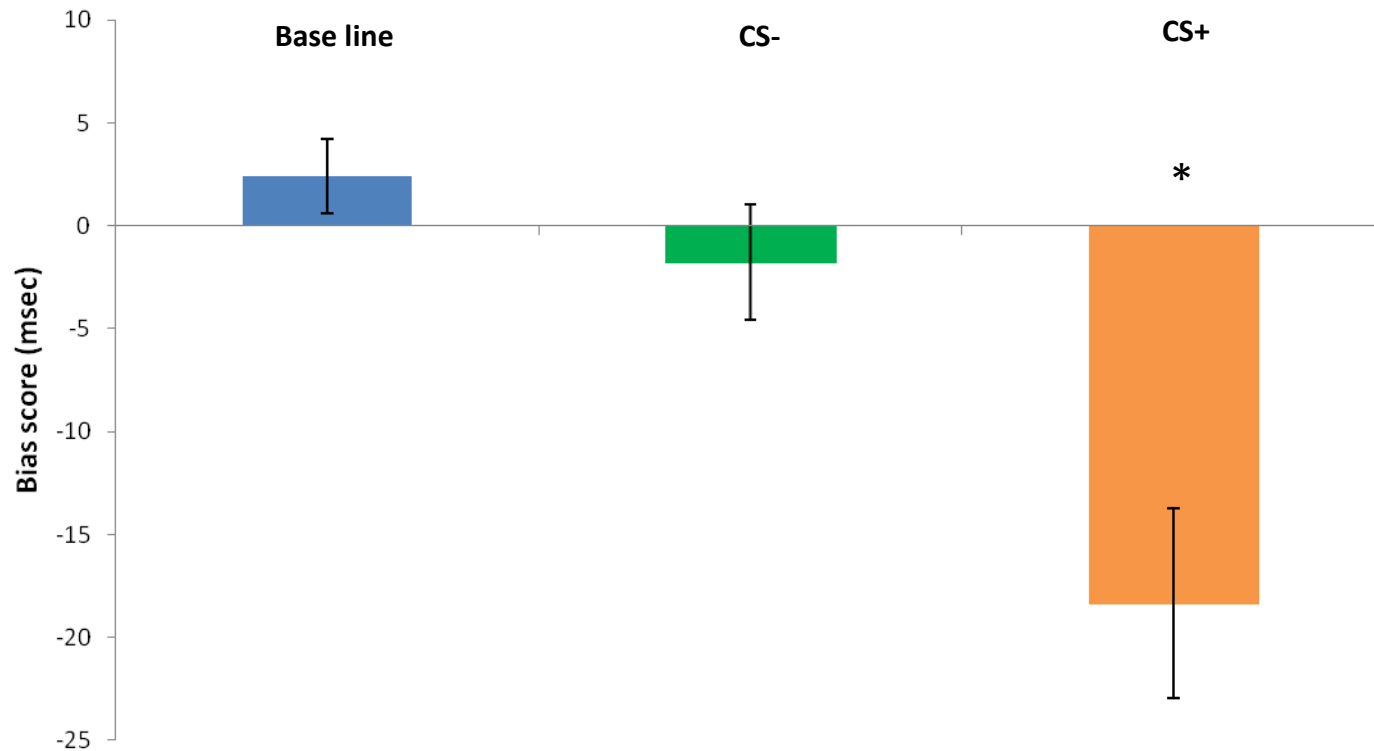


Self reported anxiety levels across the experimental blocks

$F(1, 17) = 236.66, p < 0.001$



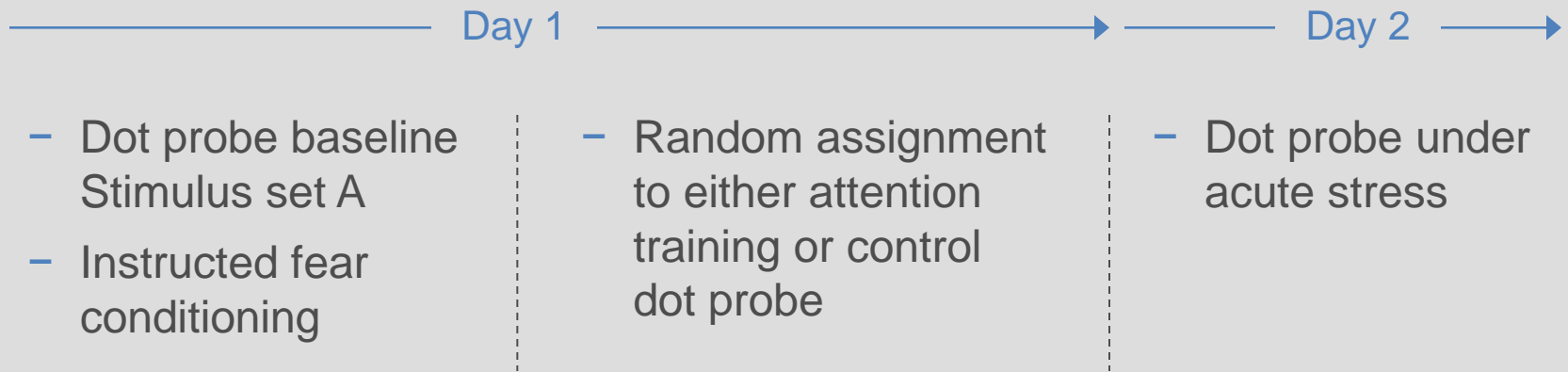
Attention bias scores across blocks



$F(2, 34) = 12.61, p < 0.01$ | CS + compare to zero: $t(17) = -3.98, p < 0.01$

Manipulating attention biases

Study 2 design



Time line

Training / Control Conditions

Training condition ABM
100% trials were congruent

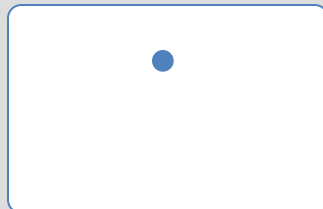
Congruent



500 ms



1000 ms

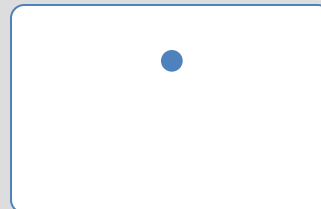
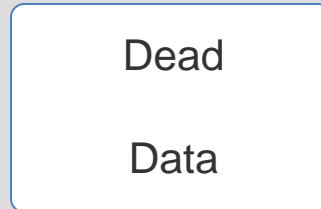


Until
Response

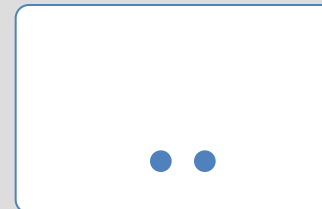
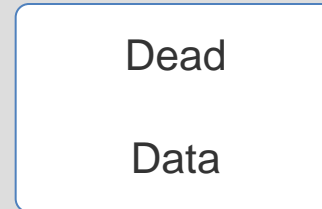
Control

50% trials were congruent & 50% incongruent

Congruent



Incongruent



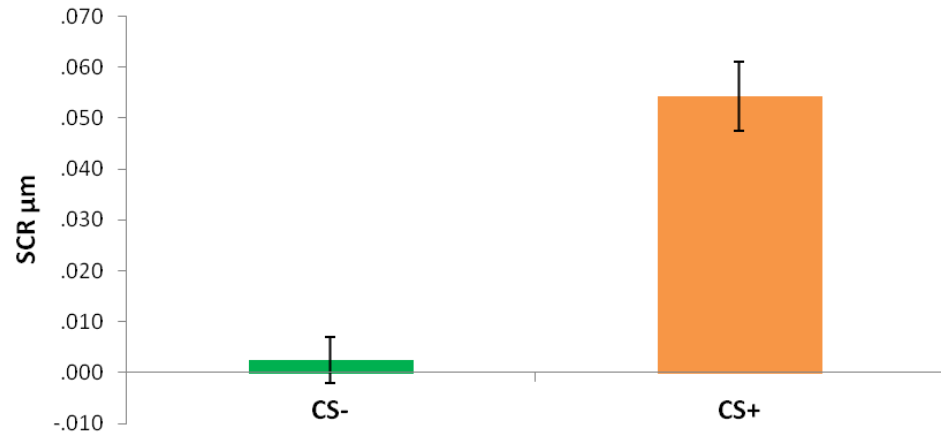
500 ms

1000 ms

Until
Response

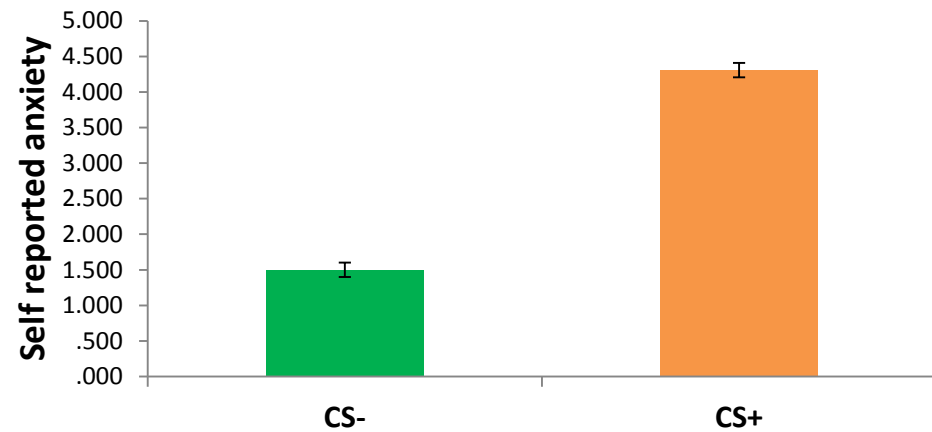
SCR onset levels across the experimental blocks

$F(1, 28) = 35.07, p < 0.01$

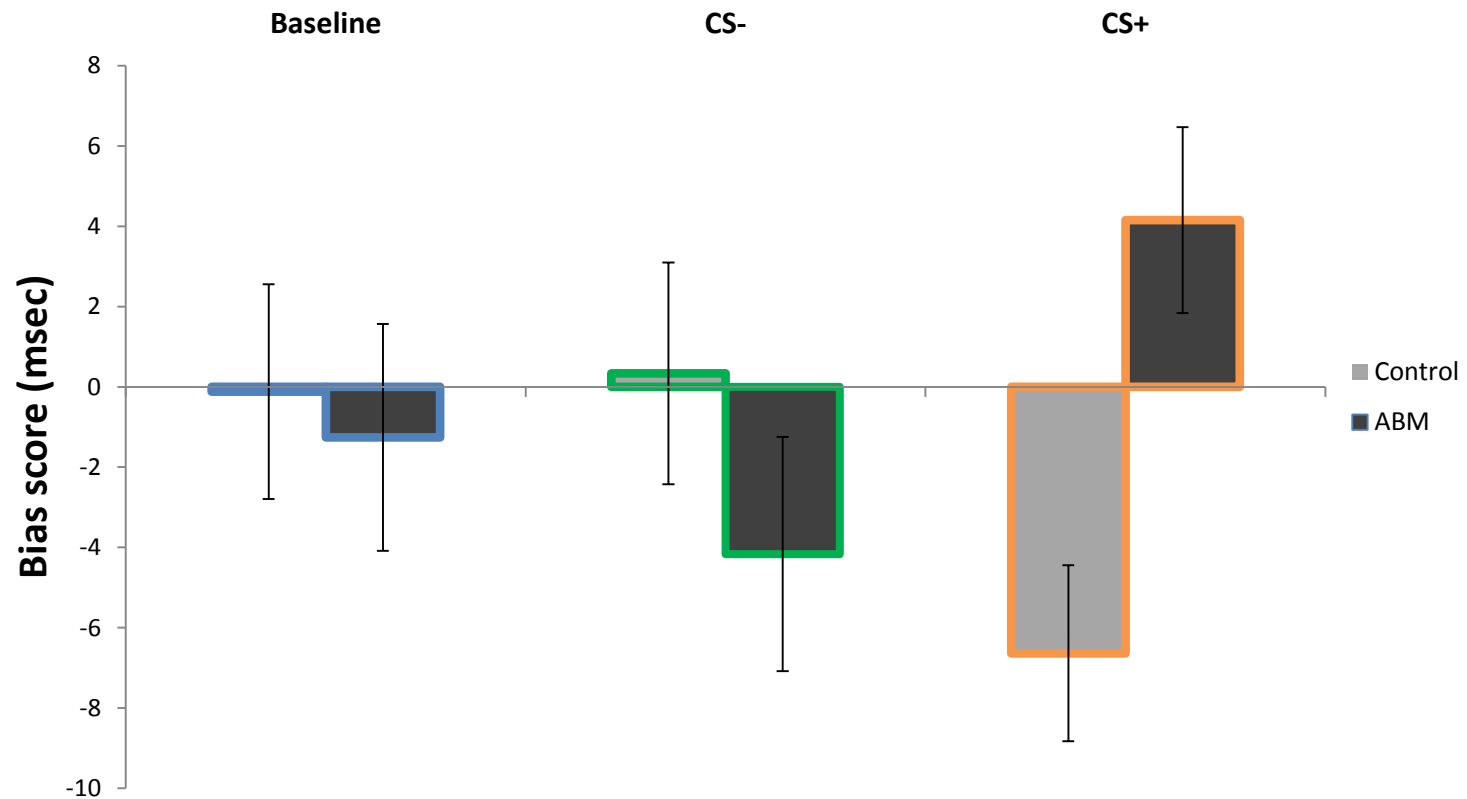


Self reported anxiety levels across the experimental blocks

$F(1, 35) = 562.26, p < 0.001$

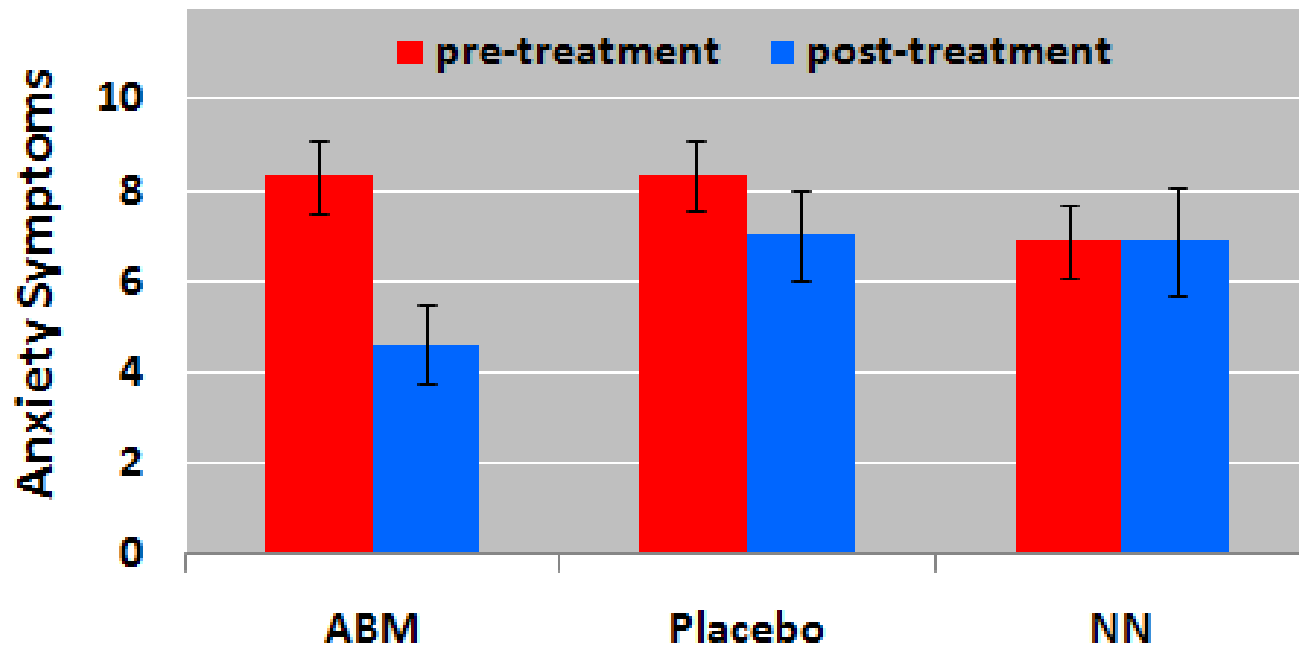


Attention bias scores across blocks

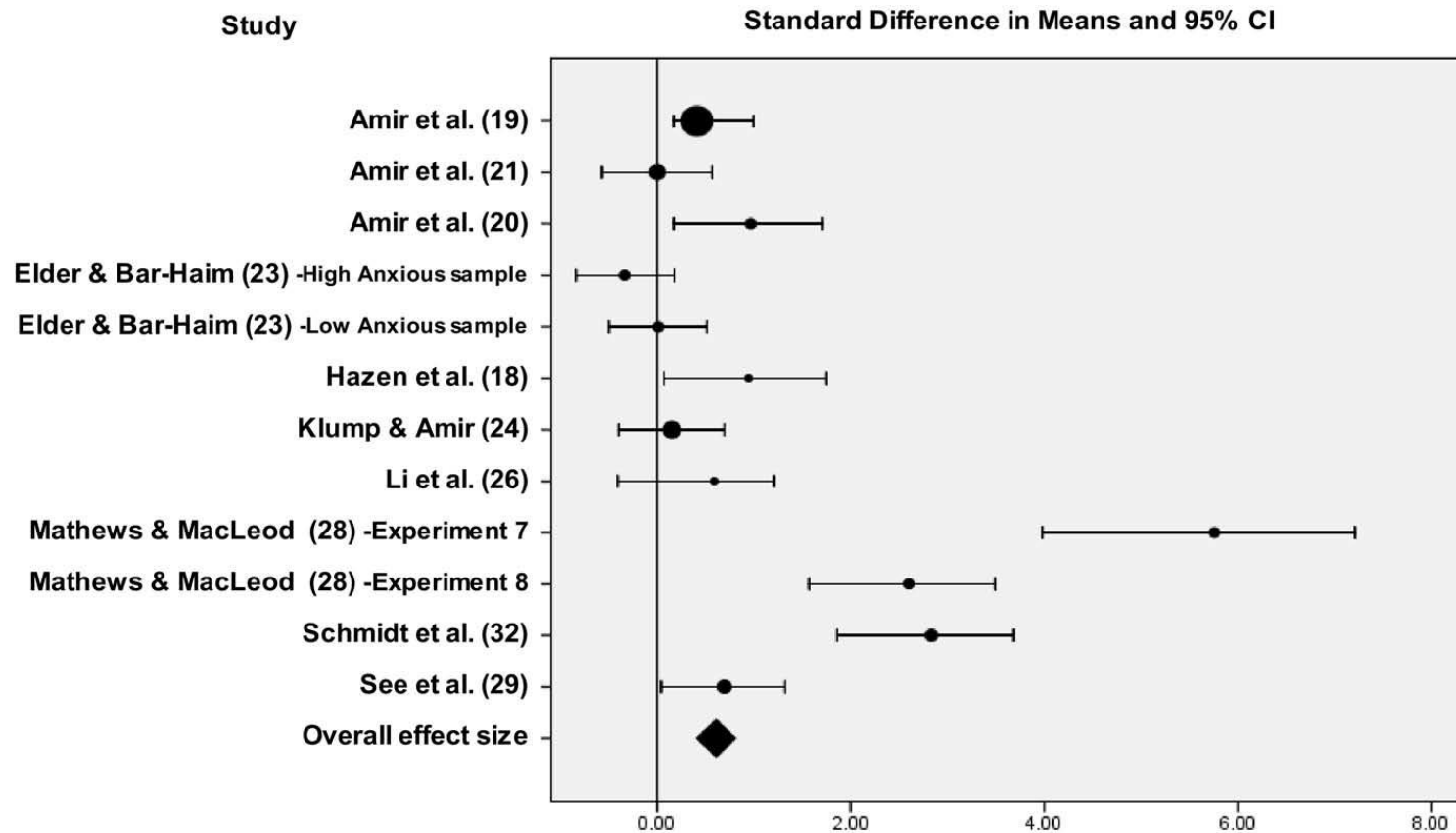


$F(2, 68) = 4.09, p < 0.02$

Four-Week Treatment Outcomes in Pediatric Anxiety Disorders

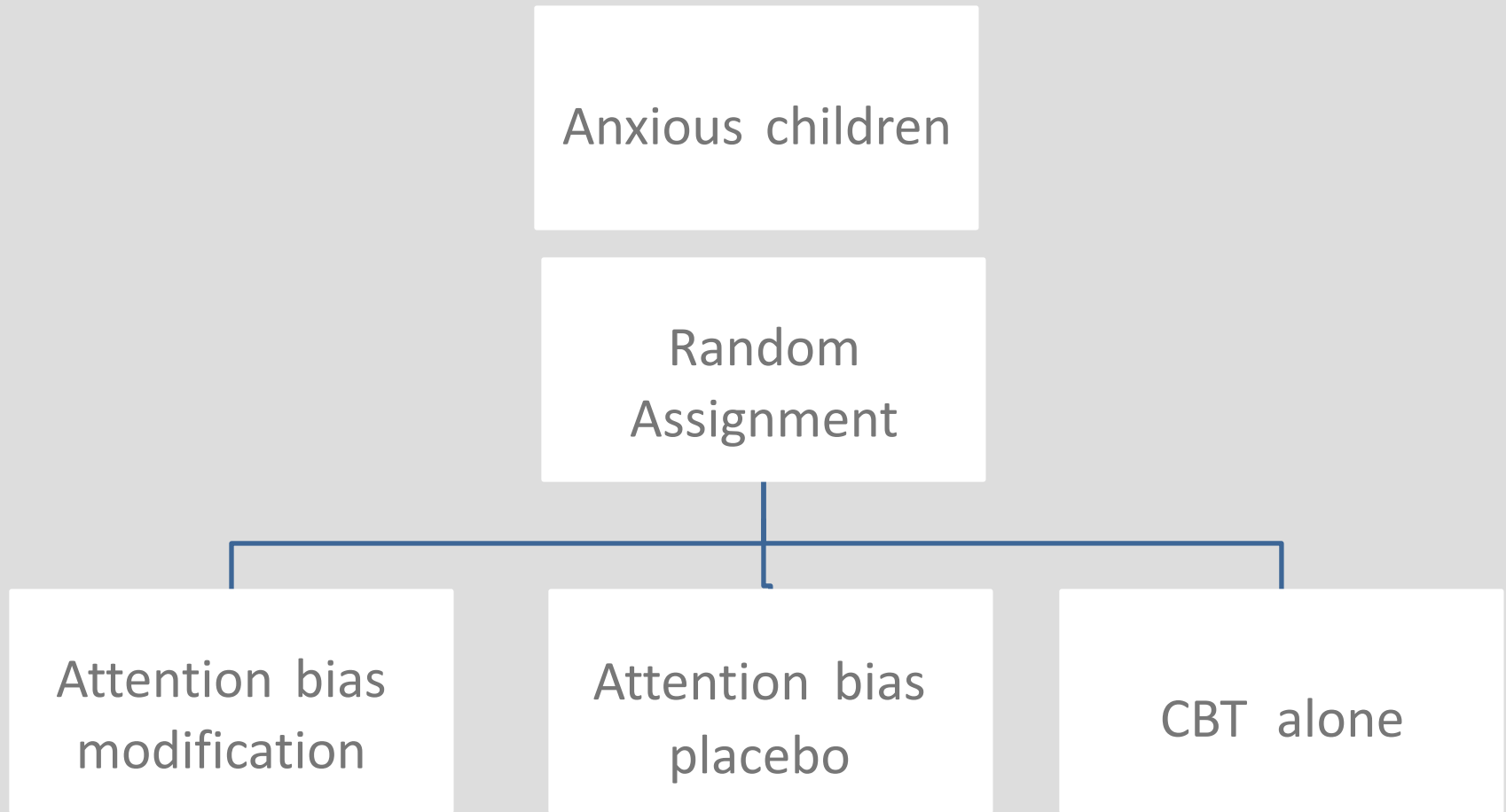


Meta-analysis training studies



$d = 0.61$

Current clinical study



Taken together

- Anxiety/risk for anxiety is associated with attentional biases
- Attention bias is a plastic phenomenon
- Attention bias could be manipulated/trained
- Attention training could have a therapeutic effect

Collaborators



- Danny Pine
- Ellen Leibenluft
- Jennifer Britton
- Johanna Jarcho
- Eric Nelson



- Yair Bar Haim



- Nathan Fox