Anxiety Moderating the Benefit of Proactive Control on Reappraisal

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Introduction

- **Cognitive reappraisal:** Emotion Regulation (ER) strategy that involves reinterpreting a negative situation as more positive; effective and requires cognitive effort.[1, 2]
- **Dual-Mechanisms of Control (DMC) framework:** 2 modes of cognitive control in regulating actions/thoughts.[3]
  - **Proactive**: advanced preparation before goal-oriented behavior
  - **Reactive**: present engagement of situation; recruits attention
- **Anxiety Influence on ER and Cognitive Control**
  - Reappraisal mechanisms are impaired in anxiety disorders.[4]
  - Anxiety impairs proactive control and enhances reactive control.[5, 6]

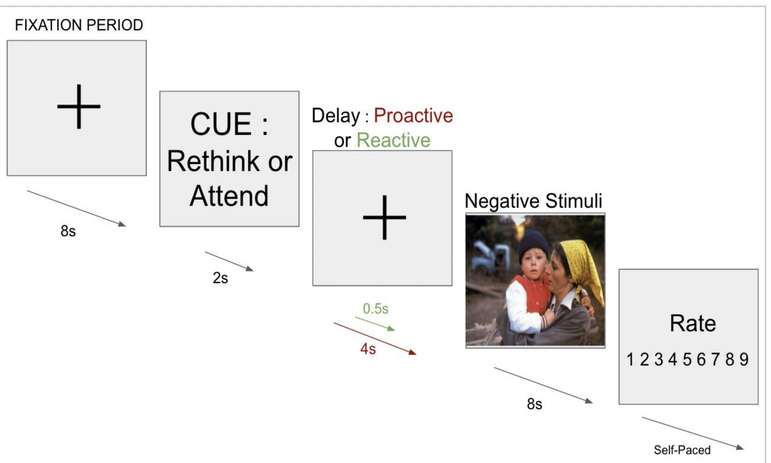
Previous literature has not yet explored how anxiety may affect proactive versus reactive cognitive control in respect to emotion regulation strategies.

Objectives

- To test how timing of cognitive control may benefit the effectiveness of ER strategies for anxious individuals.
- To explore the effect of anxiety on proactive versus reactive use of reappraisal in terms of reappraisal efficacy and effort using both self-reported and physiological metrics.

Methods

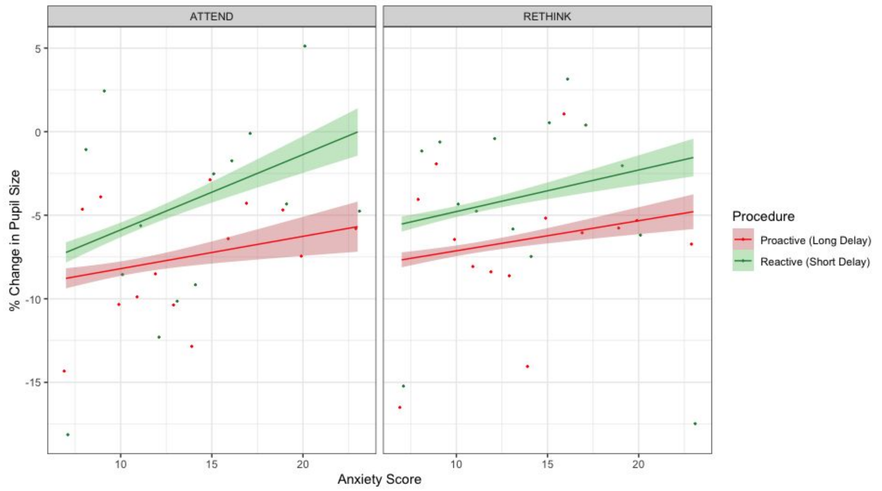
Participants (N=43 Younger Adults, 42 Older Adults) completed an emotion regulation task (80 trials).



Methods Cont.

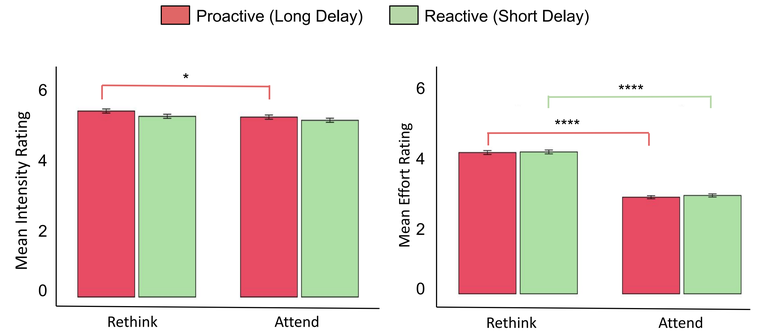
- **Independent Variables**
  - Total ***Anxiety*** Score (anxiety subscale from DASS-21); continuous
  - Randomized ***Delay*** Period: **SHORT** (reactive; 0.5s) or **LONG** (proactive; 4s)
  - Randomized ***Strategy***: **RETHINK** (reappraise in a positive way) or **ATTEND** (passive viewing)
- **Dependent Variables**
  - Self-Reported Intensity Rating and Effort Rating
  - Pupil dilation via eyetracking (index of emotional arousal and cognitive effort)
- **Pupil Size Preprocessing**
  - Pupillometry data were segmented into 250 ms bins (32 time bins)
  - *Average pupil range (mm) = Max pupil size (average pupil response to black screen) - Min pupil size (average pupil response to white screen)*
  - *% change in pupil size = (bin average - baseline) / average pupil range*

Pupil Size Results



- **Significant Anxiety x Delay x Strategy interaction in % change pupil size** proactive control significantly decreased pupil size compared to reactive control
  - Attend: enhanced decrease with higher anxiety score ($M_{diff} = 2.53$, $p = .04$)
  - Rethink: marginally enhanced decrease with higher anxiety score ($M_{diff} = 2.47$, $p = .06$)
- **Significant main effect of delay ($p < .001$)**: proactive control showed less pupil size than reactive control, regardless of anxiety level and strategy used
- **Significant main effect of strategy ($p < .001$)**: rethinking dilated pupil more than passive viewing, irrespective of anxiety level and delay

Self-Reported Rating Results



- **Significant main effect of delay for emotional intensity rating ($p < .001$)**: proactive control led to higher intensity rating than reactive control, regardless of anxiety level and strategy used,
- **Significant main effect of strategy for both emotional intensity rating ($p < .01$) and effort rating ($p < .001$)**: rethink engaged higher effort than attend, irrespective of anxiety level and delay
- No significant Anxiety x Delay x Strategy interaction found for both intensity and effort ratings

Discussion

- Inconsistent with prior literature indicating impaired effect of anxiety on proactive control in non-ER context,[6] we found that overall, anxiety amplifies the benefit of proactive control, especially for passive viewing compared to rethinking.
- Pupil dilates more in reactive vs. proactive trials, suggesting that proactive control decreased arousal and/or cognitive effort during task, thus indicating more successful emotion regulation.
- Pupillometry, but not self-reported metrics, revealed less effort for proactive vs. reactive reappraisal. Future studies could examine the reason behind this divergence of self-reported and biomarkers of cognitive effort.
- Understanding the temporal dynamics of emotion regulation could facilitate development of anxiety treatments by varying cognitive control timing based on specific anxiety levels.

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