

# A Cognitive Behavioral Therapy (CBT) Lesson Design for Statistics Anxiety

## Background

### Problem Scope

Statistics anxiety is feelings of anxiousness when faced with statistical problems, tasks, and environments. Over three-fourths of graduate students in the social sciences experience statistics anxiety at levels that undermine their learning (Onwuegbuzie et al., 2000). This anxiety is often accompanied by low computational self-concept characterized by feelings of hopelessness and reifying thoughts such as “I’ve never been good with numbers” (Malik, 2015, p. 129).

### Current recommendations

Past studies have used interventions or methods that suggest changes to the instructors’ behaviors or pedagogy (e.g., instructor immediacy, use of student-centered pedagogies and activities). Anxiety is unlikely to be permanently reduced if underlying thoughts go unaddressed (Williams & Garland, 2002).

### CBT and cognitive restructuring

CBT is a family of therapeutic interventions which aims to improve emotional responses through a variety of thought-change strategies (Arch & Craske, 2008). Cognitive restructuring is one such strategy.

Anxieties are often fed by thoughts that don’t accurately reflect reality. Cognitive restructuring reduces their impact by having clients directly experience the anxiety-inducing stimuli without the negative outcomes and using those experiences to confront reifying thoughts (Wolgast et al., 2013).

With thoughts that more accurately reflect reality, clients experience reduced anxiety when confronting the feared stimulus (Bond & Dryden, 2002).

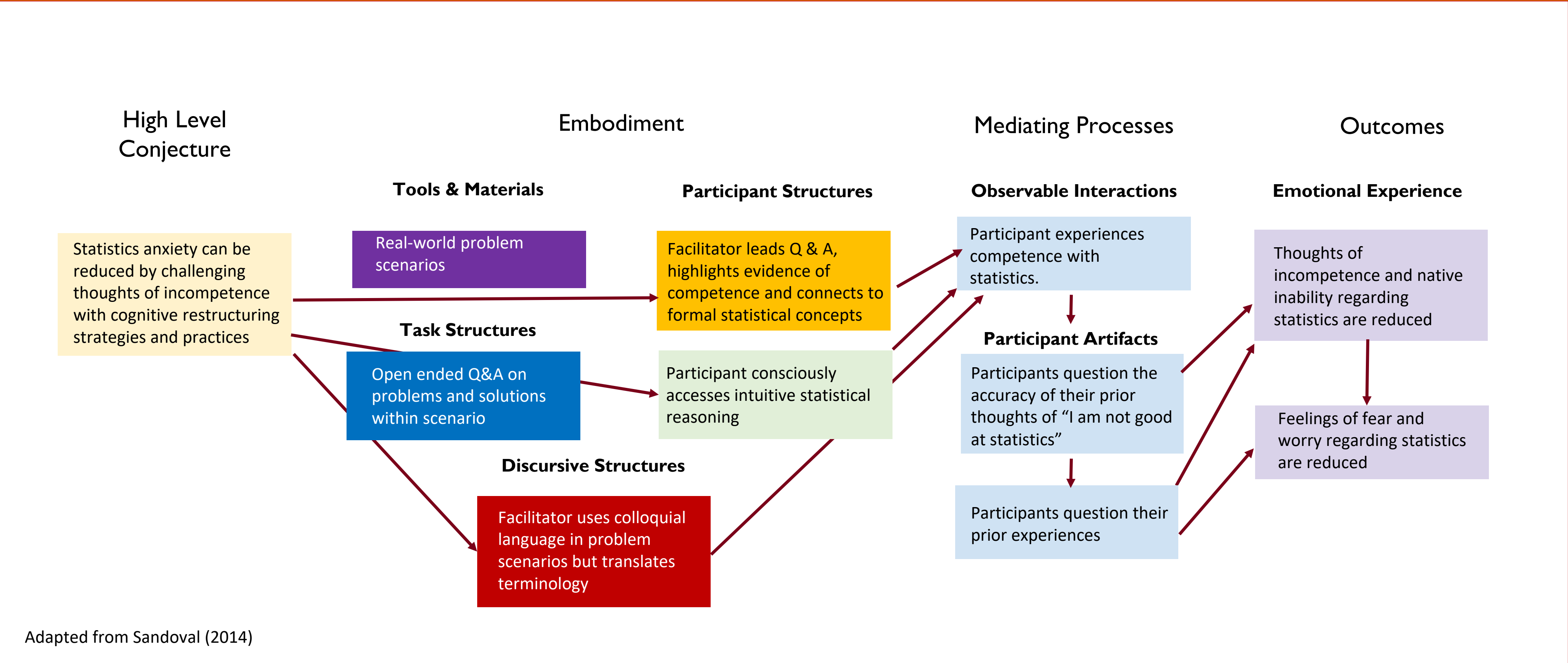
### Can cognitive restructuring help with statistics anxiety?

Evidence for CBT treatment of generalized anxiety has been validated by the Task Force on Promotion and Dissemination of Psychological Procedures (Chambless et al., 1996). Bicer et al. (2020) identified seven studies examining CBT treatments for math anxiety and found an average weighted mean effect size of -0.64, but none of these studies used cognitive restructuring, instead focusing on acceptance and commitment therapy, which emphasizes minimizing over-reactions.

## Research Questions

1. What experiences give rise to graduate students’ statistics anxiety?
2. What reifying thoughts underlie graduate students’ statistics anxiety?
3. Can cognitive restructuring redress such anxiety-inducing thoughts, and thereby reduce graduate students’ statistics anxiety?

## Conjecture Map



## Methods

**Participants:** Multiple-case study of graduate students with statistics anxiety.

**Measures:** Changes to computational self-concept, changes to statistics anxiety

1. Statistics Anxiety Rating Scale (STARS) (Pre → Post)
2. Semi-structured Interview (Pre → Post)
3. Video-based analysis of the lesson

**Procedures:**

1. Administer Pre-STARS and Pre-Interview (counterbalanced by participant)
2. Video record CBT-based statistics lesson with cognitive restructuring
3. Administer Pre-STARS and Post-Interview (counterbalanced by participant)

## Statistics Lesson

### Grapes of Stat

I would like you to imagine that we're in a store right now, and you have to **choose one bag of grapes to buy**. You're buying this for me, so please pick the best bag of grapes.

- Where were your eyes scanning?
- When you picked up the first bag, what was going through your mind? Did you already know that was the bag you’d buy?
- Why did you pick up the bag and try to look at more grapes than your initial scan? What made you want to get more information?

This is really sound statistical thinking! You’re attending to representativeness and generalizability of a sample!

In looking at grapes on all sides of the bag, you exhibited your knowledge that the grapes initially scanned may not be a representative sample of all the grapes in the bag.

In order to accurately estimate the quality of all grapes, you needed more information!

## Implications

This project may give insight into thoughts underlying graduate students’ statistics anxiety in order to:

- Examine how instructional methods can be adapted to address these anxieties
- Help students overcome their anxiety during statistics instruction using CBT-inspired methods

## Contributors

This work was completed through the Link Tank, a graduate student group at the University of Minnesota. The Link Tank’s goals are to link people and ideas and promote interdisciplinary collaborations among graduate students.

The following individuals contributed to the conceptualization and completion of this project, listed in alphabetical order:

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