Reducing the Impact of Statistics Anxiety in College Classrooms

By Allyson Kiss, Rachel Harari & Rose Vukovic

If you've found this article, chances are you have had encounters with students who frankly seem afraid to learn statistics—or perhaps you are that student. Sometimes the signs are easy to recognize. A student might declare "I'm not a math person" or "my brain doesn't work that way." A different student might not speak up in class, but instead privately email a list of questions to the professor to avoid slowing down the class with seemingly simple questions. These students may also turn assignments in late (if at all), frequently miss exams, or submit them blank. Others might continuously delay taking the course, hoping the requirement might magically disappear. In each case, many college students are faced with taking statistics courses with a sense of anxiety that could inhibit academic performance. The purpose of this article is to describe statistics anxiety and to provide educators with practical strategies to help reduce statistics anxiety in students and classrooms.

What is Statistics Anxiety?

Statistics anxiety refers to “anxiety that occurs as a result of encountering statistics in any form and at any level” (p. 199; Chew & Dillon, 2014). Statistics anxiety involves physiological arousal and negative cognitions both in the immediate context of a setting (e.g., statistics class) or in anticipation of having to perform (e.g., being called to answer a question). These anxious reactions might be more intense for students with disabilities – especially those with a long history of negative learning experiences. Statistics anxiety shares similar causes, effects, and treatments with math anxiety and other performance based anxieties. Yet, statistics anxiety is distinct in some ways and may be more associated to reasoning using concepts with words, and making connections between problems using patterns or relationships (Baloglu, 2004). While the distinctions are not yet clear, the current knowledge base is sufficiently developed to provide tools to reduce students’ anxieties. Many of the strategies described in this article may also alleviate math anxiety in other coursework.

Statistics anxiety can be described by six key dimensions: worth of statistics (belief whether statistics is relevant to everyday life), interpretation anxiety (anxiety about interpreting or making decisions from data), test and class anxiety (anxiety invoked by having to take an exam or attend class), computational self-concept (anxiety experienced when attempting to solve math problems and perception of their ability to do so), fear of asking for help (anxiety experienced when having to ask another student or professor for help), and fear of statistics teachers (students’ perception of their professor). The highest amount of anxiety may be induced by administering exams, attending class and asking students to interpret data (Onwuegbuzie, 1998). It is important for educators to take these perceptions and anxieties seriously and make efforts to support these students.

What Can We Do?

An estimated 65% to 80% of students appear to experience uncomfortable levels of statistics anxiety (Onwuegbuzie & Wilson, 2003). This anxiety can be reduced over time when students are presented with high quality instruction and evidence based supports. Professors may consider the following strategies to help ease statistics anxiety in aims of creating more enjoyable learning experiences and improving student math performance for all students, whether or not they have anxiety. We describe strategies designed to alleviate statistics anxiety in four categories: positive environment and communication, delivery of instruction, test related strategies and cognitive based strategies.

Positive environment and communication. It is important for statistics professors to create a classroom environment with ongoing community building; students must be actively involved in day to day course dynamics. These strategies can help reduce students' fear of statistics teachers, fear of asking for help, and anxiety related to attending class. Without strong community, students may unintentionally build barriers that impact their learning. In fact, one study found that students perceived the interpersonal style of the instructor as more important than the specific teaching strategies the instructor used (Wilson, 1999). Some ways to build a positive emotional climate include:

- Promote a positive attitude by encouraging students that all the tasks are achievable. Orientation letters where instructors inform students on what to expect and how to prepare for the class are very helpful, because it shows students that the instructor cares about students' learning. If the instructor is sensitive to students' concerns and attentive to their worries, students will learn more effectively (Pan & Tang, 2005).
- While lecturing can be a necessary tool to relay important information, incorporating applied and interactive instruction can help students build community. Professors could spend class time presenting a statistics problem to the class and ask students to solve the problem as a

team. Students should be encouraged to respond to others for help and support. In this way, students are teaching one another and building their self-concept (Macheski, Buhmann, Lowney & Bush, 2008).

- Many students who experience statistics anxiety are afraid to ask for help. Professors should include flexible office hours and promote responses to emailed questions that are instructive, informative, and free from judgement. It is helpful to send the reply to everyone, because it is likely that other students had the same question. Professors could also use technology to let students ask anonymous questions during class (or before/after class) to encourage participation. Using the last 5-10 minutes of each class to prompt students to write about the most important concept they learned in class and what questions remain unanswered can improve professor-student communication, reinforce key concepts, reduce statistics anxiety, and improve performance in class (Wang & Lee, 2014). It is important to provide students with feedback at the next class and use the brief papers to inform future instruction.

Delivery of instruction. Strategies related to delivering instruction in a variety of ways can help combat statistics anxiety by helping students understand the worth of statistics to real life, easing anxiety around interpreting statistics and easing anxiety related to attending class. Using technology and collaborative learning can be a great help in focusing on conceptual and applied knowledge rather than computation and rote memorization of formulas.

- Many students grumble that what they are learning is not related to them, and tend to shut down because they do not believe the material applies to their everyday lives. However, if statistical concepts could be used to solve practical, real-life problems, those misconceptions could become dispelled. Some ideas might include campus-community research projects or using current news stories to introduce and explain basic statistical concepts and

methodological issues in research (Dilevko, 2000). Applied projects may also help students understand the importance and worth of statistics in everyday life.

- Students should be encouraged to use data from real research projects (with permission from the Principal Investigator) rather than only using data generated by the professor; this will facilitate deep rather than surface learning of abstract statistical concepts. Professors could use student research examples in class during lectures or discussion; calling on students and asking them to use their own examples while the professors show how the statistical concept applies to that dataset.
- When students work together in a group, their math self-concept improves and math anxiety decreases (Van Gundy, Morton, Liu & Kline, 2006). Rather than feeling isolated, students who work together might share the same fears, and in turn receive social validation when they solve problems correctly. Students value one another when they are able to work together to achieve a challenging goal (Townsend & Wilton, 2003).

Test related strategies. While statistics anxiety and test anxiety are distinct, some of statistics anxiety is the result of anxiety related to taking tests (Onwuegbuzie, 1998). These strategies are important because tests are often a barrier between completing statistics coursework successfully to complete college degrees.

- Provide students with a practice test or a test blueprint that outlines the content to be assessed. Having clear expectations allows students to focus on learning and practicing the course content rather than using their mental energies toward worrying about what the test will look like. Professors may also allow students to write test items as a studying tool and then use a sample of those items on the exam.

- Focus on supporting students in learning skills and concepts rather than memorizing information solely for the purpose of the exam. One way to do this is to provide opportunities to retake tests to correct errors with formative feedback (Beilock & Willingham, 2014). Just the option to retake tests has been found to help reduce anxiety even if students don't use the option. Professors may use learning management systems to give and score these assessments without adding extra time to their teacher duties.

Cognitive based strategies. Given that statistics anxiety shares similarities with other anxieties (e.g., math anxiety, test anxiety), some of the most effective interventions for alleviating statistics anxiety include general anxiety reducing strategies. These strategies often use a combination of behavioral and cognitive skills or restructuring and can help improve students' self-concept and reduce the working memory resources used during anxious reactions.

- Guided breathing exercises with focused attention on the breath (e.g., feel the inhale and exhale of the breath) are effective in improving mood and math performance especially for highly anxious students (Brunye et al., 2013). Professors and students may find videos or audio of guided breathing and practice these techniques in the classroom, perhaps at the beginning of each class or before an exam or difficult assignment. Students may also be given resources to practice these skills outside of the classroom.
- Expressive writing provides a mechanism for students to manage their negative thoughts and may increase the availability of working memory resources to focus on the task at hand. Give students 5 to 10 minutes immediately before an exam to expressively write about their anxiety concerning the exam (Park, Ramirez & Beilock, 2014; Ramirez & Beilock, 2011). Students can be prompted to write openly about their thoughts and feelings regarding the problems or the

task they are about to complete. This writing exercise does not need to be collected and students can write confidentially.

- Prompt students to re-appraise an anxious situation. In one study (Jamieson et al., 2010), guiding students to re-appraise a situation helped them score significantly better on a high stakes standardized mathematics test and that improvement was maintained 1-3 months later. Students were read a simple script explaining that many people feel anxious while taking a test but that recent research suggests that this anxiety can help performance. When students took the exam, they were reminded of the research that the anxiety might be helping them perform better. This could be used class wide throughout a semester or directly before class exams.

Other considerations. For students with high anxiety, there are psychological interventions that may help. These interventions (e.g., cognitive behavioral therapy, desensitization, counseling group, acceptance and commitment therapy) tend to be difficult to implement in a typical classroom and require trained professionals in mental health; yet professors should be aware of what resources exist and their potential usefulness to share with students. Some colleges have resources specific to math anxiety but in all cases, professors are encouraged to connect with their campus disability resource centers to know how, when and where to refer students.

Conclusion

Statistics is often the most anxiety inducing course that students are required to take in their post-secondary studies. If we don't utilize strategies to address components of statistics anxiety, students will continue to struggle through these courses and statistics will be a barrier to their degree completion. We encourage students to advocate for their learning by suggesting these strategies in course evaluations, sharing this article with professors or advisors, and trying some of the strategies

at home (e.g., breathing, writing). When strategies are used to support students in anxious situations the negative consequences of anxiety are reduced and students are able to learn in a supportive environment and foster positive attitudes toward statistics.

About the Authors

Allyson Kiss, PhD, is a school psychologist at Anchorage School District. She was trained in Educational Psychology at the University of Minnesota where she developed research interests in the identification of students with math difficulties and how math attitudes impact math performance. Dr. Kiss has experience as a teaching assistant and/or instructor for courses such as assessment and due process in special education, introduction to statistics, and research methods.

Rachel Harari is an English teacher and Department Chair of English Language Arts at Magen David Yeshivah High School in Brooklyn, New York. Rachel is currently pursuing her Doctorate in Educational Leadership at Teacher's College, Columbia University.

Rose Vukovic, PhD, is an Associate Professor of Educational Psychology at the University of Minnesota. Trained in special education, school psychology, and health promotion, Dr. Vukovic brings an interdisciplinary and ecological lens to working with schools and student to inform intervention and instructional practice.

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