

Development and Validation of the Statistics Anxiety Measure

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The Statistics Anxiety Measure (SAM) was developed through thematic analysis of previous statistics anxiety and attitudes toward statistics research; it originally consisted of six factors: anxiety, fearful behavior, attitude, expectations, history and self-concept, and performance. After assessing pilot data via exploratory factor analysis (EFA), factors were redefined and reduced to five: anxiety, attitude towards class, fearful behavior, attitude towards math, and performance. Final structure of the SAM was simplified by combining statistics anxiety and fearful behavior, which ensured all factors were represented by a minimum of five items ranging in agreeability levels.

The SAM was administered in two phases, pilot ($n = 347$) and final administration ($n = 433$), to statistics students across eight departments at the University of Denver during Winter and Spring Quarter, 2007. Model and item fit were assessed using confirmatory factor analysis (CFA) and multidimensional item response theory (MIRT). Items were reduced for CFA identification purposes by combining pilot estimates (EFA loading, MIRT item fit, and Cronbach's alpha). CFA assessed model and item fit, and MIRT assessed item fit and differential item functioning across gender, race, age, class level, and business vs. nonbusiness classes. Subscale internal consistencies using Cronbach's alpha ranged from 0.82 to 0.95. The Statistics Anxiety Rating Scale (STARS: Cruise & Wilkens, 1980) and the Survey of Attitudes Towards Statistics (SATS: Schau et al., 1995) were administered in a limited number of classes to assess convergent validity of the SAM anxiety and attitude dimensions. Although

a high correlation ($r = .75, p < .05$) was exhibited between the STARS and the anxiety subscale, no significant correlations were found between the SATS and the attitude subscales indicating that only certain attitudes towards statistics highly correlate with statistics anxiety.

The SAM provides the most theoretically comprehensive and useful measure of statistics anxiety to date, combining information from prior statistics anxiety research and attitudes towards statistics, while specifically addressing areas of concern for students, teachers, and researchers. The SAM allows students to identify sources of anxiety, teachers to determine the best structure for their course to reduce students' statistics anxiety, and researchers to explore statistics anxiety further.