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# A multivariate investigation of the differences in mathematics anxiety

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## Abstract

Anxiety has been found to be one of the most prevalent emotional problems associated with mathematics. Researchers have clustered variables that affect mathematics anxiety around three main sources: Situational, dispositional, and environmental. In the present study, two of the environmental sources (i.e., gender and age) were studied, after taking into account mathematics experience. The participants were 759 college students who responded to the Revised Mathematics Anxiety Scale (RMARS) and a set of demographic questions. The results showed multivariate differences between men and women and among three age groups, after adjusting for the differences in previous mathematics experiences. Female students showed significantly higher mathematics test anxiety, whereas male students were significantly higher in numerical task anxiety. In addition, older students were found to experience higher mathematics test and course anxiety but were lower in numerical task anxiety. It was concluded that gender and age differences should be investigated in the studies of mathematics anxiety and that the multidimensionality of this construct should be carefully taken into account. Suggestions for mathematics teachers were made based on the results.

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*Keywords:* Mathematics anxiety; Multivariate differences; College students

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## 1. Introduction

The use of mathematics in everyday life is more essential than ever. Therefore, mathematics is a part of the curricula of primary, secondary, and higher education. Oropesa (1993) predicted that over 50% of the students enrolled in mathematics courses are social science majors who are under-prepared. Not surprisingly, abundant student difficulties have been reported with mathematics courses (i.e., Hembree, 1990; Oropesa, 1993; Skiba, 1990). Most of these student difficulties are hypothesized to be attitudinal in nature (Aiken, 1970a, 1970b; Richardson & Suinn, 1972). Mulenga (1990) noted that mathematics educators have become more interested in the affective factors in recent years. Suinn and Edwards (1982) predicted that about half of the variance in mathematics achievement could be accounted for by factors other than intellectual ones.

Mathematics anxiety is one of the common attitudinal and emotional factors that have received attention in recent years. Numerous definitions of mathematics anxiety have been suggested (e.g., Berebitsky, 1985; Brush, 1980; Buckley & Ribordy, 1982; Cope, 1984; Fennema & Sherman, 1976; Kogelman, Forman, & Asch, 1981; Richardson & Suinn, 1972; Sherard, 1981; Suinn, Edie, Nicoletti, & Spinelli, 1972; Tobias & Weissbrod, 1980; Wagner, 1980). One of the earliest definitions was that mathematics anxiety is “the presence of a syndrome of emotional reactions to arithmetic and mathematics” (Dreger & Aiken, 1957, p. 344). In the broadest sense, mathematics anxiety has been defined as “any situation in which an individual experiences anxiety when confronted with mathematics in any way” (Byrd, 1982, p. 38).

Mathematics anxiety has been considered as an interaction of many factors, including mathematics itself, educational and curriculum-related issues, parental attitudes, values, and expectations toward mathematics (Lazarus, 1974); but, research findings are “inconclusive in regard to the causes of mathematics anxiety” (Mulenga, 1990, p. 2). However, researchers have identified student-related, teacher-related, and teaching-related sources of mathematics anxiety (Harris & Harris, 1987; Wagner, 1980). As a result of a literature review, Shodahl and Diers (1984) concluded that the sources of mathematics anxiety included inadequate preparation, attitudes of the mathematics teachers and their teaching methods, inadequate mathematics textbooks, and the students’ levels of thinking. Berebitsky (1985) has also reviewed the relevant literature and concluded that parental attitudes, mathematics teachers, and the nature of mathematics contributed to mathematics anxiety.

The sources (antecedents) of mathematics anxiety are commonly divided into three major groups: Situational, dispositional, and environmental. Situational causes are immediate factors that surround the stimulus (Fitzgerald, 1997; Lazarus & Averill, 1972). Dispositional causes are personality-related factors that individuals bring to the setting. The major distinction between situational and dispositional factors is that situational factors are external, whereas personality-related factors are internal (Byrd, 1982). Environmental causes are prior perceptions, attitudes, and experiences that have affected the individual. In the present study, the relationships between mathematics anxiety and several environmental factors are investigated, after adjusting for the effects of mathematics experience.

Gender difference in mathematics anxiety is the single most studied environmental antecedent. However, the inconsistency of the results is notorious. The sex-role socialization hypothesis (Hunsley & Flessati, 1988) posits that because women have less experience with mathematics, they have more mathematics anxiety. Whereas a number of studies have supported that women experience

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