

Prediction of College Students Achievement in Introductory Statistics Course

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Despite the increased importance and use of statistics in many domains, many students encounter difficulty in their introductory statistics courses. Cognitive factors such as mathematics aptitude and background, and affective factors such as mathematics and statistics anxiety, attitudes about mathematics and statistics, and achievement motivation are some of the factors that have been suggested as related to performance in statistics (Lalonde & Gardner, 1993, Nasser, 1998). High mathematics and statistics anxiety, negative attitudes about mathematics and statistics, low achievement motivation, and low math aptitude can result in impaired statistics performance. However, it should be noted, that the magnitude and direction of the effects of cognitive and especially affective variables on statistics performance is not agreed upon in the literature (Gal & Ginsberg, 1994).

This study was designed to examine the extent to which statistics and mathematics anxiety, attitudes about mathematics and statistics, achievement motivation, and mathematics aptitude are predictive of achievement in an introductory statistics course.

1. Method

The sample consisted of 169 Arab college-students that were enrolled in a teacher-training program for elementary and middle schools in an academic institute at the central district of Israel. The massive majority of participants were females (96%). Statistics for all participants was a required course.

Students' attitudes about mathematics was measured by the Arabic version of the Mathematics Attitude Scale (MAS, $\alpha=.92$). The Revised Mathematics Anxiety Rating Scale (RMARS, $\alpha=.94$) was used to measure students' mathematics anxiety. The Motive to Avoid Failure Scale (M_f , $\alpha=.86$) was utilized to assess achievement motivation. Statistics anxiety was measured by the Statistical Anxiety Rating Scale (STARS, $\alpha=.92$). The Survey Attitudes About statistics (SATS, $\alpha=.86$) was employed to measure students' attitudes about statistics. All instruments were translated into Arabic by the author and then back translated by a bilingual native speaker of Arabic to validate the fidelity of the original translation. Statistics achievement (S-ACH) was measured by the expected and the actual scores on the final statistics examination. Mathematics score, mathematics level, and number of mathematics units at high school were used to measure mathematics aptitude (M-APT).

2. Results and discussion

Figure 1 presents a path model for predicting statistics achievement by cognitive and affective variables. Despite having a significant effect on the motive to avoid failure, attitudes about mathematics and mathematics anxiety predicted only 10% of the variance in this variable. Attitude about mathematics was positively related to Attitudes about statistics while motive to avoid failure was negatively related to attitudes about statistics. These two variables accounted for 37% of the variance in attitudes about statistics. All three exogenous variables (MAS, RMARS, and M-APT) and two of the endogenous variables (SATS, and M_f) were significantly related to statistics anxiety and accounted for

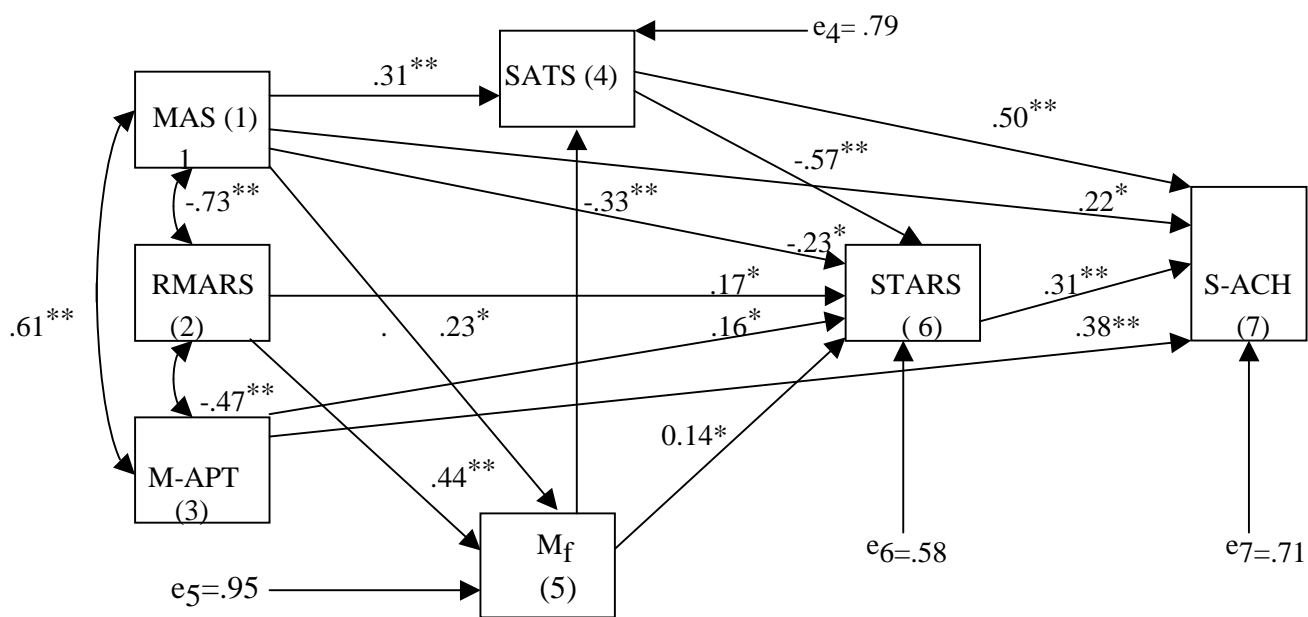


Figure 1. Path model for predicting statistics achievement.

67% of its variance. The largest negative relation existed between statistics anxiety and attitudes about statistics. This finding supports the claim that negative attitudes may translate into anxiety. Four of the variables had direct effect on statistics achievement. Among these, attitudes about statistics had the largest positive effect. Interestingly, the effect of statistics anxiety on statistics achievement was positive despite the negative bivariate correlation between the two. The positive β associated to the path between statistics anxiety and achievement can result from the relations among other variables related to statistics anxiety and included in the path model.

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RÉSUMÉ

Cette étude examine les corrélations entre différents variables relatifs à l'anxiété des mathématiques et en statistique, l'aptitude pour les mathématiques et la motivation d'éviter l'échec, afin d'expliquer le niveau des étudiants en statistique. Les résultats révèlent que ces variables sont modérément associés et permettent de prédire, directement et/ou indirectement, le niveau des étudiants en statistique