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The role of Achievement Goals, Academic Motivation in Statistics Anxiety: Testing a causal model

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Abstract

The present study aims at analyzing the effect of achievement goals on statistics anxiety through academic motivation approaches. In doing so, 345 undergraduate students (68 male and 277 female) from the faculties of psychology and educational sciences of Tehran city were selected using census sampling method. The participants answered the questionnaires prepared on achievement goals, academic motivation and, statistics anxiety. The Path Analysis method indicated that mastery goals have direct negative effects on statistics anxiety (p<0.01). Performance-Approach and Performance-Avoidance goals affect on statistics anxiety only through extrinsic motivation and amotivation. Mastery as well as Performance-Approach goals have direct positive effects on intrinsic motivation and the extrinsic one respectively (p<0.01). All the three variables of academic motivation directly influence statistics anxiety. All in all the findings indicate that achievement goals affect statistics anxiety more often through academic motivation.

Keywords: Achievement Goals, Academic Motivation, Statistics Anxiety

1. Introduction

Since anxiety is a reaction to pressure, an urgent need is felt for recognizing press-producing and annoying factors in educational environments. Psychologists and educational specialists have had a particular view toward this problem (Schunk et al. 2008; Bembenutty, 2008). Among the most kinds of anxiety to which some studies have been allocated in the last three decades, one can refer to 'Math Anxiety', 'Computer Anxiety', 'Test Anxiety', and 'Statistics Anxiety'. Most of the researchers have called the aforementioned anxieties as 'State Anxiety' (Wang et al. 2009). State Anxiety refers to the unstable and transient experiences of tension, fear, and intense emotion of the self-dependant neural system in a specific context and situation (Tanaka et al. 2006). Statistics anxiety has been defined as a state anxiety, since this kind of anxiety occurs when the student is learning statistics concepts and terms and also its application in a special context. Some evidences indicate that nearly 66 to 80 percent of the students experience a high level of statistics anxiety when facing statistics' concepts and subjects and also evaluations related to this course (Baloglu, 2003).

Various studies have indicated that statistics anxiety has a positive relationship with the increase in dropping out and procrastination in the pursuit of education (Onwuegbuzie, 2004). Some researchers believe that many students describe statistics as the most distressing course in their academic studies (Hanna et al. 2008).

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Although statistical science as well as its application are among the important unavoidable courses for the students of psychology and educational sciences and also it is quite clear that statistical concepts reinforce students reasoning power and critical thinking (Baloglu, 2003), a great number of the students have not yet understood it or they feel considerably anxious about it and call this course as the most detestable course in their academic studies. Zidner (1991) and Conners et al. (1998) assert that if there was a chance for omitting a course in their academic studies, most of the students would choose statistics.

1.1. Statistics anxiety

State anxiety is a state in which one experiences in dealing with statistics' concepts, matters, educational situation, and an evaluation context as intense worries, displeasing attitudes, mental disorder, tension and mental emotion (Zidner, 1991). From the very beginning statistics anxiety was defined as a multidimensional variable over the multidimensionality of which most of the scholars are unanimous. Cruise and Wilkins (1980) have all identified 6 components or variables for statistics anxiety and any of them have studied a different dimension of this variable. These six dimensions of statistics anxiety include: Worth of Statistics, Test and Class Anxiety, Fear of Asking for Help, Interpretation Anxiety, Computational Self-Concept, and Fear of Statistics Teacher. Although most of the studies done concerning statistics anxiety have emphasized on its cognitive aspect, based on three aforementioned effective factors upon statistics anxiety it can be concluded that various variables like motivate, emotional, social, and cognitive variables affect this phenomenon. Thus many of the problems in statistics may not result form inadequacy or lack of talent and capability, rather it may have originated from the attitude, emotional, and motivate variables (Baloglu, 2003).

From a long time ago psychologists and teachers have discussed the role of motivation in success and failure of different academic domains (Pintrich et al. 2003) and in the contemporary literature of 'motivation in education', the motive structures of cognitive-social theories, specially achievement goals (Ames:1992) and self-determination (Deci and Ryan, 1985) have appeared useful in describing anxiety.

Achievement Goals

'Achievement goals' is one of the most outstanding and complete frameworks for understanding progress motivation and specially motivation in education and skill domains (Kaplan and Flum, 2010). Midgley, Kaplan, and Middleton (2001) identify achievement goals as behavioral goals that are understood or followed by the individual in competence attitude context. achievement goals are divided into three distinct elements: Performance-Approach Goals, Performance-Avoidance Goals, and Mastery Goals. Findings of most of the studies done concerning achievement goals and other variables indicate that mastery goals have a positive relationship with high 'self-efficacy', adopting deep cognitive strategies such as 'expansion' as well as learning meta-cognitive strategies, self-controlling learning, effective and appropriate treatment with the problems and failures, high grades, help request, peer (or classmate) learning, and generally with individuals' positive motivation emotions and profiles and their psychological social well-being (Elliot et al. 1999; Dweck and Leggett, 1998; Gholamali lavasani et al. 2011). Avoidance goals have a positive relationship with employing superficial learning strategies such as mental reviewing and memorizing (Lee et al. 2010).

On the other hand since performance-approach goals are connected with a combination of positive and negative patterns and outcomes, there is not much coordination in the researchers' findings, i.e., the students with performance-approach goals experience both the positive emotions such as deep learning strategies, high self-efficacy, high grades, more efforts, and intrinsic motivation increase as well as the negative emotions such as anxiety and jealousy. With regard to performance-avoidance goals there is a high coordination in the studies suggesting that it is connected with the negative and irreconcilable patterns (Lee et al. 2010). According to the research findings that have studied the relationship between achievement goals and anxiety, one can claim that there is a negative relationship between mastery goals and anxiety (Putwain and Daniels, 2010), an insignificant positive
relationship between performance goals and anxiety, and a significant positive relationship between avoidance goals and anxiety (Elliot and Church, 1997).

**Academic Motivation**

There are various theories concerning academic motivation, but in this study it is defined based on the "self-determination theory" that was developed by Deci and Ryan (1985). This model (SDT), claims that a complete analysis of motivation process must take into consideration three important entities i.e., intrinsic motivation, extrinsic motivation, and amotivation (Vallerend et al. 2010). Intrinsic motivation refers to a motivation that drives individuals toward performing a specific homework and duty spontaneously and intrinsically and apart from the extrinsic rewards of performing the homework itself, it is valuable a satisfactory for the individual (Deci and Ryan, 2000; Lee et al. 2010). When people are motivated extrinsically, they tend to attempt for achieving something beyond the pleasure of the duty or activity itself (Lee et al. 2010). Amotivated individual is referred to someone who has not received any motivation (i.e., neither intrinsic pleasure and value nor extrinsic motivations) for performing his/her activities and thus avoids from doing any kind of activity (Deci and Ryan, 2000). Amotivation is somewhat like the concept of "learned helplessness". When individuals are in a state feeling that something that is done by them is out of their own control and is governed by the extrinsic powers, so they are not motivated intrinsically of extrinsically and adopt avoidance (Fortier et al. 1995).

Generally the findings of the studies done concerning the academic motivation and anxiety indicate that intrinsic motivation has a positive relationship with health indices such as self-confidence, tranquillity, responsibility, creativity, and self-flourishing while extrinsic academic motivation and amotivation have a positive relationship with the incompatible behaviours" indices such as dropping out, anxiety, alcohol abuse, and indifference towards responsibility (Deci and Ryan, 2000).

**Methodology**

2.1. Design

The method adopted in the present study is a descriptive (non-experimental) one and the research design is path analysis correlation because in this study the relationships among the variables are discussed in a causal model.

2.2. Population and Sampling

The population includes all male and female undergraduate students of educational sciences and psychology in the state universities of Tehran (345 students) who had registered for two courses i.e., descriptive statistics and inferential statistics in the first semester of the 2010-2011 academic year.

2.3. Instruments

In the present study Middleton and Midgley's questionnaire was used for measuring achievement goals. In the present study in respect of the research subject subscales of mastery goals, performance-approach goals, and performance-avoidance goals were employed. For determining this scale's reliability Cronbach's alpha method was adopted. In the present study the reliability coefficient of the three subscales of mastery goals, performance-approach goals, and performance-avoidance goals are 79%, 85%, and 81% respectively. For measuring the academic motivation Vallerend's (Vallerend et al. 1992) Academic Motivation Scale was employed. In this study Cronbach's alpha rate for subscales of intrinsic motivation, extrinsic motivation, and amotivation are 84%, 86%, and 67% respectively.

For measuring students' statistics anxiety, Statistics Anxiety Rating Scale (STARS) Cruise (Cruise et al. 1985) was used. Statistics anxiety rating scale is a 51-question questionnaire that is developed in a Likert five-degree approach. In this study Cronbach's alpha scale was measured at 0.90 for the subscales of statistics value, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help, and fear of statistics teacher.

**Research Findings**
First descriptive indices (mean, standard deviation, skewness, and kurtosis) for the whole sample were studied and reported in table 1. With regard to the collected data, correlation coefficients of studied variables were measured and they are shown in Correlation Matrix (table 2).

### Table 1. Descriptive Indices of the Research Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Goals</td>
<td>13.45</td>
<td>5.51</td>
<td>0.23</td>
<td>-1.19</td>
</tr>
<tr>
<td>Performance-</td>
<td>10.84</td>
<td>4.62</td>
<td>0.23</td>
<td>-1.10</td>
</tr>
<tr>
<td>Performance-</td>
<td>8.53</td>
<td>3.53</td>
<td>0.09</td>
<td>-1.20</td>
</tr>
<tr>
<td>Intrinsic</td>
<td>27.56</td>
<td>10.58</td>
<td>0.64</td>
<td>-0.52</td>
</tr>
<tr>
<td>Extrinsic</td>
<td>28.85</td>
<td>9.79</td>
<td>0.554</td>
<td>-0.28</td>
</tr>
<tr>
<td>Amotivation</td>
<td>12.57</td>
<td>3.85</td>
<td>-0.15</td>
<td>-0.67</td>
</tr>
<tr>
<td>Anxiety</td>
<td>148.50</td>
<td>30.51</td>
<td>-0.06</td>
<td>-0.96</td>
</tr>
</tbody>
</table>

### Table 2. Correlation Matrix of the Research Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Goals</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance-</td>
<td>-0.55**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance-</td>
<td>-0.58**</td>
<td>0.62**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrinsic Motivation</td>
<td>0.51**</td>
<td>-0.38**</td>
<td>-0.39**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrinsic Motivation</td>
<td>0.34**</td>
<td>0.46**</td>
<td>0.41**</td>
<td>-0.14*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amotivation</td>
<td>-0.49**</td>
<td>0.36**</td>
<td>0.31**</td>
<td>-0.50**</td>
<td>0.22**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Statistics Anxiety</td>
<td>-0.51**</td>
<td>0.35**</td>
<td>0.39**</td>
<td>-0.48**</td>
<td>0.36**</td>
<td>0.49**</td>
<td>1</td>
</tr>
</tbody>
</table>

*P<0.05, **P<0.01

#### 3.1. Anxiety Predictors

For predicting anxiety, the proposed conceptual model was analyzed through the Path Analysis Method. For assessing the model, the Maximum Probability Method was employed. For measuring the model's fitness K Square Index on the level of latitude, Comparative Fitness Index (CFI), Conformity Fitness Index (GFI), Adjusted Conformity Fitness Index (AGFI) and, Square of Mean Error of Estimate Squares (RMSEA).

**Figure 1. The diagram of standardized paths and parameters of the fit anxiety statistics prediction model**
3.2. Indirect (Side) and Total Effects
Based on the path analysis, the indirect effect of mastery goals on statistics anxiety through the intrinsic motivation and amotivation (-0.26) is at significant level of (p<0.01). Thus the motivative mediation role of intrinsic motivation and amotivation among the mastery goals and anxiety is confirmed. The indirect effect of performance-approach goals on the statistics anxiety through the extrinsic motivation and amotivation (0.09) is at positive and significant level of (p<0.01).

Table 4. Examined Paths in Path Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Direct Effects</th>
<th>Indirect</th>
<th>Total Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>mastery goals effects on anxiety</td>
<td>-0.19**</td>
<td>-0.26**</td>
<td>-0.45**</td>
</tr>
<tr>
<td>Performance-approach effects on anxiety</td>
<td>-0.23**</td>
<td>0.09**</td>
<td>-0.14**</td>
</tr>
<tr>
<td>Performance-avoidance effects on anxiety</td>
<td>0.07**</td>
<td>0.28**</td>
<td>0.35**</td>
</tr>
</tbody>
</table>

*p **<0.01

4. Conclusion
In this study the effect of achievement goals and academic motivation on statistics anxiety was analyzed. Path analysis confirmed this hypothesis of ours that students' goal orientation and academic motivation can affect students' level of anxiety in statistics. As the research findings indicate, mastery goals, performance-approach goals and performance-avoidance goals have a direct and significant effect on statistics anxiety. All these three points have effect on statistics anxiety through intrinsic motivation, extrinsic motivation and amotivation respectively. All in all achievement goals and academic motivation can explain only 0.31 percent of the statistics anxiety changes. Based on the findings, performance-approach goals have direct negative significant effect on statistics anxiety and this is not consistent with most of the researches' findings of Tanaka et al (2006) and Elliot and church (1997). This might be resulted from a dual combination of performance-approach goals from the models and positive-negative results over which there is not much consistency among the researcher's findings i.e., students with performance-approach goals experience both positive emotions like employing deep learning strategies, high self-efficacy, high grades, more efforts and intrinsic motivation increase and negative emotions such as anxiety and jealousy (Lee et al. 2010; Kaplan and Flum, 2010). Findings show that performance-avoidance goals have direct negative weak (but) significant effect on statistics anxiety; rather they affect statistics anxiety through amotivation and extrinsic motivation. This finding is consistent with research findings of Dweck and Leggett (1988), Pintrich et al. (2003).

The findings of this study indicate the relationship between achievement goals and academic motivation and confirm the correlation between individuals' goal orientation and the level of their self-determination. Mastery goals have a positive significant relationship with intrinsic motivation and a negative significant one with amotivation and explain %26 and %24 of their changes respectively. Also performance-approach goals as well as performance-avoidance goals have a significant relationship with extrinsic motivation and explain %23 of their changes.

Generally the findings of this study were consistent with other suggested models (Dweck and Leggett, 1988; Tanaka et al. 2006 and Putwain and Daniels, 2010) and emphasize on goal orientation and academic motivation in explaining anxiety changes in a specific context (statistics).
References


