The Relationship between State-Trait Anxiety and Academic Performance among Chiropractic Students

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Abstract

To assess the level of anxiety as well as the relationship between anxiety and academic performance among chiropractic students. A total of 461 first-quarter students were recruited. The Spielberger State-Trait Anxiety Inventory (STAI) was administered to all participants at the beginning of the chiropractic training program. The mean State-Anxiety (STAI-S) score and Trait-anxiety (STAI-T) score was 35.15 and 35.30 respectively. We found a statistically significant negative correlation between STAI-S scores and both the overall anatomy grades as well as the written exams scores (r=-.105 and r=-.098 respectively). A negative correlation was also found between STAI-T scores with both the overall anatomy grades and lab exam scores (r=-.09 and r=-.088 respectively). The results of this study confirmed a negative relationship between anxiety and academic performance among chiropractic students. This suggests that stress and anxiety management should be incorporated into the chiropractic curriculum to for better academic outcomes.

Keywords: stress; anxiety; chiropractic; academic performance

1. Introduction

The definition of anxiety varies among the experts. For example, Breuer's definition of anxiety disorders relates to the dual characteristics of excessive emotional fear and physiological hyperarousals (Breuer, 1999). On the other hand, Harris and Coy defined anxiety as a basic human emotion consisting of apprehension and uncertainty that typically appears when an individual perceives an occurrence as being a threat to one's ego or self-esteem (Harris & Coy, 2003). Charles Spielberger posits that anxiety can be further differentiated into state and trait anxiety (Spielberger & Vagg. 1995). State anxiety is a situational and transitory state of fear, nervousness, discomfort, and arousal of the autonomic nervous system induced by perceived danger. In comparison, trait anxiety refers to a more consistent tendency to assess and react with fear, worry, and anxiety across multiple situations (Spielberger et al., 1983; Vitasari et al., 2010).

Past studies have indicated early college or university attendance as a source of elevated anxiety among students (Aktekin et al., 2001; Bouteyre et al., 2007; Mundia, 2009). There is evidence to suggest that college students experience higher levels of anxiety when compared to other age groups (Wong et al., 2006; Dahlin et al., 2005); furthermore, anxiety also affects graduate students (Dyrbye et al., 2005; Barbosa et al., 2013). For example, the students of healthcare professions have elevated level of anxiety in comparison to the general population (Dyrbye et al., 2005; Macauley et al, 2018). Macauley and colleagues reported that 83% of healthcare professional students have greater than normal State Anxiety and 56% of them have higher than normal Trait Anxiety levels (Macauley et al., 2018). Furthermore, the high rates of anxiety place students at risk for poor health outcomes (Jonas et al., 1997) and anxiety-related performance issues in schools (Shanafelt et al., 2002; Barbosa et al., 2013).

There has been tremendous interest in the relationship between anxiety and academic performance. Researchers from around the world have sought to clarify this correlation at different educational levels. Studies focused on high school students have found that higher level of anxiety correlated to lower academic performance (McCraty, 2007) as well as poorer academic achievement (Mazzone et al., 2007). Sharif & Armitage (2004) further discovered that not only did severe anxiety impair academic performance, it also resulted in higher dropout rates (Sharif & Armitage, 2004). However, when Yokus (2013) investigated the relationship between state-trait anxiety levels and academic achievement among music teacher candidates, he found that there was a significant negative relationship between academic achievements and trait anxiety levels, but was no statistically significant relationship between state anxiety levels and academic achievement scores (Yokus, 2013).

Chiropractic educational programs are characterized by challenging courses and high credit loads during each academic term (Christensen MG, 2010; Council, 2007). Students matriculated into chiropractic programs come from diverse academic backgrounds and possess varying personal traits. There is little information regarding the association between anxiety and academic performance within the chiropractic student population. Since our student is representative of the average students enrolled in higher education, based on past literatures, we hypothesized that high levels of anxiety would negatively impact academic performance including written and laboratory tests within the chiropractic students population as well. Therefore, this study aimed to assess the level of anxiety among chiropractic students and subsequently examined the relationship between their anxiety level and academic performance.

2. Methods

2.1 Student Participants

The study protocol was reviewed and approved by the Institutional Review Board prior its execution. Four hundred and sixty-one (461) 1st quarter students across eight consecutive classes were invited to participate during the 2014 and 2015 academic years. All students were enrolled in a 13-quarter curriculum and were taking anatomy taught by the same instructor.

2.2 Anxiety Assessment

A validated assessment instrument, the Spielberger State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983), was administered to all participating students at the beginning of the chiropractic training program during the first week of classes.

The STAI inventory is comprised of a total of 40 questions. It is evenly separated into state and trait anxiety, each with 20 questions. This study utilizes all of the original items in the STAI without any modifications. Participants are rate themselves on a 4-point frequency scale. The State-Anxiety (STAI-S) scale (STAI Form Y-1) evaluates the respondents' feelings about anxiety "right now, at this moment". The 4-point scale is categorized as: one (not at all), two (somewhat), three (moderately so), and four (very much so). The Trait-anxiety (STAI-T) scale (STAI Form Y-2) assesses how people "generally feel" about anxiety. Its 4-point scale is categorized as: one (almost never), two (sometimes), three (often), and four (almost always). All of the responses are added resulting in a total score. Possible results range from twenty to eighty with higher scores corresponding to the presence of higher levels of anxiety (Spielberger et al., 1983). The instrument was tested for reliability and validity. Internal consistency coefficients for the scale range from .86 to .95; test-retest reliability coefficients range from .65 to .75 over a 2-month interval (Spielberger, 1983).

Four additional questions were included in the questionnaire to gather demographic information. These items include the participants' age, sex, highest academic degree achieved, and ethnicity.

2.3 Academic Performance Assessment

Academic performance was quantified using scores from the first quarter spinal anatomy course. This was a crucial class for incoming students. Total course scores from all written and laboratory examinations were tallied for this measure.

2.4 Data Analysis

Data was analyzed using SPSS version 22.0 (IBM SPSS, Chicago). Statistical test assumptions were verified and a *p* value of less than .05 was considered significant.

Pearson's linear correlation analysis was performed to evaluate the correlation between STAI scores and the total class grades, written exam scores, and lab exam scores.

Anxiety was categorized into two levels based on STAI scores (Antony et al., 2001). Students with STAI scores of 47 or more were assigned to the high-anxiety group, and students with STAI scores below 47 were assigned to the low-anxiety group. Differences in academic performance across these two groups were evaluated via independent t-test.

3. Results

3.1 Demographic Information

Demographic data is summarized in Table 1. Male students were overrepresented in our sample. Highest current academic degree, age, and ethnicity skewed substantially in favor of bachelor degrees, <30 years of age, and Caucasians respectively. This sample of convenience included 160 females and 254 males with ages ranging from 20 to 52 years (25.3 ± 4.7 years, mean ± SD).

3.2 STAI scores

The mean STAI-S score and STAI-T score for all students were 35.15 ± 11.10 (mean ± SD) and 35.30 ± 9.42, respectively. The mean STAI-T score for females was significantly higher than that for males (36.75 ± 10.24 and 34.39 ± 8.76, respectively, *p* = 0.013), while there was no statistically significant difference between female and male STAI-S scores (36.33 ± 12.03 and 34.40 ± 10.41, respectively, *p* = 0.085).

Independent t-test demonstrated statistically significant differences in the overall anatomy grades (sum of written and lab exams) as well as lab exam scores between the two STAI-T levels. However, no statistic significances were found between the two groups on the written exam (Table 2).

3.3 Relationship of STAI to academic performance

The linear analysis showed a small, but statistically significant negative correlation between STAI-S scores and overall course grades (*r* = - .105, *p* = .016, 1-tailed) as well as written exam scores (*r* = - .098, *p* = .023, 1-tailed). A similar linear analysis revealed a small, but statistically significant negative correlation between STAI-T scores and course grades (*r* = - .09, *p* = .034, 1-tailed) and lab exam scores (*r* = - .088, *p* = .037, 1-tailed) (Table 3).

4. Discussion

The mean STAI-S score and STAI-T score for all students were 35.15 and 35.30, respectively for this study. These results indicated that most chiropractic students experience certain level of anxiety. This is consistent with past studies conducted on students of other educational levels. In contrast to previous studies, the participants enrolled in this study showed lower level of overall anxiety. In a study of 132 students, McKnight et al. found that the average anxiety level in the sample population was 40.25 (McKnight & McKnight, 2012). Similarly, in Spielberg's study the mean STAI-S scores for college male and female students were 36.47 and 38.76, respectively (Spielberg, 1983). There are three plausible explanations for the difference. The first reason is the timing of the survey. Our survey took place at the first week of class after enrollment. Although the students may have understood the prepared themselves for the challenge of chiropractic education, they have yet been confronted by actual exams or other course work. The second possible reason was the students' educational backgrounds. While the subjects of the other studies were predominantly undergraduates, our students were post-graduate students who have already completed a base level of higher education. They were more academically mature and more confident in their

abilities of handling difficult coursework. Lastly, the topic of study in this class may have played a role. Although spinal anatomy is one of the most challenging courses in the program due to its in-depth nature as well as clinical and professional application, majority of the students were likely to have previous experience with anatomy during their undergraduate studies. It is possible that they were more comfortable with the topic at baseline and perceive it as an easy subject.

The results of this study also suggest an inverse relationship between academic performance and level of anxiety. This finding is consistent with some reports from other researchers. For example, Hamzah demonstrated that students experiencing higher level of anxiety tend to obtain lower marks on their end-of-semester examination (Hamzah, 2007). A fair number of studies have also found similar correlation between high anxiety level and lower academic performance among high school students (McCraty, 2007, Mundia et al., 2007). Interestingly, a report suggested a positive relationship between low level anxiety and academic outcome (El-Anzi, 2005). A 2009 study, however, did not observe a significant relationship between anxiety and academics achievements (Ndirangu et al., 2009). Lastly, a meta-analysis concluded that the strength of the relationship between anxiety and performance varies from study to study with correlations from extreme negative to positive values (Seipp, 1991). Therefore, the direction of the relationships between level of anxiety and academic performance is still open for debate. Analyzing the reciprocal relations using cross-lagged structural equation modeling, one study also suggested that different components related to the anxiety might play role in determining negative or positive direction (Steinmayr et al., 2015).

According to the Practitioner's guide (Antony et al., 2001), STAI scores for people with diagnosed anxiety typically fall within the range of 47 to 61. In this study, a post hoc analysis of the data was conducted with a cutoff point of 47. A significant difference in overall anatomy grades (written and lab exams) were noted between the students in low (<47 points) and high (≥47 points) STAI-T groups. The mean of overall anatomy grades in high STAI-T group was significantly lower than those in low STAI-T group. This is likely due to test anxiety. Common symptoms of such performance anxiety include feelings of nervousness, panic, concerns regarding failing examinations, feeling incapable of completing tasks as instructed, elevated heart rate, and restlessness, all of which can contribute to lower academic performance (Vitasari et al., 2010). Past research also revealed that elevated anxiety may decrease working memory and abstract reasoning while increase distraction in students (Aronen et al., 2005).

Lastly, the results of our study noted the existence of gender differences in anxiety, which was generally higher in females. This finding is in accordance with a previous research study (Pomerantz et al., 2002). One possible explanation may be the differing societal attitudes and expectations for male and female students. Furthermore, there are a number of female students in our program who are married with children. Meeting demands at school while maintaining their household responsibilities may lead to elevated stress and overall anxiety.

5. Limitation

This study is a cross sectional design study. We have data from only first-quarter chiropractic students in a 13-quarter curriculum that may limits generalization.

6. Acknowledgement

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Table 1 - Demographic Data for All Students

Demographics	Groups	N	%
Sex	Male	254	61
	Female	160	39
Academic degree	Bachelor only	392	95
	Master or PhD	22	5
Age, y	< 30	359	86
	30 – 40	48	12
	> 40	7	2
Ethnicity	Caucasian	312	75
	Hispanic	60	15
	African American	12	3
	Other	30	7

Table 2 - Mean ± SD Anatomy Grades, Written Exam, and Lab Exam between Two STAI Levels

		Total grades*	Written Exam	Lab Exam
STAI-S score	< 47 (n = 348)	185.55 ± 17.11	92.75 ± 12.36	92.80 ± 7.38
	≥ 47 (n = 66)	183.51 ± 19.44	92.07 ± 13.03	91.44 ± 9.28
p value		0.385	0.683	0.264
STAI-T score	< 47 (n =357)	186.10 ± 17.00	93.03 ± 12.31	93.07 ± 7.03
	≥ 47 (n = 57)	179.74 ± 19.61	90.21 ± 13.17	89.53 ± 10.70
p value		0.023	0.112	0.001

*Sum of the written exam scores and the lab exam scores

Table 3 – Coloration coefficient between STAI and academic performance

Variable	1	2	3	4	5
1. STAS-S		.71**	-.105*	-.098*	-.081
2. STAI-T			-.09*	-.072	-.088*
3. Anatomy grade				.922**	.799**
4. Written exam					.475**
5. Lab exam					

*$p < .05$, 1-tailed; **$p < .001$, 1-tailed.