EVALUATION OF ANXIETY AMONG MEDICAL AND ENGINEERING STUDENTS BY FACTOR ANALYSIS

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Abstract: Anxiety is an inevitable part of life in contemporary society. Anxiety corrupts a person's ability to think, perceive and learn. A person suffering from anxiety usually experiences difficulties in concentrating, remembering the learned material and establishing what the necessary relations among events or people are. The purpose of this study was to evaluate the main anxiety items of the students of two faculties. Factor analysis was performed to form groups of unrelated items by gathering related items in the scale and to rank factors affecting anxiety by their importance. In accordance with the data obtained from studies on the anxiety of engineering and medical students, factor analyses gave the following results for state anxiety: in engineering students there were units accumulated in 5 factors, in medical students there were units accumulated in 4 factors, and for trait anxiety they were in 6 factors for both. Our studies show that even if the STAI results are similar, factor analyses should be carried out and solutions should be sought in accordance with the results. During education in universities, causes of (state - trait) anxiety should be investigated and curriculums should be changed in order to lessen anxiety, psychological and social support units should be established and students should be prepared for the future.

Key words: anxiety, engineering students, medical students, state anxiety, trait anxiety

INTRODUCTION

Anxiety is an inevitable part of life in contemporary society. It is important to realize that there are many situations that come up in everyday life in which it is appropriate and reasonable to react with some anxiety. It is usual to feel anxiety in response to everyday challenges involving potential loss or failure (Bourne, 2004). Anxiety corrupts a person's ability to think, perceive and learn. A person suffering from anxiety usually experiences difficulties in concentrating, remembering the learned material and establishing what the necessary relations among events or people are.

Anxiety has long been researched as a multidimensional construct, with particular distinction between state, or situationally based, and trait, or dispositional anxiety. Both state and trait anxiety are multidimensional constructs, and dispositional features interact with specific situations to produce anxiety (Endler, Macrodimitris, Kocovski, 2003). In order to reduce anxiety levels among people, one should learn the sources of anxiety.

The State-Trait Anxiety Inventory (STAI) is probably among the most widely

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used self-report measures of anxiety in clinical and research settings (Keedwell, Snaith, 1996). Spielberger (Spielberger, Gorsuch, Lushene, 1970), developed the STAI as a self-report scale measuring two separable components: state anxiety, which refers to a transitory emotional state characterized by subjective feelings of tension that may vary in intensity over time, and trait anxiety, which refers to a relatively stable disposition to respond to stress with anxiety and a tendency to perceive a wider range of situations as threatening.

In Spielberger's State and Trait Anxiety Inventory (STAI), anxiety was calculated by summing up the answers with the Likert Scale. Although the mean of the points is similar, the causes creating the anxiety would be different in different societies. Factor analysis is a set of statistical methods for analyzing the correlations among several variables in order to estimate the number of fundamental dimensions that underlie the observed data and to describe and measure those dimensions (Last, 2001).

The purpose of the present study was to show that there could be differences between the two populations according to factors that cause anxiety, even if there is no significant difference between their anxiety levels.

METHOD

The study was done in the Spring 2003 semester. It was conducted on a sampling number of 344 students at the Uludag University Faculties of Medicine (n = 199) and Engineering (n = 145). In the faculty of medicine there were 111 male (age mean ± SEM: 22.71 ± 0.28) and 88 female (age mean ± SEM: 22.14 ± 0.34) students, and in the faculty of engineering there were 91 male (20.86 ± 0.18) and 54 female (20.22 ± 0.19) students. The sample was stratified by classes according to the number of students. Students were chosen from class lists using the table of random numbers. All subjects participating in the research were informed about the study and informed consent was obtained from them.

Reliability analysis was performed with Cronbach alpha reliability coefficient. After normality was tested by the One Sample Kolmogorov-Smirnov test, Mann-Whitney U-test and t-test were performed for comparison of scale scores between the groups. Pearson Chi-square test and Fisher's exact test were performed for between-group comparisons of categorical data.

Factor analysis was performed to form groups of unrelated items by gathering related items in the scale and to rank factors affecting anxiety by their importance. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity was performed on the data set in order to assess appropriateness for factor analysis. Homogeneity of variances in variables was tested by Levene statistics to determine the data matrix that would be used in factor analysis.

First, factor analysis was performed without rotating the axes. After observing that the variables were distant from the axes, the varimax method was considered as the best rotation among orthogonal rotation methods for our data set following the application of several rotation methods. When performing factor analysis, factor selection was done by considering number of eigenvalue greater than 1.

Statistical significance was set as $\alpha = 0.05$.

RESULTS

Cronbach alpha was determined as $\alpha = 0.91$ for state anxiety and $\alpha = 0.84$ for trait

anxiety, so scales were considered to be reliable.

In our studies variables of sex, age, class, years lost during education, accommodation type, place lived in for the longest period, area lived in for the longest period, number of individuals living together, economic level of the family, employment type, special friends of the opposite sex, chronic diseases, parents' livelihood and lifestyle, attitude of the family, education level of the mother, education level of the father, difficulty understanding lessons, examination periods, difficulty of adapting to the university lifestyle, level of confidence in solving one's own problems, previous psychiatric illnesses, psychiatric illnesses of relatives, problems experienced in the last year, satisfaction in the field of education, high school graduated from, and social security covering health are homogeneous in both faculties ($p > 0.05$).

The STAI scores for medical students were 39.49 ± 0.69 for state anxiety (mean ± SE) and 43.11 ± 0.55 (mean ± SE) for trait anxiety. For engineering students these were 39.01 ± 0.76 and 43.89 ± 0.62 respectively. The differences were not statistically significant ($p > 0.05$).

Results for Factor Analysis

Bartlett's tests of sphericity were done ($p < 0.001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy was calculated for medical students (KMOstate anxiety = 0.91 and KMOtrait anxiety = 0.82) and for engineering students (KMOstate anxiety = 0.88 and KMOtrait anxiety = 0.80). Therefore it was decided that data were appropriate for factor analysis. After homogeneity of variances in variables was tested by Levene statistics ($p < 0.001$), we decided that the use of correlation matrix computed by raw data matrix was appropriate for factor analysis.

Factor Analysis for State Anxiety

After applying factor analysis for state anxiety results, it has been seen that units have accumulated in 5 factors for engineering students (cumulative variance = 65.98%) and have accumulated in 4 factors for medical students (cumulative variance = 61.07%) (Table 1).

Table 1. The factoring of the items found in state anxiety according to faculties, and their scope

STATE ANXIETY			
FACTOR		ENGINEERING	MEDICINE
I	% of variance	37.27%	39.08%
	cumulative variance	37.27%	39.08%
	items	I am tense	I am tense
		I feel nervous	I feel nervous
		I am jittery	I am jittery
		I feel indecisive	I feel indecisive
		I feel strained	I feel upset
	scope	Anger, Regret	Anger, Complaint

Table continues

Table 1 (continued)

STATE ANXIETY			
FACTOR		ENGINEERING	MEDICINE
II	% of variance	10.05%	9.42%
	cumulative variance	47.31%	48.50%
	items	I don't feel satisfied	I don't feel satisfied
		I don't feel comfortable	I don't feel comfortable
		I'm not relaxed	I'm not relaxed
		I don't feel calm	I don't feel at ease
			I don't feel steady
			I don't feel pleasant
	scope	Exhaustion, Strain	Exhaustion, Misery
III	% of variance	7.97%	7.25%
	cumulative variance	55.28%	55.74%
	items	I don't feel at ease	I don't feel satisfied
		I don't feel self-confident	I am presently worrying over possible misfortunes
		I don't feel content	I feel frightened
		I don't feel steady	I am worried
		I don't feel pleasant	
	scope	Strain, Lack of confidence	Worry
IV	% of variance	5.63%	5.32%
	cumulative variance	60.91%	61.07%
	items	I feel upset	I don't feel calm
		I am presently worrying over possible misfortunes	I don't feel secure
		I feel frightened	I don't feel self-confident
		I am worried	I don't feel content
			I feel confused
	scope	Worry	Strain, Lack of confidence, Confusion
V	% of variance	5.08%	
	cumulative variance	65.98%	
	items	I don't feel secure	
		I feel confused	
	scope	Lack of confidence, Confusion	

Table 2. The factoring of the items found in trait anxiety according to faculties, and their scope

TRAIT ANXIETY			
FACTOR		ENGINEERING	MEDICINE
I	% of variance	26.74%	26.96%
	cumulative variance	26.74%	26.96%
	items	I feel like a failure	I don't feel pleasant
		I'm not "calm, cool and collected"	I don't feel rested
		I lack self-confidence	I'm not happy
		I'm not a steady person	I feel inadequate
			I don't feel content
	scope	Ambivalence, Agitation, Lack of confidence	Misery, Exhaustion
II	% of variance	8.20%	9.17%
	cumulative variance	34.94%	36.13%
	items	Some unimportant thought runs through my mind and bothers me	Some unimportant thought runs through my mind and bothers me
		I take disappointments so keenly that I can't put them out of my mind	I take disappointments so keenly that I can't put them out of my mind
		I get in a state of tension or turmoil as I think over my recent concerns and interests	I get in a state of tension or turmoil as I think over my recent concerns and interests
		I have disturbing thoughts	I have disturbing thoughts
		I feel inadequate	I feel satisfied with myself
			I worry too much over something that doesn't really matter
	scope	Uneasiness, Misery	Uneasiness, Fragility, Worry

Table continues

Table 2 (continued)

TRAIT ANXIETY			
FACTOR		ENGINEERING	MEDICINE
III	% of variance	7.40%	7.11%
	cumulative variance	42.34%	43.24%
	items	I don't feel secure	I don't feel secure
		I don't feel pleasant	I feel nervous and restless
		I don't feel rested	I feel that difficulties are piling up so that I cannot overcome them
		I'm not happy	I'm not a steady person
		I am content	
	scope	Misery, Exhaustion, Lack of security	Lack of security, Weariness, Ambivalence
IV	% of variance	6.24%	6.24%
	cumulative variance	48.57%	49.49%
	items	I don't feel satisfied with myself	I feel like a failure
		I worry too much over something that doesn't really matter	I lack self-confidence
	scope	Fragility, Worry	Ambivalence, Lack of confidence
V	% of variance	5.91%	5.63%
	cumulative variance	54.48%	55.11%
	items	I can't make decisions easily	I can't make decisions easily
		I feel nervous and restless	I wish I could be as happy as others seem to be
	scope	Timidity, Weariness	Timidity, Emulation for happiness
VI	% of variance	5.57%	5.30%
	cumulative variance	60.05%	60.41%
	items	I wish I could be as happy as others seem to be	I'm not "calm, cool and collected"
		I feel that difficulties are piling up so that I cannot overcome them	
	scope	Emulation for happiness, Weariness	Agitation

The units located in the first factor can be described as anger and regret in engineering students and anger and complaint in medical students. The units located in the second factor can be described as exhaustion and strain in engineering students and exhaustion and misery in medical students. When anxiety in situations has been analyzed the third factor can be described as strain and lack of confidence in engineering students and worry in medical students. In engineering students the fourth factor unit is worry. In medical students the units located in level four vary considerably and may be generalized as strain, lack of confidence and confusion. In engineering students the units located in level five may be generalized as lack of confidence and confusion.

Factor Analysis for Trait Anxiety

After applying factor analysis for trait-anxiety results, it has been seen that units have accumulated in 6 factors both for engineering (cumulative variance = 60.05%) and for medical students (cumulative variance = 60.41%) (Table 2).

First level units in engineering students can be generalized as ambivalence, agitation and lack of confidence and in medical students these are misery and exhaustion. Second level units in engineering students can be generalized as uneasiness and misery, and in medical students these can be generalized as uneasiness, fragility and worry. In the analyses of continuous anxiety, units in third level factors are misery, exhaustion and lack of security in engineering students, and lack of security, weariness and ambivalence in medical students. Fourth level units in engineering students are fragility and worry, and in medical students these are ambivalence and lack of confidence. Fifth level units in engineering students are timidity and weariness, and in medical students these are timidity and wishing ineffectually for happiness. Sixth level units in engineering students are wishing ineffectually for happiness and weariness, and agitation in medical students.

DISCUSSION

Factors used to describe state and trait anxiety have some common features and some features that vary between medical and engineering students. In explaining state anxiety, the facts can, in accordance with the level of importance of each item, be listed as: in engineering students, anger, regret, exhaustion, strain, lack of confidence, worry and confusion and for medical students as anger, complaint, exhaustion, misery, worry, strain, lack of confidence and confusion. In the explanation of state anxiety we can see that anger and exhaustion have the same effect in engineering and medical students. These facts are important information in explaining state anxiety.

In explaining trait anxiety the facts can, in accordance with the level of importance of each item, be listed as: in engineering students, ambivalence, agitation, lack of confidence, uneasiness, misery, exhaustion, lack of security, fragility, worry, depression and wishing ineffectually for happiness, and for medical students as misery, exhaustion, uneasiness, fragility, worry, lack of security, depression, ambivalence, lack of confidence, wishing ineffectually for happiness and agitation. In the explanation of trait anxiety we can see that uneasiness, lack of security and depression have the same effect in engineering and medical students. Some of facts similar to these, which can be seen in state anxiety, are not seen in trait anxiety.

In our review of the literature we have not seen a study similar to ours. We have decided that it would be more appropriate to discuss the findings of our study. Evaluations show that anxiety gathers depression and it is not possible to have anxiety only (Endler, Macrodimitris, Kocovski, 2003; Ollendick, Seligman, Goza, Byrd, Singh, 2003; Caci, Baylé, Dossios, Robert, Boyer, 2003). In our studies exhaustion, regret, and lethargy, which may be taken as depression indicators, have been used to define anxiety.

Like the Brazilian study (Andrade, Gorenstein, Filho, Tung, Artes, 2001), our findings apply to Turkish university students and cannot be generalized to patient populations. Anxiety arises with the effect of different factors or the same factors with different intensities in different populations.

Generally, it could be concluded that there is a positive relationship between high degrees of academic achievement and low anxiety. There is a certain degree of anxiety that increases academic achievement, but if anxiety increases beyond that degree the opposite happens (El-Anzi, 2005).

Both the faculties where we carried out our studies are hard to enter and are courses of study that try to train students for a hard profession in the future. Engineering students worry that they may not find jobs in the future and they express these feelings with ambivalence, confusion, lack of confidence and worry. In general medical doctors are continuously learning and working throughout their lives. In our country medical doctors are working in public or private institutions. However the private sector is more tiring and does not take account of the needs of doctors. In addition every medical doctor desires to specialize in one field but only 10% of doctors are able to achieve this. This is why medical students have been giving answers such as misery, exhaustion, uneasiness, fragility, worry that reflect depressing situations.

CONCLUSION

Our studies show that even if the STAI results are similar, factor analyses should be carried out and solutions should be sought in accordance with the results. During education in universities, causes of (state - trait) anxiety should be investigated and curriculums should be changed in order to lessen anxiety, psychological and social support units should be established and students should be prepared for the future.

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HODNOTENIE ANXIETY FAKTOROVOU ANALÝZOU MEDZI ŠTUDENTMI TECHNIKY A MEDICÍNY

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Súhrn: Anxieta patrí k životu dnešnej spoločnosti. Anxieta u ľudí narúša schopnosť premýšľať, vnímať a učiť sa. Anxiózny človek zvyčajne zažíva problémy sústrediť sa, zapamätať si naučené veci a vytvárať potrebné vzťahy medzi udalosťami či ľuďmi. Výskum bol zameraný na hlavné zložky anxiety u študentov dvoch fakúlt. Pomocou faktorovej analýzy sme vytvorili skupiny nesúvisiacich položiek zoskupením súvisiacich položiek škály a usporiadali faktory ovplyvňujúce anxietu podľa ich dôležitosti. Faktorová analýza údajov týkajúcich sa anxiety študentov techniky a medicíny priniesla nasledujúce výsledky: pre anxietu ako stav sa u študentov techniky sa vytvorilo 5 faktorov, u študentov medicíny 4 faktory a pre anxietu ako črtu zhodne po 6 faktorov. Naše výskumy ukazujú, že aj keď sú v oboch skupinách výsledky v STAI podobné, je potrebné urobiť faktorovú analýzu a závery by sa mali robiť v súlade s jej výsledkami. Počas univerzitného štúdia by sa mali skúmať príčiny anxiety (ako stavu - črty) a učebné plány by sa mali prispôsobiť tak, aby sa znížila anxieta, mali by sa vytvori skupiny psychologickej a spoločenskej podpory a študenti by mali byť pripravovaní na budúcnosť.