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Adaptation of Survey of Attitudes Towards Statistics (SATS 36) for Russian sample

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Abstract

In this paper we discuss the process of adapting a tool for measuring statistics anxiety (Survey of Attitudes Towards Statistics (SATS 36)) in Russia. Our sample consists of 253 political science, sociology, and psychology students in statistics courses. The internal consistency of the Russian SATS is 0.94, however there are some differences in factor structure between the original and the new scale.

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1. Problem statement

Modern education in social science requires deep training in research methods and statistics. However, many students do not realize that they will have a lot of statistic courses when they chose social sciences and humanities. The conflict between reality and expectations leads to students' anxiety towards statistics.

A mismatch between expectations and curricula can have both positive and negative effects. On the one hand, it can destroy students' learning activities, but on the other hand, it can encourage them to study harder. The way a student copes with this conflict depends on his or her level of statistics anxiety. As Onwuegbuzie (2003) states, from two thirds to four fifths of students feel anxious about statistics and research methods courses. Of course this assumption requires further research, and our aim is to create an instrument to measure statistics anxiety in a Russian sample.

Purpose of the study is to adapt the Survey of Attitudes Towards Statistics (SATS 36) (Schau, 1996, 2003) for Russian sample.

2. Review

2.1. The nature of statistics anxiety

We base our study on Zeidner's definition of statistics anxiety: "a performance characterized by extensive worry, intrusive thoughts, mental disorganization, tension and psychological arousal... when exposed to statistic content, problems, instructional situations, or evaluative contexts, [which] is commonly claimed to debilitate performance in

a wide variety of academic situations by interfering with the manipulation with the statistics data and solution of statistics problem” (Zeidner, 1990, p.146).

2.2. *Statistics anxiety antecedents*

Onwuegbuzie (2003) categorizes the antecedents of statistics anxiety in three classes:

Situational: statistics prior knowledge, statistics course grade, the status of the course (required or elective), major attitudes towards calculators, course and instructor evaluation and satisfaction with the statistics course (Bell, 2003, Onwuegbuzie, 2003).

Dispositional: perceived level of mathematics self-concept (Zeidner, 1991), level of self-esteem (Benson, 1989), perfectionism (Onwuegbuzie and Daley, 1999), procrastination (Onwuegbuzie, 2000b; Rodarte-Luna and Sherry, 2008), cognitive skills such as poor reading ability (Collins and Onwuegbuzie, 2002), and high spatial intelligence and interpersonal intelligence (Onwuegbuzie and Daley, 1997). Most studies of statistics anxiety antecedents are focused on this class.

Environmental: gender, race, country of origin and other factors (for example, Bell, 1998, Benson, 1989; Bradley and Wygant, 1998, Rodarte-Luna and Sherry, 2008, Onwuegbuzie, 1999).

2.3. *Statistics anxiety components*

Statistics anxiety has been conceptualized as a multidimensional construct (Cruise and Wilkins, 1980; Cruise et al., 1985; Zeidner, 1991; Onwuegbuzie et al., 1997; Onwuegbuzie, 2003). For example, Onwuegbuzie et al. (1997a) identified four general components (instrument, content, interpersonal and failure). Using factor analysis Cruise (1985) identified six components (worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help, failure anxiety).

2.4. *Statistics anxiety and academic performance*

A growing body of researches has documented that statistics anxiety has a negative impact on students' performance in statistics and research method courses. Onwuegbuzie (2000) reports that statistics anxiety turned out to be the best predictor of success in research methodology. Fitzgerald states the same about statistics courses. And finally Onwuegbuzie (1997a) reported that statistics anxiety primarily affects a student's ability to understand research articles fully, as well as to analyze and to interpret statistical data. Although, it is quite clear that statistics anxiety is a debilitating phenomenon, it is possible that statistics anxiety also has a facilitative component. Onwuegbuzie (2003) supposes that a certain amount of statistics anxiety may prevent students from being too complacent in preparing for upcoming examinations and pass them successfully. However, as stated, there is a lack of studies about positive effects of statistics anxiety (Onwuegbuzie, 2003).

3. Method

In our research we used SATS (36-item version) (Schau et al., 1995; Schau, 2003) to measure statistics anxiety. SATS is a seven-point (from strongly disagree to strongly agree) Likert-type questionnaire. The first version of SATS was designed in 1995 (Schau et al., 1995); in 2003 it was updated by adding two subscales (Schau, 2003).

SATS consists of six subscales: (1) Affect (six items): positive and negative feelings concerning statistics; (2) Cognitive Competence (six items): attitudes about intellectual knowledge and skills when applied to statistics; (3) Value (nine items): attitudes about the usefulness, relevance, and worth of statistics in personal and professional life; (4) Difficulty (seven items): attitudes about the difficulty of statistics as a subject; (5) Interest (four items): students' level of individual interest in statistics and (6) Effort (four items): the amount of effort students spend on learning statistics. (Schau et al., 1995, p.870, Schau, 2003). Additional scales: Study Skills and Past Math History.

Our research group performed translation from English into Russian. The first translation was the joint work of a research assistant, who performed the translation, and a statistics instructor. After that, we performed another stage of translation, corrected some inaccuracies and collected feedback from two statistics instructors, a psychological assessment instructor and fifteen psychology students. After the pilot study some items were reworded as respondents did not understand certain terms.

The Russian adaptation of Spielberger's STAI (State – Trait Anxiety Inventory) by Khanin (1978) and NEO-PI Neuroticism scale were used for validation.

4. Sample

A pilot study of 70 political science and sociology students of the National Research University Higher School of Economics was conducted in May – June 2011 in Moscow, Russia. The main study was conducted during the first week of November 2011. The sample consisted of 253 individuals including 88 political science, 95 sociology, and 69 psychology students of the above mentioned University; 182 students were female and 70 male.

5. Findings and results

The internal consistency (Cronbach's Alpha) of the Russian version of SATS is 0,94. Item-Total correlation varies from 0.1 to 0.8.

5.1. Principal components analysis

For exploratory analysis we performed PCA (Equamax rotation). Seven factors were extracted. The total variance explained equals 65%.

Value of statistics in professional life (7; 0.898): this scale reflects students' representations about the value of statistics in their future professional lives.

Negative expectations towards statistics (9; 0.905): this scale reflects negative emotional states and attitudes towards the statistical courses.

Efforts (5; 0.843): this scale reflects students' intentions to work hard during the course and to make every effort to complete the course successfully.

Value of statistics in everyday life (5; 0.828): this scale reflects students' beliefs about the value of statistical knowledge in their everyday lives, not including their future professions.

Interest (4; 0.72): this scale reflects students' positive expectation towards the course and their interest in course curriculum.

Difficulty (4; 0.701): this scale shows the expected difficulty of statistics courses.

Statistical thinking (2; 0.502): this scale consists of two questions, and both of them are about special type of thinking required in statistics. However, as we see, the Cronbach's Alpha for this factor is quite low. The possible explanation is that students did not understand these questions and they formed a separate factor. We consider removing these items from the final version of Russian SATS.

5.2. Statistics anxiety and other anxiety scales

There were significant correlations between the Russian version of SATS 36 and Spielberger's Anxiety as a trait scale (Pearson correlation is -0.24; $p = 0.0001$) and NEO PI Neuroticism scale (Pearson correlation is 0.274; $p = 0.00001$). It should be mentioned that these correlations are larger for males (SATS*AT is -0.41 ($p = 0.0005$), SATS*NEO-PI is 0.43 ($p = 0.0002$)) than for females (SATS*AT is not statistically significant, SATS*NEO-PI is 0.2 ($p = 0.008$)).

There was no significant correlation between the scores on SATS 36 and Spielberger's Anxiety as a State scale.

6. Discussion

As we see from Cronbach's Alpha and correlations with three different anxiety scales, the Russian version of SATS 36 has shown good reliability and construct validity (connections with the anxiety scales show a good level of convergent validity). Thus statistics anxiety is a separate stable trait. Weak significant correlations between SATS and Anxiety as a trait and Neuroticism scales indicate that students with expressed anxiety feel uncomfortable in statistics classes, and this discomfort is not caused by situational factors such as the instructor, fear of failure, fear of audience, etc. The reason for this discomfort can be named as anxiety towards statistics and measured on the Russian sample by the Russian SATS 36. Anxiety as a Trait is one of the dispositional factors of statistics anxiety.

As to comparison of our extracted factors and the original scale structure there are few discrepancies. The original SATS has six scales, whereas the Russian version has seven scales; even with the removed Statistical thinking scale the content of the scales is similar but not equal to original SATS.

Similar discrepancies were found on other adaptations of SATS 36 in other languages (Baloglu, M. 2002; Pan W., Tang M. 2005). We suppose that these are due to some cultural differences in students' attitudes towards statistics.

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