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The Influence of Anxiety on Attentional Control in comparison of Music Academy and
Aviation Academy students' samples

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ABSTRACT

The aim of this study was to test the predictions of attentional control theory (ACT) on the sample of aviation and music academy students. Previous findings reported various relationships between anxiety, attention, self-esteem and performance, as well as support of ACT (e.g. see Fales *et al,* 2008; Derryberry, 2002; Yoshie *et al,* 2009; Dandeneau & Baldwin, 2009; Wilson, Vine & Wood, 2009 for review). Self-report measures of attention, control, self-esteem and anxiety were used to compare results from sample groups. Consistent with variety of previous findings, anxiety was highly correlated with attention subscales, as well as with negative self-esteem. ANOVA Sheffe and detailed regression analysis demonstrated peculiarities of each group involved. While aviation students reported significant relationships between trait anxiety and attention subscales and negative self-esteem, music students reported significant relationships between same subscales and state anxiety.

Keywords: anxiety, attentional control theory, self-esteem, performance, music students, aviation students

Ärevuse ja tähelepanu kontrolli omavaheline seos lennuakadeemia ja muusikaakadeemiate üliõpilaste valimite näitel

KOKKUVÕTE

Käesoleva uuringu eesmärk oli kinnitada tähelepanu kontrolli teooriat (Attentional Control Theory, ACT) lennu- ja muusika-akadeemiate tudengite valimite näitel. Varasemate uuringute järgi on olemas mitmeid seoseid ärevuse, tähelepanu, enesehinnangu ja soorituse vahel, mis ühtlasi toetavad ACT-d (vt. Fales *et al,* 2008; Derryberry, 2002; Yoshie *et al,* 2009; Dandeneau & Baldwin, 2009; Wilson, Vine & Wood, 2009). Grupide võrdlemiseks kasutati uuringus enesekohaseid küsimustike, mis mõõdavad tähelepanu, kontrolli, enesehinnangut ja ärevust. Varasemate uuringute toetuseks saadud tulemused kinnitavad tugevat seost ärevuse, tähelepanu kontrolli alaskaalade ja negatiivse enesehinnangu vahel. ANOVA Sheffe analüüs tõi välja gruppide omapärad. Sellal kui seega lennuakadeemia tudengid näitasid olulist seost püsiärevuse ja tähelepanu alaskaalade ning negatiivse enesehinnangu vahel, ilmnes muusikatudengitel oluline seos seisundiärevuse ja samade tähelepanu- ja negatiivse enesehinnangu alaskaalade vahel.

Märksõnad: ärevus, tähelepanu kontrolli teooria, enesehinnang, sooritus, muusikatudengid, lennuakadeemia tudengid

INTRODUCTION

The influence that anxiety exerts on individual's performance continues to be one of the main interests to psychologists from different fields. Although functional from the evolutionary perspective, anxiety is experienced as an aversive emotional and motivation state occurring in threatening circumstances, related to the subjective evaluation of a situation with regard to one's self-esteem (Eysenck, 2007).

Attentional control theory (ACT), developed by Eysenck and his colleagues, is currently the leading approach to understand the influence of anxiety on individual's control. It is assumed that anxiety impairs efficient functioning of the goal-directed attentional system and increases the extent to which processing is influenced by the stimulus-driven attentional system. In addition to decreasing attentional control, anxiety increases attention to threat-related stimuli. Adverse effects of anxiety on processing efficiency depend on two central executive functions involving attention control: inhibition and shifting. However, anxiety may not impair performance effectiveness (quality of performance) when it leads to the use of compensatory strategies; e.g. enhanced effort or increased use of processing resources (Eysenck *et al.,* 2007). A later findings by Derakshan and Eysenck (2009) develops current approach further and therefore attentional control theory assumes that anxiety impairs the efficiency of two types of attentional control: (1) negative attentional control (involved in inhibiting attention to task-irrelevant stimuli); and (2) positive attentional control (involved in flexibly switching attention between and within tasks to maximize performance). More specifically, there is strong evidence that anxiety impairs processing efficiency more than performance effectiveness; that anxiety impairs the inhibition function; and that anxiety impairs the shifting function (Derakshan, Eysenck, 2009; see Eysenck & Derakshan, 2010; Derakshan *et al,* 2009; Eysenck *et al,* 2007; for review).

Thus it is possible to divide attention control theory and anxiety background with resulting processes onto three aspects. The first one would be neuropsychological, which describes neural processes of attention in brain activity in condition of anxiety states (see Booth *et al,* 2003; Raz, 2004; Liston, McEwen & Casey, 2009, Fales *et al,* 2008 for review). The second aspect would be behavioral/emotional and/or cognitive-emotional interactions, which show an important role of deficiencies in self-confidence (Yoshie *et al,* 2009), self-esteem (Ryan, 1998) and self-control (Derryberry, 2002) together with negative emotionality in causing anxiety and therefore influencing the performance. The third aspect would be physical

performance, which includes individual's motor performance on tasks and somatic symptoms in condition of anxiety states (see Coombes *et al,* 2009; Harmat & Theorell, 2010; Langendörfer *et al,* 2006, Wilson *et al,* 2009 for review).

Regarding the second aspect, a wealthy number of findings have reported strong relationships between attentional control, or anxiety and self-perception items such as self-esteem, self-confidence and self-control. Individuals with low self-esteem are highly attentive to information conveying rejection, whereas those with high self-esteem appear to inhibit their attention to this sort of information (Dandeneau & Baldwin, 2009). In addition, musical performance anxiety research by Ryan (1998) demonstrated significant correlations between self-esteem, particularly social self-esteem, and both state anxiety and trait anxiety among children. Interviewed subjects reported feelings of anxiety when performing in piano recitals, many of them noting a fear of making mistakes in front of people as the primary cause of such anxiety. However, adults demonstrated strong relationships between self-esteem and performance as well. Main findings in the study by Yoshie (2009) reported that among subscales used only self-confidence intensity positively predicted global performance, as well as all the skill components: the artistic expression, temporal accuracy, and technical accuracy.

For support of the motor performance side of the third aspect a few studies are reviewed. High anxiety levels are reported to accompany significant bodily changes such as elevated heart rate, increased sweat rate, heightened muscular tonus and activity. Research by Yoshie and colleagues (2009) demonstrated that skilled pianist in competition condition reported a considerably impaired performance. Social-evaluative stressor affected autonomic arousal, which caused a dramatic increase in heart rate during performance. Results showed increased electromyographic (EMG) activity of the *biceps brachii* and upper trapezius muscles during the execution of various motor tasks under psychological stress. Such elevated muscle activity in the upper extremity has reflected increased corticospinal motor tract excitability associated with negative emotions. Additionally, findings made by few researches in sport psychology reported an impaired performance by sportsmen when anxious. Pijpers and colleagues (2003) investigated anxiety and physiological changes on a sample of mountain climbers and reported significantly higher heart rate, more muscle fatigue and higher blood lactate concentrations among subjects when they climbed a high route and felt anxious. The climbing time was longer in anxiety-provoking condition. Authors cite the paper by Williams and Elliot (1999), which demonstrated an increased rate of visual scanning and the number of fixations on opponents' arms and fists among karate fighters. Anxiety symptoms can

seriously interfere with motor and visuomotor control and attentional control system (see Wilson, Vine & Wood, 2009; Wilson, Wood & Vine, 2009; Yoshie *et al,* 2009 for review), however for some type of sports it can be beneficial, while for some it may significantly impair the performance.

Finally, there are a few recent findings reporting relationship between anxiety and academic performance (see Vitasari *et al,* 2010; Eum & Rice, 2010; Pomerantz, Altermatt & Saxon, 2002 for review). Study by DordiNejad *et al,* (2011) reported a negative relationship between test anxiety and participants' academic performance, which means that people with higher test anxiety have low academic performance.

The goal of the present study is to search for support of ACT by using attention and control self rating scales and testing two contrasting groups. The reasons for this were the findings from the previous study (Grigorjeva, 2010), which revealed significant differences between the samples of aviation, arts and music students, where the first group reported very low negative emotionality on all scales used, while the second group showed high scores in depression and the third sample in anxiety. In addition to Estonian students from aviation and music academies a sample of students from Rimsky-Korsakov Saint-Petersburg Conservatory was taken with the purpose to test possible cross-cultural differences in anxiety (see Lowe & Ang, 2012; Baloğlu, Deniz & Kesici, 2011 for review). Therefore, based on previous findings and relations between anxiety and attentional control according to ACT, the following hypotheses were proposed:

> Hypothesis 1: Estonian Aviation Academy students would score significantly lower on anxiety and attention hindrances' subscales and higher on attentional control subscale.

> Hypothesis 2: Estonian Academy of Music and Theater students would obtain higher scores than individuals from the first group in anxiety and attention hindrances' subscales and lower on attentional control subscale.

> Hypothesis 3: Rimsky-Korsakov Saint-Petersburg Conservatory students would show higher scores in anxiety subscales in comparison with other groups.

> Hypothesis 4: Individuals with higher anxiety level will indicate a lower grade point average in the specialty (e.g. piano, string, flute or vocal department).

> Hypothesis 5: All the groups would report significant relationship between anxiety, attentional hindrances and attentional control subscales.

METHOD

Participants

A total of 116 students participated in this study. The sample included three groups of students from the following institutions: Estonian Academy of Music and Theater (*N = 54; among them 34 females and 18 males)*, Estonian Aviation Academy (*N = 44; among them 7 females and 37 males)* and of Rimsky-Korsakov Saint-Petersburg Conservatory *(N = 20, among them 15 females and 5 males)*. The age of participants ranged from 18 to 45 years (*M = 22,68, SD = 3,81).* All participants filled in the questionnaires whether on paper blank or via on-line form.

In the following text the abbreviated names of the higher education institutions, where the participants came from will be used: Estonian Academy of Music and Theater – EMA; Estonian Aviation Academy – EAA; Rimsky-Korsakov Saint-Petersburg Conservatory – RKC.

Measures

The measures used in our research were adapted and put together by Aavo Luuk, the supervisor of the author of the present paper and are at the stage of approbation.

Attention scale

The attention scale used in our questionnaire is based on the Attentional Control Scale (ACS, Derryberry & Reed, 2002). Differently from Attentional Control Scale, which measures attentional focus (the ability to focus attention), attentional shift (the ability to shift attention between tasks), and thought control (the ability to flexibly control thought), our attention scale consists of the following subscales: ATT_1, attention internal hindrances subscale (5 items; Cronbach's $\alpha = 0{,}740$), ATT_2, attention external hindrances subscale (5 items; Cronbach's $\alpha = 0{,}706$) and ATT_3, attention control subscale (5 items; Cronbach's $\alpha = 0{,}700$).

The attention internal hindrances´ subscale is supposed to measure the influence of bothering factors inherent to the person (e.g. doubt, fear, confusion, anger, anxiety, depression etc.) on her/his attention. The attention external hindrances´ subscale is supposed to measure the influence of bothering factors coming from outside of the person (e.g. noise, music etc.) on her/ his attention. The attention control scale is supposed to measure

individual's ability to voluntary control his/her attention. The items are scored on a 5-point Likert-scale, ranging from 0 (wrong/strongly disagree) to 4 (right/strongly agree).

Control scale

The control scale also consists of three subscales, the first being the attention control subscale (5 items; Cronbach's $\alpha = 0,700$), described above as ATT_3. Its repeated use under the control scale could be expedient if the summary control scores were calculated by summing up the results of all three subscales related to control. This opportunity was not used in the present study. Other two subscales are CTRL_1, the external locus of control subscale (5 items; Cronbach's $\alpha = 0,735$) and CTRL_3, the planning-type of control subscale (5 items; Cronbach's $\alpha = 0,700$).

The external locus of control subscale is based on "The Locus of Control Theory" (Rotter, 1966). The locus of control is a particular personality trait which measures the extent to which a person attributes control over the outcome of environmental events to oneself. A person is said to have an internal locus of control if he or she generally believes that a reinforcing event is contingent upon his or her own behavior. At the other end of the continuum, a person is said to have an external locus of control if he or she does not perceive any contingency between a reinforcing event and personal action, but instead attributes the event to luck, chance, fate, or powerful others, or simply labels the event as unpredictable.

Instead of the expected internal locus of control subscale, the planning-type of control subscale emerged from exploratory factor analysis and it is supposed to measure the individual's ability to plan his/her actions according to situation. The items of the scale are scored on a 5-point Likert-scale, ranging from 0 (wrong/strongly disagree) to 4 (right/strongly agree).

Negative self-esteem and responsibility scales

The negative self-esteem scale EHI_1 is based on The Rosenberg´s Self-Esteem Scale (RSES; Rosenberg, 1965, Pullmann, Allik, 2000, Pullmann, Allik, & Realo, 2009). Several researchers who conducted factor analyses of the 10-item Rosenberg Scale have suggested that the scale reflects a two-dimensional construct, comprised of positive and negative images of the self (Bachman & O'Malley, 1986; Goldsmith, 1986; Kaplan & Pokorny, 1969; Owens, 1993). From the initial item pool used in preparing the scales applied in the present study, a negative self-esteem scale (10 items; Cronbach's $\alpha = 0,842$) emerged together with a scale preliminarily named as responsibility scale EHI_3 (11 items; Cronbach's $\alpha = 0,819$). The

items are scored on a 5-point Likert-scale, ranging from 0 (wrong/strongly disagree) to 4 (right/strongly agree).

The dark facets of personality

The scale of the dark facets of personality is based on The Dark Triad´s theory. The Dark Triad is composed of Machiavellianism, subclinical narcissism and subclinical psychopathy. Machiavellian individuals tend to be manipulative, while demonstrating a 'cool' or 'cold' approach to others (Christie & Geis, 1970; Hunter, Gerbing, & Boster, 1982). Subclinical narcissists, sometimes called 'normal narcissists' (Sedikides, Rudich, Gregg, Kumashiro, & Rusbult, 2004), tend to have a sense of entitlement and seek admiration, attention, prestige and status (House & Howell, 1992; Morf & Rhodewalt, 2001; Raskin & Hall, 1979). Subclinical psychopaths are characterised by high impulsivity and thrill-seeking and tend to have low empathy (Paulhus, Hemphill, & Hare, in press). In our questionnaire we have two subscales – psychopathy subscale EHI_2 (11 items, Cronbach's $\alpha = 0,750$) and narcissism subscale EHI_4 (4 items, Cronbach's $\alpha = 0,710$). Although a comprehensive set of appropriate statements were used on initial sample, the Machiavellianism factor did not emerge from exploratory factor analysis. The items of the psychopathy subscale come from the 31-item self-report psychopathy scale-III (SRP-III; Paulhus, Neumann, & Hare, in press) and the items of the narcissism subscale are based on the 40-item Narcissistic personality inventory (NPI-40; Raskin & Terry, 1988). The items are scored on a 5-point Likert-scale, ranging from 0 (wrong/strongly disagree) to 4 (right/strongly agree).

Visual Analogue Scale for Anxiety

Visual Analogue Scale for Anxiety (AAS) consists of a 10-cm horizontal line, anchored on the left by the words ''zero anxiety'' and on the right by ''maximal anxiety.'' Participants were provided with written instructions on how to evaluate their anxiety by marking the line with a vertical stroke to show how anxious they feel at the moment. A mark at the extreme left would show that the person was feeling not at all anxious at the moment. A mark at the extreme right would show that the person was feeling extremely anxious at the moment. A mark near the centre would show that the person was feeling moderately anxious. The Visual Analogue Scale of Anxiety has been used in several studies to measure the degree of anxiety in anxiety disorder patients and healthy subjects. It has proven to be a valid method for the measurement of anxiety and is highly sensitive for change (Hornblow & Kidson, 1976; Kindler *et al,* 2000; Bringuier *et al,* 2009).

State anxiety scale

To measure state anxiety, the adapted State Version of State-Trait Inventory for Cognitive and Somatic Anxiety (Ree *et al,* 2000) was used. The StaAnx scale has 21 items (Cronbach's $\alpha = 0,923$) together on two subscales of somatic component of anxiety (arousal) and cognitive component of anxiety (worry). The items are scored on a 5-point Likert-scale, ranging from 0 (wrong/strongly disagree) to 4 (right/strongly agree).

Frequency of anxiety episodes (Trait anxiety) scale

To measure trait anxiety we used adopted Trait Version of State-Trait Inventory for Cognitive and Somatic Anxiety (Ree *et al,* 2000). The AnxFrq scale has 21 items (Cronbach's $\alpha = 0,925$), which are identical to the items of the State Version of the scale with two subscales of somatic component of anxiety (arousal) and cognitive component of anxiety (worry). The items are scored by frequency of occurrence on a 5-point Likert-scale, ranging from 0 (almost never) to 4 (almost every time). For students from RKC same questionnaires were translated into Russian language. Translated version was firstly filled by 28 Russian Philology department students from Philosophy faculty of University of Tartu in order to test questionnaires on their reliability. Both anxiety scales showed acceptable reliability (internal consistency) on Cronbach's α –s. For Trait Anxiety $\alpha = 0,87$ and for State Anxiety $\alpha = 0,85$. Reliability indexes for attention, control and other subscales were lower, however most of them still acceptable or close to acceptable: ATT_1 $\alpha = 0,.549$, ATT_2 $\alpha = 0,723$, ATT_3 $\alpha = 0,622$, CTRL_1 $\alpha = 0,732$, CTRL_3 $\alpha = 0,572$, EHI_1 $\alpha = 0,763$, EHI_2 $\alpha = 0,703$, EHI_3 $\alpha = 0,649$, EHI_4 $\alpha = 0,471$.

Procedure

The responses from EAA and partly from EMA students were collected during their lectures; average time for filling in the questionnaires was approximately 20-25 minutes. Another group of participants from EMA and students from RKC filled in questionnaire via Internet form, uploaded on www.e-formular.ee. Data from EAA and EMA students was collected during 3 weeks, and from RKC students during 6 weeks. Each time it was negotiated with the professors to get the permission to test the students during their respective lectures. During the procedure itself students were asked to fill in a questionnaire for research purposes with a more detailed instruction written on a blank. Confidentiality of participants' information was

especially emphasized before they started filling in the forms. Detailed instruction written on a blank was as the following:

With the current questionnaire we ask you to evaluate your feelings and thoughts concerning anxiety. Questionnaire has two forms and in the first one we ask about frequency of occurrence those feelings and thoughts concerning anxiety. Please, evaluate the frequency of occurrence of your anxiety-related feelings and thoughts in your everyday life, which, as a rule doesn't comprise events causing high level of anxiety. If such events have occasionally happened, please try not to take them into account. Read each statement carefully and try to evaluate, how often it describes your emotional state. The statements in the questionnaire don't have right or wrong answers, because we want to know just your own opinion about yourself.

EMA and RKC students were given three separate pieces of paper, each with the anxiety visual analogue scale of 10 centimeters long and were asked to mark with the cut-off line their anxiety level according to the following conditions for each scale: anxiety analogue scale 1 (AAS 1) for the current anxiety state (during a lecture or other everyday situation), anxiety analogue scale 2 (AAS 2) for anxiety state right before individual's public performance (concert or exam) and anxiety analogue scale 3 (AAS 3) for anxiety state right after the same public performance (concert or exam). During the 4 weeks period they had to mark their state anxiety AAS 1 in everyday situation once and AAS 2 before and AAS 3 after a selected public performance event in accordance with conditions on given scales. For RKC group the period of collecting data was longer due to the physical distance to Saint-Petersburg, so they returned the blanks 2 months after receiving them.

Data analysis

The results were entered to Excel spreadsheet for sorting and preparing them for further analysis. To assess the collected results, ANOVA, *t*-test, Correlation and Regression were used. ANOVA was used to examine the general effects of groups, StaAnx and AnxFrq, anxiety analogue scales on ACS subscales, as well as on academic grades examined via questionnaires. *t*-test was used for examining differences between traits in compared pairs of groups and gender. Correlation between StaAnx and AnxFrq scales and ACS subscale were used to examine relationships between the items. Further on a regression analysis was applied to test groups for peculiarities regarding subscales.

RESULTS

Data from 116 students were analyzed. Descriptive information for 11 measured subscales, anxiety analogue scale measures and academic grades of the study sample is displayed in Table 1. There were no data collected for grades and anxiety analogue scale in the second and third conditions (AAS 2 and AAS 3) from EAA students.

The group from EAA students showed the lowest means and standard deviations in all negative emotionality and attention hindrances' measures and highest means in attention control. RKC group reported the highest scores in internal attention hindrances *(M = 9,25)*, negative self-esteem *(M = 17,05),* anxiety analogue scale AAS 1 *(M = 21,35)*, state anxiety *(M = 29,25)* and trait anxiety *(M = 28,20)*. In a contrast to RKC group, participants from EAA scored the lowest in the following subscales: internal attention hindrances *(M = 5,68)*, external attention hindrances *(M = 9,14),* negative self-esteem *(M = 10,55)*, anxiety analogue scale the first condition AAS 1/current anxiety *(M = 15,95)*, state anxiety *(M = 9,07)* and trait anxiety *(M = 14,98)*. Students from EAA group also scored the highest *(M = 14,14)* in attention control subscale, however not statistically significantly differently from other groups means.

Table 1

Descriptive Statistics for EMA, RKC and EAA groups

Measured subscales	EMA		RKC		EAA	
	M	**SD**	**M**	**SD**	**M**	**SD**
ATT_1	7.85	3.24	9.25	3.60	5.68	3.00
ATT_2	12.19	3.81	11.4	4.31	9.14	3.96
ATT_3	11.67	3.59	13.45	2.26	14.14	3.23
CTRL_1	6.65	3.57	9.10	2.99	6.34	3.24
CTRL_3	15.08	4.25	16.55	3.41	16.45	3.87
EHI_1	13.85	5.92	17.05	5.84	10.55	5.74
EHI_2	8.17	5.16	10.6	4.03	10.73	5.10
EHI_3	31.35	6.97	32.25	3.29	33.02	5.90
EHI_4	8.98	3.3	8.85	1.79	9.09	3.22
AAS 1	18.04	18.08	21.35	7.98	15.95	16.67
AAS 2	77.38	16.69	88.15	12.44	-	-
AAS 3	30.62	18.44	29.45	16.62	-	-
Grades	4.16	0.54	3.73	0.59	-	-
StaAnx	23.44	9.44	29.25	11.3	9.07	9.53
AnxFrq	17.87	11.56	28.2	15.25	14.98	9.84

Notes: N = 116; M – mean; SD – standard deviation. The acronyms used for the student subject groups are the following: EMA – Estonian Academy of Music and Theater; RKC - Rimsky-Korsakov Saint-Petersburg Conservatory; EAA – Estonian Aviation Academy.

One-way ANOVA Post Hoc Scheffe analysis was used to test for group differences with regard to subscales used. Table 2 represents only significant differences between groups. It must be noted that statistically significant differences were revealed mostly between EAA and two music academies student groups. In order to examine possible differences between EMA and RKC students an independent sample *t*-test was performed and significant differences appeared on the following subscales: attention control (*M*EMA = 11,67, SD*EMA* = 3,59, *M*RKC = 13,45 SD*RKC* = 2,26, *p* =. 015)*, external control (*M*EMA = 6,65, SD*EMA* = 3,57; *M*RKC = 9,10, SD*RKC* = 2,99; *p* =. 005)*, negative self-esteem (*M*EMA = 11,67, SD*EMA* = 3,59; *M*RKC = 13,45 SD*RKC* = 2,26; *p* =. 015)*, psychopathy (*M*EMA = 8,17, SD*EMA* = 5,16; *M*RKC = 10,60 SD*RKC* = 4,03; *p* =. 041)*, anxiety analogue scale 2 (*M*EMA = 77,38, SD*EMA* = 16,69; *M*RKC = 88,15, SD*RKC* = 12,44; *p* =. 005)*, academic grades (*M*EMA = 4,16, SD*EMA* = ,54; *M*RKC = 3,73 SD*RKC* = ,59; *p* =. 007)*, state anxiety (*M*EMA = 23,44, SD*EMA* = 9,44; *M*RKC = 29,25, SD*RKC* = 11,30; *p* =. 050)*, trait anxiety (*M*EMA = 17,87, SD*EMA* = 11,56; *M*RKC = 28,20, SD*RKC* = 15,25; *p* =. 011)*.

Table 2

Statistically significant comparisons between EMA, RKC and EAA groups on the 8 measured subscales, based on One-Way ANOVA, Scheffe test

Measured subscales	Groups in comparison	Mean Difference	*p*
ATT_1	EMA EAA	0.66	.006**
	EAA RKC	0.87	.000**
ATT_2	EMA EAA	0.81	.001**
ATT_3	EMA EAA	0.67	.002**
CTRL_1	EMA RKC	0.88	.024*
	RKC EAA	0.91	.011*
EHI_1	EMA EAA	1.20	.025*
	RKC EAA	1.58	.000**
EHI_2	EMA EAA	1.02	.047*
StaAnx	EMA EAA	2.01	.000**
AnxFrq	EMA RKC	2.65	.005**
	RKC EAA	3.15	.000**

Notes: ** Statistically significant difference (*p*<0.01)
* Statistically significant difference (*p*<0.05)
N=116. The acronyms used for the student subject groups are the following: EMA – Estonian Academy of Music and Theater; RKC - Rimsky-Korsakov Saint-Petersburg Conservatory; EAA – Estonian Aviation Academy.

For the further step a one-way ANOVA analysis was made for each group separately, in order to detect possible in-group differences dependent on anxiety measures. Therefore StaAnx and AnxFrq were set as factors and ACS subscales as dependent variables. For EAA group significant differences were found dependent on trait anxiety measure and the following subscales: internal attention hindrances *(F = 3,005, p = .009)*, external attention hindrances *(F = 3,160, p = .006)*, attention control *(F = 3,930, p = .002)*, psychopathy *(F = 2,885, p = .011)* and responsibility *(F = 2,694, p = .016)* . Dependent on state anxiety measure there were significant differences only in two subscales: responsibility (F = *2,313, p = .027*) and anxiety analogue scale 1 *(F = 3,147, p = .004)*.

EMA group reported significant differences dependent on state anxiety measure and the following subscales: external attention hindrances *(F = 2,662, p = .010)*, responsibility *(F = 2,806, p = .008)* and anxiety analogue scale 1 *(F = 6,117, p = .000)*. No significant differences were revealed dependent on trait anxiety measure on any ACS subscales.

RKC group reported significant differences dependent on state anxiety on internal attention hindrances *(F = 48,891, p = .005)*, external attention hindrances *(F = 13,043, p = .028)* subscales and dependent on trait anxiety on the same subscales – internal attention hindrances *(F = 43,250, p = .023)* and external attention hindrances *(F = 20,635, p = .047)*.

Correlations of anxiety and ACS subscales

In order to understand the relationship between anxiety and attention more clearly, a general correlation between measured subscales was further examined. Correlations were calculated between all subscales, and many statistically significant correlations appeared, as it was expected. However, the main aims of observations were correlations between anxiety and other subscales measured. Significant correlations were found between state anxiety and all other measured subscales except planning-type of control, psychopathy, narcissism and also grades**.** Table 3 shows statistically significant correlations between negative self-esteem, state anxiety, trait anxiety and ACS subscales. As it was expected, state anxiety and trait anxiety were positively correlated with internal attention hindrances, external attention hindrances, external control and all anxiety analogue scale measures. Negative self-esteem was positively correlated with both state and trait anxiety, as well as with internal and external attention hindrances, and external control. Negative correlations appeared between anxiety subscales, attention control and responsibility. Majority of correlations were significant at the level *p = .000*, which reports a strong relationship between measured anxiety and attention subscales.

Table 3

Statistically significant correlations between negative self-esteem, state, trait anxiety and ACS subscales

Subscale	*M*	*SD*		ATT_1	ATT_2	ATT_3	CTRL_1	EHI_1	EHI_3	AAS 1	AAS 2	ASS 3
EHI_1	13.15	6.242	*r*	.570**	.346**	-.457**	.387**					
			p	.000	.000	.000	.000					
SA	18.99	12.628	*r*	.589**	.369**	-.477**	.214*	.619**	-.299**	.443**	.419**	.242*
			p	.000	.000	.000	.021	.000	.001	.000	.000	.041
TA	18.55	12.457	*r*	.525**	.221*	-.409**	.178	.538**	-.227*	.468**	.393**	.101
			p	.000	.017	0	.056	.000	.014	.000	.001	.399

Notes: ** Statistically significant difference (*p*<0.01)
            * Statistically significant difference (*p*<0.05)
        ATT_1 – Internal attention hindrances, ATT_2 – External attention hindrances, ATT_3 – Attention control, CTRL_1 -– External control, EHI_1 – Negative elf-esteem, EHI_3 – Responsibility, AAS 1 – Anxiety analogue scale 1, AAS 2 – Anxiety analogue scale 2, AAS 3 – Anxiety analogue scale 3

Regression

Whereas ANOVA Sheffe analysis revealed significant differences between groups on eight subscales and correlation analysis reported significant relationships between same subscales, a regression analysis was performed to describe possible peculiarities of relationships for each group. Table 4 shows statistically significant regression coefficients for attention and anxiety subscales. EAA group reported the strongest relationship between internal attention hindrances, attention control and trait anxiety, while EMA and RKC groups revealed significant relationship between state anxiety and attention subscales.

Table 4

Statistically significant regression coefficients for ACS and anxiety subscales, split by groups, based on Linear Regression.

ACS/Anxiety Subscales	EMA		RKC		EAA	
	R²	*p*	*R²*	*p*	*R²*	*p*
ATT_1	0.209		0.623		0.305	
StaAnx		.023*		.004**		.675
AnxFrq		.747		.282		.002**
ATT_2	0.07		0.316		0.129	
StaAnx		.062		.045*		.445
AnxFrq		.171		.29		.032*
ATT_3	0.199		0.379		0.46	
StaAnx		.024*		.097		.842
AnxFrq		.811		.762		.000**
CTRL_3	0.001		0.001		0.178	
StaAnx		.889		.938		.041*
AnxFrq		.84		.98		.953

EHI_1	0.41		0.101		0.463	
StaAnx		.011*		.211		.015*
AnxFrq		.062		.354		.039*
EHI_3	0.044		0.046		0.352	
StaAnx		.572		.396		.005**
AnxFrq		.553		.389		.551

Notes: ** Statistically significant difference (*p*<0.01)
   * Statistically significant difference (*p*<0.05)
   N=116. The acronyms used for the subject groups are the following: EMA – students from Estonian Academy of Music and Theater; RKC - Rimsky-Korsakov Saint-Petersburg Conservatory; EAA – Estonian Aviation Academy.

The influence of gender upon these results was further examined. It was necessary because the numbers of female and male students were quite unbalanced within each group. In order to find out, whether different numbers of females and males had any influence upon results, an independent sample *t*-test was carried out. *t*-test resulted in demonstrating significant differences between gender in EMA group for negative self-esteem subscale (*M*$_{Female}$ = 15,06, *SD*$_{Female}$ = 5,75, *M*$_{Male}$ = 11,56, *SD*$_{Male}$ =5,71, *p* = .041) and in EAA group for external attention hindrances subscale (*M*$_{Female}$ = 5,71, *SD*$_{Female}$ = 3,30, *M*$_{Male}$ = 9,78, *SD*$_{Male}$ =3,77, *p* = .011), planning-type control subscale (*M*$_{Female}$ = 13,29, *SD*$_{Female}$ = 3,95, *M*$_{Male}$ = 17,05, *SD*$_{Male}$ =3,59, *p* = .016) and state anxiety (*M*$_{Female}$ = 14,29, *SD*$_{Female}$ = 19,82, *M*$_{Male}$ = 8,08, *SD*$_{Male}$ =6,06, *p* = .001). Further on all gender influences upon each group were investigated and in Table 5 are represented statistically significant differences between genders within EMA and RKC student groups.

Table 5

Comparison of genders in EMA and RKC students' results on the basis of t-test

Gender / Subscales	*M*		*SD*		*p*
	EMA	RKC	EMA	RKC	
Females					
ATT_3	11,12	13,8	4,02	2,45	.021**
CTRL_1	6,82	9,33	3,41	2,44	.013**
EHI_2	7,44	10,53	4,55	4,1	.029**
Grades	4,11	3,59	,51	,57	.003*
Males					
ATT_1	7,39	11,56	3,18	4,43	.020**
EHI_1	11,56	19,2	5,71	6,83	.019**
StaAnx	20,22	31,2	8,08	8,7	.015**
AnxFrq	14,61	32,4	9,72	9,86	.002*

Note: : ** Statistically significant difference (*p*<0.01)
   * Statistically significant difference (*p*<0.05)
   Females, group 1 *N=34,* group 2 *N=15*; males' group 1 *N = 18,* group 2 *N = 5*

Visual Analogue Scale of Anxiety

Anxiety analogue scale results were not the primary subject of the present study; however there is a wealthy number of significant results on analogue scales consistent with already reviewed data which were obtained in Likert scale format on questionnaire subscales. In accordance with the plan of the study Table 6 represents descriptive statistics of visual analog scale anxiety millimeters for both musical higher institution groups: EMA and RKC. It must be reminded that repeated anxiety analog scale use did not involve EAA student sample.

Table 6

Descriptive statistics of anxiety millimeters on AAS 1, AAS 2 and AAS 3 scales

Measure	*M*	*N*	*SD*	*SE* of *M*
AAS 1	18,90	71	16,046	1,904
AAS 2	80,28	71	16,375	1,943
AAS 3	29,72	71	17,293	2,052

Table 7

Statistically significant correlations of successive visual analog anxiety measures

Measures		AAS 1	AAS 2	AAS 3
AAS 1	*r*	1		
	p			
	N	71		
AAS 2	*r*	.258*	1	
	p	.030		
	N	71	71	
AAS 3	*r*	.185	.263*	1
	p	.122	.027	
	N	71	71	71
StaAnx	*r*	.474**	.417**	.226
	p	.000	.000	.058
	N	71	71	71
AnxFrq	*r*	.441**	.394**	.104
	p	.000	.001	.387
	N	71	71	71
EHI_1	*r*	.402**	.148	.148
	p	.001	.219	.218
	N	71	71	71

Note: ** Statistically significant difference ($p<0.01$)
* Statistically significant difference ($p<0.05$)

Table 7 demonstrates statistically significant correlations between AAS and anxiety subscales, as well as between negative self-esteem. As it was expected from measuring conditions, AAS repeated use resulted in statistically significant correlations between measures AAS 1 and AAS 2 and between measures of AAS 2 and AAS 3. Then a paired sample t-test was used to test for the differences between scales and results revealed significant differences ($p = .000$) between all the pairs of AAS in conditions 1, 2, and 3.

DISCUSSION

The goal of the present study was to prove the main hypothesis that high anxiety level impairs attention control according to ACT model (Eysenck *et al*, 2007).

Results revealed significant relationships between attention and anxiety subscales, where all the groups reported significant differences between these subscales. Despite the inhomogeneity of groups used, the study succeeded to confirm support for anxiety and ACT relationships. As expected, the participants from EAA performed significantly lower on anxiety subscales than other groups involved, and showed higher scores on attention control, therefore supporting the first hypothesis. One of the probable reasons of such outcome is that EAA group is a preselected sample. At least part of aviation student candidates are selected on the basis of several emotional stability and cognitive abilities measures.

Comparison between groups demonstrates specific characteristics of each group. Closer look at the EAA sample data reveals a strong relationship between trait anxiety and three attention subscales: internal attention hindrances, external attention hindrances and attention control. At the same time EMA and RKC groups demonstrated strong relationships between state anxiety and the same three attention subscales. The possible explanation for such outcome might be a specific preselected nature of EAA students sample, resulting in extremely low anxiety scores, while EMA and RKC student samples are characterised by significantly higher anxiety scores. Another possible reason might be that music academy students regularly experience anxiety causing situations, i.e. public performances, where their performance is estimated by audience or jury or by both simultaneously. This may cause them to experience the anxiety episodes both as frequent and intense and the self-evaluations on anxiety scales prove it. Anxiety analogue scale helped to get a more detailed picture of state anxiety levels among musicians and revealed that student's peak of anxiety is right before their public performance/exam, which is consistent with previous findings (Vuust *et al*, 2010; Langendörfer *et al*., 2006) and explains high state anxiety scores. In addition to demonstrated high anxiety scores, music academy groups reported lower scores in attentional control scores and higher in attention hindrances and there were also significant differences among subscales between groups. RKC students' responses expressed higher scores in external control, negative self-esteem, psychopathy, anxiety analogue scale measure 2

(immediately before the examination/ performance), academic grades, state anxiety and trait anxiety than EMA group. Thus, hypothesis 2 and 3 can be confirmed.

Based on previous findings mentioned in the introductory section it was expected, that individuals with higher level of anxiety will indicate a lower grade point average, which was not confirmed.

Among additional findings, which were not included into study hypothesis, was a prominent role of negative self-esteem, related both to performance and anxiety measures in general. However, current study demonstrates that negative self-esteem plays quite an important role on anxiety and attention as well. In our results a significant relationship between negative self-esteem, ACS subscales and state anxiety were obtained, which is partly consistent with previous finding (Craft *et al*, 2003), where self-confidence displayed the strongest and most consistent relationship with performance, rather than cognitive anxiety and somatic anxiety. Such results can be interpreted and supported by the findings of Clark and Wells (1995), who proposed that when patients with social phobia become concerned that they may fail to make their desired impression on other people, their attention shifts from observation of others to detailed monitoring and observation of themselves. The study by Dandeneau and Baldwin (2009) supports the previous proposal by demonstrating that low self-esteem subjects are highly attentive to information of social rejection, whereas those with high self-esteem appear to inhibit their attention to this kind of information.

Thus it can be applied to musicians and their anxiety before public performances in the way, that if they are more concentrated on the impression they would like to leave on the audience/jury, the high negative self-esteem levels would make such expectations pessimistic both potentially and actually. Therefore it would be reasonable to assume, that by applying self-esteem improving strategies anxiety level might be significantly reduced, attention focused on motor activity and thus individual's performance would be improved. As Yoshie and colleagues (2009) concluded, pianists full of self-confidence may be able to optimistically make all possible efforts in pursuit of musical excellence.

General findings of the present study also confirm the fifth hypothesis. Extreme differences between sample groups turned out to play a beneficial role: the results of aviation academy students were a kind of reversed prove of the main assumption of the present study about significant relationships between anxiety, attentional hindrances and attentional control subscales.

Therefore, the present study supported in different ways those several previous findings, which were mentioned in the introduction section, which have lead to construction of inter-relationships between anxiety, attention, self-esteem and performance. Main relationships under discussion seem to be formed as follows: negative self-esteem has a significant influence on anxiety, which in turn affects cognitive functions and attention mechanisms in particular, and doing so also seriously affects emergence of physical anxiety symptoms. According to Yoshie (2009) muscle activity is increased together with elevated autonomic arousal under stress and anxiety, which can fatigue musicians and spoil their performance. Moreover, higher muscle activity during performance can also be a risk factor of playing-related musculoskeletal disorders.

However, there are some inconsistent findings regarding anxiety and its influence on performance. Performance quality was found to be unrelated to the anxiety measures. The relationships between performance anxiety and performance quality has long been thought of as an inverted U-shape graph, with performance quality peaking at moderate anxiety levels. For example, Yoshie and colleagues (2009) found no evidence of curvilinear or linear relationships between somatic anxiety levels and performance quality, nevertheless the increased muscle activity and joint stiffness may disrupt the musicians' subtle control of loudness (Yoshie *et al. 2008*) and the maintenance of temporal continuity (Drake & Palmer, 2000). Langendörfer and colleagues (2006) demonstrated intensive chronic somatic symptoms, experienced by musicians during their performance; however no data was provided regarding its impact on performance quality. This topic remains important, as it can be strongly related to musicians' academic performance.

Limitations of the present study

The present study has some potential limitations. Firstly, adapted questionnaires for the Russian sample were tested on a two small trial samples to demonstrate acceptable reliability of the scales, but were not analyzed for proving their factor structure. Secondly, Russian sample of musicians is quite small and due to above limitations it would be reasonable to exclude it from the general sample. However, after careful considerations it remained in the sample. The reason for such decision was that after a few trials of analysis with and without RKC there were no significant changes on results nor differences with EMA group, but rather a complement to a general sample. Thirdly, it appeared that grade points average was not a good measure for revealing relationships between anxiety and musicians' academic

performance. The possible explanation for that is the nature of highly subjective evaluation of performances among musical pedagogues. During interviews with some pedagogues and music academy students a few common features for this group appeared regarding performance estimation: jury are mainly pedagogues from the same academy, and it is common that personal relationships between them might influence an estimation process: it is very uncommon to fail or to get a grade lower, than "good". Finally, gender difference are not enough informative, as a proportion of males and females within EAA and RKC samples was extremely imbalanced. Therefore, in possible future research it would be valuable to find a low anxiety female sample and a better balanced proportion of males and females.
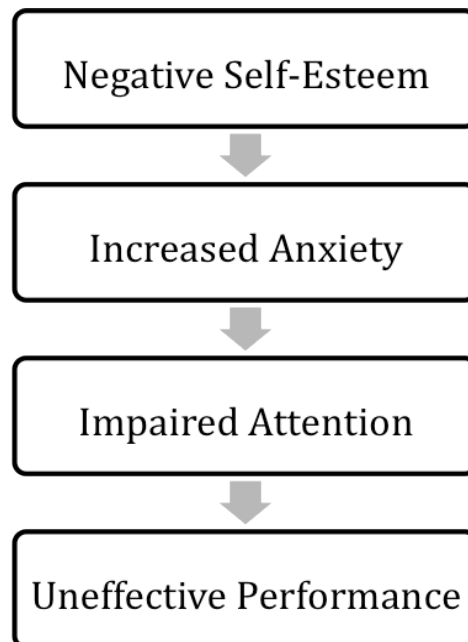
Possible future research

Study made by Ludwig (1998) reports that persons in professions that require more logical, objective, and formal forms of expression tend be more emotionally stable than those in professions that require more intuitive, subjective, and emotive forms. Another study (Sheldon, 1994) demonstrated differences between groups of artist students, physics and ecology students, where the first group were markedly higher in negative affect, anxiety and global psychosymptomology than the comparison groups. The present study supports these findings by demonstrating significant differences between music and aviation students. Regarding these peculiarities the following topic for the further investigation could be proposed. What could be a possible origin of such extreme differences between above mentioned groups of people? Hence emotionality is moderately heritable (40-60%), but is also strongly influenced by exposure to stress in a pattern consistent with gene X interaction (Bevilacqua, & Goldman, 2011, Bouchard, & Loehlin, 2001), perhaps self-control or self-discipline may be one of important factors. Derryberry (2002) describes a voluntary self-control, which can be viewed in terms of a set of executive attentional processes that allow the individual to regulate more reactive processes. Such assumption makes it possible to suggest, that different career orientation of individuals may also differ by levels of voluntary self-control and perhaps art and music students (as a more emotional sample) may report lower scores on this measure, while aviation or e.g., psychics students will score higher.

Additionally, it will be valuable for the future research to identify the coping strategies that young people could adopt on music performances or exams.

Additional findings, which were not included into study hypothesis were related to the role of self-esteem. In previous studies it has shown to be tightly related to performance or anxiety

in general. However, current study demonstrates that negative self-esteem plays quite an important role on attention and anxiety as well. In our results a significant relationship between negative self-esteem, ACS subscales and state anxiety were obtained, which is partly consistent with previous finding (Craft *et al*, 2003), where self-confidence displayed the strongest and most consistent relationship with performance, rather than cognitive anxiety and somatic anxiety. Moreover, a more detailed analysis of visual analogue scale measures of anxiety revealed significant correlation between present moment anxiety level and negative self-esteem, as well as strong relationships with state and trait anxiety while measuring anxiety on the analogue scale before the public performance. These findings are in a support of reliability of the used visual analogue anxiety scales, which means that they are representing anxiety states correctly and could be used in further research.

Such findings can be interpreted and supported by the results of Clark and Wells (1995), who proposed that when patients with social phobia become concerned that they may fail to make their desired impression on other people, their attention shifts from observation of others to detailed monitoring and observation of themselves.

Negative Self-Esteem

⬇

Increased Anxiety

⬇

Impaired Attention

⬇

Uneffective Performance

The above flowchart from Clark and Wells (1995) could be applicable to the findings of the present study and to related further research in the same direction.

Käesolevaga kinnitan, et olen korrektselt viidanud kõigile oma töös kasutatud teiste autorite poolt loodud kirjalikele töödele, lausetele, mõtetele, ideedele või andmetele.

Olen nõus oma töö avaldamisega Tartu Ülikooli digittaalarhiivis DSpace.

Darja Grigorjeva

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