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Core negative self-evaluations discriminating accepted and rejected candidates
to main aviation specializations

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ABSTRACT

The aim of this study was the preliminary validation of a new questionnaire set, which is planned to measure coherently negative aspects of individual's personality. The core negative self-evaluations questionnaire set is comprised of five different types of questionnaires with 16 subscales of measures of Attention (internal and external hindrances of attention and attention control), Control (external control and planning-type of control), Self-esteem (negative self-esteem, responsibility, psychopathy and narcissism), a longer measure of Narcissism (in 4 subscales), visual analogue scale for anxiety and state-trait anxiety questionnaires. To estimate the validity and usefulness of the core negative self evaluations measures we attempted to differentiate between accepted and rejected applicants to the Estonian Aviation Academy using the scales and subscales described. These categories of applicants could be differentiated by their score on all three attention scales, external locus of control, negative self-esteem, responsibility, psychopathy, three narcissism subscales and state- trait anxiety scales. The proposed core negative self-evaluations construct showed higher potential in differentiating between accepted and rejected candidates than all cognitive tests and had comparable differentiation power of a five factor personality trait questionnaire.

Keywords: core self-evaluations, neuroticism, anxiety, performance, attention, control

Peamistesse lennunduserialadesse aktsepteeritud ja tagasi lükatud kandideerijate eristamine negatiivsete enesekohaste tuumikhinnangute kaudu

KOKKUVÕTE

Uurimuse eesmärk oli leida valideerivat kinnitust uuele küsimustikekomplektile, mis üritab mõõta indiviidi isiksuse negatiivseid omadusi terviklikult. Enesekohaste negatiivsete tuumikomaduste küsimustikud mõõdavad tähelepanu (tähelepanu sise- ja välistakistused, tähelepanu kontroll), kontrolli (väline kontrollkese, planeerimise tüüpi kontroll), enesehinnangut (negatiivne enesehinnang, vastutustundlikus, psühhopaatia, nartsissism), nartsissismi pikema küsimustiku neljal alaskaalal, hetkeärevuse taset millimeetrites, seisundiärevust ja ärevusepisoodide esinemissagedust. Hindamaks negatiivsete enesekohaste tuumikhinnangute mõõtevahendite komplekti valiidsust praktilises rakenduses püüdsime leida erisusi Eesti Lennuakadeemia lenduri ja lennujuhi õppesse kandideerinute seast psühholoogilise valiku alusel aktsepteeritud ja tagasi lükatud kandidaatide vahel. Kandidaadid neis kahes kategoorias eristusid kõigil kolmel tähelepanu alaskaalal, välise kontrollkeskme ja negatiivse enesehinnagu, vastutustundlikkuse, psühhopaatiliste ja nartsissistlike tendentside ja seisundi- ning ärevusepisoodide sageduse alusel. Kasutatud negatiivsete tuumikhinnangute konstrukt näitas kõrget eristusvõimet aktsepteeritud ja tagasilükatud kandidaatide võrdluses, ületades tunnetuslike võimete testide eristusvõimet ja näidates isiksuse viie faktori küsimustikuga võrreldavat eristusvõimet.

Võtmesõnad: enesekohased tuumikhinnangud, neurotism, ärevus, sooritus, tähelepanu, kontroll

Introduction

The purpose of this thesis is to investigate the predictive value of our hypothesized construct of core negative self-evaluations by analyzing personality and cognitive data gained from Estonian Aviation Academy (EAA) applicants.

In organizational psychology the concept core self-evaluations was first proposed by Judge, Locke and Durham in their 1997 published article. The construct of core self-evaluations was introduced in an effort to provide a construct that would be a useful predictor for job satisfaction, as well as perhaps for other criteria, applicable to human performance evaluation. Judge Locke & Durham (1997) proposed, that core self-evaluations is a broad, latent, higher-order trait. The traits that form core self-evaluations are well-established and studied in the personality literature: (1) self-esteem, the overall value that one places on oneself as a person; (2) generalized self-efficacy, an evaluation of one's ability to complete tasks and reach goals; (3) neuroticism, the tendency to have a negativistic cognitive/explanatory style together with its opposite - emotional stability - at the other end of the same continuum; and (4) locus of control, beliefs about the predominantly perceived causes of events in one's life. The locus of control is considered internal when individuals see events as being dependent on their own behavior, and external, if a chance or powerful others seems to guide one's life (Rotter, 1966). As one can gather from the commonality among these traits, core self-evaluations is a basic, fundamental appraisal of ones worthiness, effectiveness, and capability as a person. As a summary of these scores, it seemed to be possible to estimate the value, efficiency and abilities of a person in social context. Individuals with higher self-esteem, higher self-efficacy, higher emotional stability and internal locus of control were better socially accepted among their peers, more valuable, more efficient and able to contribute more as a member of society.

Several large questionnaires were used to measure all related traits of core self-evaluation and later condensed into the *core self-evaluations scale* (CSES) by Judge, Erez, Bono & Thoresen (2003). Many of the foundational questionnaires and derived questionnaires from CSES, have confirmed in their practical application, that results gained with these tools correlate with important personality traits such as motivation and positive attitude towards work, satisfaction with work, quality and quantity of work performance, awareness of work related stress, readiness for teamwork, ability to solve conflicts, happiness and life satisfaction (Bowling, Wang, & Li, 2012; Chang, Ferris, Johnson, Rosen, & Tan, 2012).

Core negative self-evaluations

In the research at hand we hypothesized on the basis of preliminary analysis, that an opposite construct for the core self-evaluations might exist for negative attitudes and emotional dispositions. Negative self-esteem, low generalized self-efficacy, high neuroticism (or low emotional stability) and high external locus of control together would form the core for negatively oriented self-evaluation construct while their opposites create the well-known (positive) core self-evaluation construct. At the moment, judging on the basis of several pilot studies data, we hypothesize that the scales belonging to the preliminary core negative self-evaluations construct are, but should not necessarily be limited to: (1) subjective internal attention hindrances, an individuals' inherent diminished ability to control their point of focus, with difficulties to move their focus away from aversive stimuli; (2) external locus of control, with predominant attitudes and feelings that everything happening to them is influenced by factors outside of their control; (3) negative self-esteem, individuals general negative estimation of ones inherent worth; (5) psychopathic tendencies, degree to which one has antisocial personality traits; (6) narcissism, inflated sense of personal importance and a deep need for admiration; and (7) anxiety, a central component of neuroticism, expressing states of worry, uneasiness and apprehension mainly about future uncertainties.

In the present study we have at hand extensive test data of applicants to the Estonian Aviation Academy (EAA) and of the students of the same higher education institution. Test data available to us during the research contains not only the core negative self-evaluations questionnaires, but personality and cognitive test results as well, which in turn were analyzed to compare against the results of how well the core negative self-evaluations scale was able to differentiate between accepted and rejected applicants.

Our primary interest was to use the core negative self-evaluations to find statistically significant differences between accepted and rejected applicants. The applicants were attempting to gain admission to EEA to study the profession of a pilot or an air traffic controller. These two professions place high demands to psychological suitability and cognitive ability to the applicants. The demands are related, but not limited to good cognitive abilities, well-balanced personality and perfect mental health status. Signs of good emotional and social adaptation may play a crucial role in differentiating promising applicants from those who raise doubts about their reliability in highly psychologically demanding situations, which in turn should show as a statistically significant difference in the scores on related questinnaires on accepted and rejected candidates.

Research question:

Can core negative self-evaluation questionnaires and their subscales results distinguish between EAA candidates recommended to be accepted or rejected to become pilot or air traffic control students?

Hypotheses:

1. The results of questionnaires of core negative self-evaluations distinguish between the accepted and rejected applicants by differences in scale and subscale scores of attention, control, self-esteem, narcissism and anxiety.

2. Core negative self-evaluations have significant value as a predictor of suitability in comparison to cognitive ability tests.

3. Personality traits by five personality factors approach can differentiate accepted and rejected individuals.

Methods

The sample

Total of 269 subjects, 153 (42 females and 111 males) of them the applicants to the Estonian Aviation Academy at the admissions of 2011 and 2012, participated in this study. The applicants belonged to the preselected samples, fulfilling all the general application requirements, and as an additional requirement, had achieved the pre-established threshold in their state examination results in English language and mathematics or physics. Passing such preliminary selection process would open them the opportunity to apply to study at pilot or air traffic controller specializations after successful psychological and medical selection procedures. Remaining 116 subjects (24 females and 92 males) from the sample were already the students in the EAA.

Measures

Besides mandatory paper and pencil cognitive ability test battery the applicants completed several questionnaires (personality, emotional status) and as a voluntary option, the additional questionnaires of core negative self-evaluations. Core negative self-evaluation related measures are the main object of the present study. These measures were adapted and/or developed by Aavo Luuk, the supervisor of the author of the present paper and are at the stage of approbation since 2011 (Luuk, 2013). The results of the core negative self-evaluations of the subsample of applicants were not taken into account at the selection process and were for the first time decoded into subscales and analyzed in the fall of 2012, long after all the selection decisions had been made for the two groups of applicants, forming the applicants subsample of the present study.

Core negative self-evaluations scales in detail

Core negative self-evaluations scale is formed out of separate larger questionnaires and their respective subscales which are introduced in the following section. After the introduction of each broader scale, subscales which are important for negative self-evaluations scale are described in more detail.

Attentional control scale

Our attentional control questionnaire is based on the Attentional Control Scale (ACS) by Derryberry and Reed (Derryberry & Reed, 2002; Ólafsson et al, 2011; Verwoerd, de Jong, & Wessel, 2008). According to the authors the ACS measures general ability to control one's attention and is comprised of three mutually correlated subscales. First subscale measures the ability to focus attention, second measures ability to move one's focus from one task to another and the third measures the flexibility of mental control in switching between tasks. It's worth noting that

translations of the ACS have not come out with identical structure. Ólafsson et al. (2011) translated the ACS in Icelandic and found that their questionnaire had a two factor structure. In accordance with their discovery also Verwoerd, de Jong, & Wessel (2008) discovered that their Dutch translation of the ACS also has a two factor structure (attentional control and changing point of focus).

The structure of the Estonian translation with additional items turned out different when compared to the original questionnaire. The resulting three subscales are named internal hindrances of attention (5 items, Cronbachs' $\alpha=0,740$; test-retest reliability $n=99$, $r=0,777$), external hindrances of attention (5 items, Cronbachs' $\alpha=0,706$; test-retest reliability $n=99$, $r=0,792$) and attentional control subscales (5 items, Cronbachs' $\alpha=0,700$; test-retest reliability $n=99$, $r=0,659$). Internal hindrances of attention subscale measures the effects of internal self-reported psychological problems on attention (worry, distractedness, lack of concentration and forgetfulness). External hindrances of attention subscale measures factors external of one's psyche through their negative effect on attention (noise, conversations, music, circumstances of using telephone while performing another task). Attentional control subscale is designed to measure individual's ability to control ones attention consciously (effortfully concentrating on goals set and pursued despite the negative impact of distracting factors). Respondents answer to questionnaire statements on a 5-point Likert-type scoring scale from 0 (no / completely disagree) to 4 (yes / fully agree).

Control scale

The control scale has two subscales. First subscale is named external control (5 items, Cronbach's $\alpha=0,735$; test-retest reliability $n=99$, $r=0,775$). Second subscale is named planning- type of control (6 items, Cronbach's $\alpha=0,665$; test-retest reliability $n=99$, $r=0,663$). The idea of external control subscale is based on Rotter's locus of control concept (Rotter, 1966). According to this theory subjective locus of control is divided into two – internal and external. When internal locus of control is more dominant, the persons tend to feel being in charge of everything that happen to them. The opposite comprise the persons with stronger external locus of control, who are convinced, that almost all their achievements and failures are decided as a by-product of more influential people or as a result of fate, so they themselves have no sufficient control over the events in their life.

In the structure of control scale the external control subscale developed clearly, matching well with the Rotter's concept of external control, which focuses on inability to control one's life and on dependency of other persons and of fate. Rest of the questions from the initial question pool had strong loadings onto other subscale, which is named planning- type of control (including items on

planning, time management, discipline, carefulness, achieving goals by overcoming obstacles). Contrary to the Rotter's theory, internal control scale did not form out of the item loadings in statistical analysis. On the control scale subscales respondent answers each statement using 5-point Likert- type scoring scale from 0 (no / completely disagree) to 4 (yes / completely agree).

Self-esteem scale

The self-esteem questionnaire has negative self-esteem and responsibility subscales. Negative self-esteem subscale (10 items, Cronbach's α=0,842; test-retest reliability n=99, r=0,827) is designed after the Rosenberg's Self-Esteem Scales (RSES) Estonian version (Pullmann, & Allik, 2000; Pullmann, Allik, & Realo, 2009). Rosenberg's self-esteem scale has 10 statements of which five are worded as positive self-statements and five are negative self-statements. Together with additional items the negative statements of Rosenberg self-esteem scale formed a distinct negative self-esteem subscale. Responsibility subscale (11 items, Cronbach's α=0,819; test-retest reliability n=99, r=0,800) was structured out of the original statements which measured different facets of social responsibility such as perseverance, deliberation, sense of responsibility when making choices and attitude towards peers. The questions on this subscale are positive by their content, but to name the entire subscale to measure positive self-esteem would be inaccurate or at least premature. More appropriate preliminary label seems to be the responsibility subscale. Both subscales are responded in the form of 5-point Likert-type scale from 0 (no / totally disagree) to 4 (yes / completely agree). The subscale scores are not combined to form a total self-esteem core.

The dark facets of personality

The dark facets of personality scale is based on the idea of „ The Dark Triad" theory (Paulhus & Williams, 2002; Jonason & Webster, 2010; Rauthmann & Kolar, 2012). According to this theory the three personality traits of *narcissism*, *machiavellianism* and *psychopathy*, all of which are interpersonally aversive, are theoretically separate but empirically very similar and might share a common latent component. The dark triad can be thought of as temporary activity state, socially exploitative strategy, which may have formed to apply exploitative behavior in circumstances where other members of the group would likely punish anyone not adhering to social norms (Jonason & Webster, 2010). All three components of the triad reflect in different degrees socially malevolent behavior which manifests in bragging, emotional insensitivity, duplicity and in aggression (Paulhus & Williams, 2002).

Psychopathy subscale

When talking about psychopathy, on one side there are psychopaths with stable and specific everyday behavioral tendencies (emotional insensitivity, manipulativeness, glibness, ruthlessness

and lack of anxiety) and on the other side individuals who exhibit antisocial and psychopathic tendencies only in high stress situations. Early psychopathy theories classified individuals in the first group having first order psychopathy features and second group as having second order psychopathy (Karpman, 1948). More recent views divide the construct of psychopathy under two different factors, of which the first one reflects individual's core psychopathy traits and the second deviant behavior lifestyle (Hare et al, 1990). Most modern views find, that Hare's latest tool for measuring psychopathy - Hare Psychopathy Checklist – Revised (PCL-R), supports the notion that psychopathy construct consists in fact from four subscales of personal relations, emotionality, lifestyle and antisociality (Neumann, Hare, & Johansson, 2012).

Source materials for the psychopathy subscales used in this study were the 12 statements from „Dirty Dozen" about psychopathy, machiavellianism and narcissism (Jonason & Webster, 2010) and 26 statements from Levenson's psychopathy scale based on self-esteem statements (Levenson, Kiehl, & Fitzpatrick, 1995; Lynam, Whiteside, Jones, 1999). Statements concerning remorse, lack of moral self-esteem, emotional coldness and cynicism are from the first source. From the second source we used questions which correspond to first and second order psychopathy. Results of the analysis was a single factor measurement scale of psychopathy with 10 statements (Cronbach's α=0,813; test-retest reliability n=99, r=0,726), which measures respondents exploitative behavior, indifference, insensitivity, lack of empathy, disregard towards other people, disregard of love, achieving goals without concern for others. Subscales are rated on Likert-type scale from 0 (no / don't agree) to 4 (yes / completely agree).

Narcissism and machiavellism subscales

Four statements from Jonasons & Websters (2010) „Dirty dozen" questionnaire loaded strongly on narcissism subscale (Cronbach's α=0,710; test-retest reliability n=99, r=0,720). The machiavellism questions are originally from different sources (Dolan & Rennie, 2006; Gunnthorsdottir, McCabe, & Smith, 2002; Jonason & Webster, 2010; Loney et al, 2007; Neumann et al, 2011), though unexpectedly when the new questionnaire translations were created none of the statements measuring machiavellism formed a meaningful cluster and one statement loaded strongly with psychopathy and was moved in to that group. Also these subscales are rated on four point Likert–type scale similarly to previous statements.

Visual analogue scale for anxiety

First Visual Analogue Scale for Anxiety (VAAS), was created by Hornblow and Kidson in 1976. Visual analogue scale for anxiety is presented as 100 mm long horizontal line. Left end of the line is marked with number 0 and the right and with 100, which means no anxiety and maximum anxiety

respectively. Respondent draws a vertical line there where they feel that their level of anxiety is at the moment. Visual analogue scale for anxiety is often used to measure surgical patients anxiety level (Bringuier et al, 2009; Davey et al, 2007; van Duinen, Rickelt, & Griez, 2008; Kindler et al, 2000; Millar et al, 1995). It has been found, that the scale is valid and very sensitive to changes. In context at hand test subjects have reported average anxiety of 19,0 (mm) with standard deviation of 8,9. From three separate samples the following correlations have been found in relation to state anxiety score: $r=0,509$; $r=0,467$; $r=0,503$.

State-Trait Anxiety Inventory

Spielberger's (1983) State-Trait Anxiety Inventory (STAI) was one of the first questionnaires to differentiate between state anxiety and trait anxiety. As a continuation of this idea, in this research state anxiety questions are based on State Version of State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA) (Grös, Antony, Simms, & McCabe, 2007). STICSA questionnaire has 21 questions which are divided into physical component (activation of anxiety) and cognitive component (worrying) subscales. STICSA has been analyzed in several studies (Gros, Simms, & Antony, 2010; Ree, French, MacLeod, & Locke, 2008; Van Dam, Gros, Earleywine, & Antony, 2013) and the results have confirmed the validity of the test. In this study the Estonian translation of STICA has 21 statements and shows strong reliability as a whole (Cronbach's $\alpha=0,923$; test-retest reliability $n=98$, $r=0,707$). The respondent rates the statements on a Likert-type scale from 0 (no / don't agree) to 4 (yes / completely agree). The statements in the Estonian version cluster into two similar factors, just like in the original questionnaire.

Narcissism questionnaire

Self-worth scale is meant to measure narcissism and the statements were put together using the the Pathological Narcissism Inventory (PNI) as a model (Pincus *et al,* 2009). The original questionnaire has 52 statements and 7 subscales. The subscales are divided between categories of narcissistic grandiosity and narcissistic vulnerability. More specifically, first category measures entitlement rage, exploitativeness, grandiose fantasies, self-sacrificing and self-enhancement. Second category measures contingent self-esteem, hiding the self and devaluing. In the Estonian translation meaningful classification of the original 52 statements was possible only for 20 statements. These 20 statements were divided into four subscales of five statements each. These subscales are labeled as: disappointment due to unfulfilled expectations placed on others (5 items, Cronbach's $\alpha=0,783$; test-retest reliability $n=98$, $r=0,649$), sensitivity to being noticed by others (5 items, Cronbach's $\alpha=0,791$; test-retest reliability $n=98$, $r=0,821$), using others for positive image building, (5 items, Cronbach's $\alpha=0,803$; test-retest reliability $n=98$, $r=0,841$) and manipulating others (5 items,

Cronbach's α=0,665; test-retest reliability n=98, r=0,766). Statements in the questionnaire are rated on a Likert-type scale from 0 (no / don't agree) to 4 (yes / completely agree).

EE.PIP-NEO personality quiestionnaire

Personality traits were charted with EE.PIP-NEO personality questionnaire (Mõttus, Pullmann & Allik, 2006). In addition to the five general personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism), the questionnaire has 6 subscales for each major trait, where each subscale measures a specific aspect of the higher-order trait. Neuroticism subscales measure anxiety, anger, depression, self consciousness, immoderation and vulnerability. Extraversion subscales measure friendliness, gregariousness, assertiveness, activity level, excitement-seeking and cheerfulness. Openness subscales measure imagination, artistic interests, emotionality, adventurousness, intellect and liberalism. Agreeableness subscales measure trust, morality, altruism, cooperation, modesty and sympathy. Conscientiousness subscales measure self-efficacy, orderliness, dutifulness, achievement striving, self-discipline and cautiousness.

The EE.PIP-NEO questionnaire is not part of the proposed core negative self-evaluations questionnaires and is used to measure personality traits for selection decision purposes.

Results

Core negative self-evaluations as indicators of applicant suitability

Independent-samples t-test was done with two groups, the accepted and rejected applicants, to see if the core negative self-evaluation measure score would allow us to reliably predict weather applicant is accepted or rejected. Subsample size for the analysis was 152 subjects, since suitability data for the remaining participants was not available. In the subsample of the EAA candidates 86 were the accepted and 64 the rejected applicants.

Independent-samples t-test results

Attentional control questionnaire

The accepted applicants scored significantly lower on internal hindrances of attention [M_{acc}= 3.61, SD_{acc}= 2.14], [M_{rej}= 5.58, SD_{rej}= 2.45]; (t[150]=5.25, $p < .001$) and external hindrances of attention subscale [M_{acc}= 6.78, SD_{acc}= 3.47], [M_{rej}= 8.77, SD_{rej}= 3.63]; (t[150]=3.41, $p< .001$). The accepted applicants scored higher on attentional control scale [M_{acc}= 15.8, SD_{acc}= 2.21], [M_{rej}= 14.06, SD_{rej}= 2.17]; (t[150]= -4.80, $p< .001$).

Control questionnaire

The accepted individuals scored significantly lower on external control [M_{acc}= 3.9, SD_{acc}= 3.28], [M_{rej}= 5.55, SD_{rej}= 3.18]; (t[150]=3.1, $p<$ .002) and no difference was found on planning type control (t[150]=-1,22, p = 0,224).

Self-esteem questionnaire

The accepted applicants group scored significantly lower on negative self-esteem [M_{acc}= 7,81, SD_{acc}= 4,31], [M_{rej}= 12.95, SD_{rej}= 5.48]; (t[150]=6.48, $p <$ .001), on psychopathy subscale [M_{acc}= 8.42, SD_{acc}= 4.83], [M_{rej}= 11.95, SD_{rej}= 4.73]; (t[150]=4.49, $p<$,001) and higher on responsibility subscale [M_{acc}= 36,39, SD_{acc}= 3,91], [M_{rej}= 33,61, SD_{rej}= 4,47]; (t[150]=-4,07, $p=$,001). No difference was found in narcissism as measured by the self-esteem questionnaire subscale (t[150]=0,15, p = 0,881). Detailed narcissism questionnaire analysis below gave more specific results.

Narcissism questionnaire

The accepted applicants group scored significantly lower on "disappointment due to unfulfilled expectations placed on others" subscale [M_{acc}= 3.77, SD_{acc}= 2.46], [M_{rej}= 6.34, SD_{rej}= 3.15]; (t[150]=5.63, $p<$,001), on "sensitivity to being noticed by others" subscale [M_{acc}= 4.18, SD_{acc}= 3.11], [M_{rej}= 6.27, SD_{rej}= 3.62]; (t[150]=3.79, $p<$,001)., on "using others for positive image building" subscale [M_{acc}= 5.86, SD_{acc}= 3.63], [M_{rej}= 7.59, SD_{rej}= 3.38]; (t[150]=2.98, $p=$ .003). There was no difference in "manipulating others" subscale results between groups (t[150]=-1.09, $p=$ .277).

Visual analogue scale for anxiety

There was no difference between groups on visual analogue for anxiety scores (t(150)=0.68, p = .500).

State-Trait Anxiety Inventory

The accepted applicants group scored significantly lower on state anxiety [M_{acc}= 6.68, SD_{acc}= 7.27], [M_{rej}= 13.36, SD_{rej}= 10.29]; (t(150)=3.4, $p<$ .001) and also on anxiety frequency [M_{acc}= 7.26, SD_{acc}= 5.31], [M_{rej}= 15.78, SD_{rej}= 9.43]; (t(150)=5.05, $p<$ .001).

Cognitive tests as a predictor of applicants' suitability

Data from EAA candidates includes also 13 cognitive ability test results. These test were: Shortened version of RAVEN matrices, test of technical thinking, Estonian vocabulary test, Categorization task of verbal items, Logical numerical rows with multiple choice, Logical numerical rows with free ending, Left-right discriminating spatial ability, Number of mistakes in spatial ability, Long-term visual memory, Complex coding (multitasking), Number of mistakes in complex coding, Mental arithemetics, Logical letter rows with multiple choice (Luuk, Luuk & Aluoja, 2009). An independent-sample *t*-test was done to analyze the differences between accepted and rejected individuals' cognitive performance.

From all the cognitive ability tests only Complex coding (multitasking) had statistically significant differences between accepted and rejected individuals [M_{acc} = 105.03, SD_{acc} = 22,68], [M_{rej} = 96.14, SD_{acc}= -2.58, *p*< .004]; (*t*[150]= -2.58, *p*< .004). Test of Logical letter rows with multiple choice task results were not statistically significant between groups, but did show a tendency that suitable applicants score higher on this task (*t*[150]= -1.83, *p*= .069).

NEOAC traits and suitability to profession

Since previous measures gave interesting results, we decided to expand our dependent variables to personality traits, based on EE.PIP-NEO. Since EAA student's would have to qualify for a profession that place significant psychological demands on them, it's plausible that several personality traits will be more pronounces in the approved applicant group. This analysis is adequate because EE.PIP-NEO results, especially those of neuroticism and concientiousness domains were part of the criteria for selection process.

Earlier research (Luuk, Luuk, & Aluoja, 2009) had found that Extraversion and its facets E1 - Gregariousness and E6 - Positive emotions (Cheerfulness) were useful and negative predictors of air traffic controllers' professional success. Independent samples *t*-test showed significant statistical differences between accepted and rejected applicants.

Most personality traits were significantly different between the accepted and rejected individuals. In neuroticism the accepted score lower than the rejected individuals [M_{acc}=37.42, SD_{acc}=15.55], [M_{rej}=56.44, SD_{rej}=16.45]; (*t*(151) = -7.25, *p*< .001).
In extraversion the accepted scored higher than the rejected individuals [M_{acc}=126.90, SD_{acc}=15.60], [M_{rej}=112.71, SD_{rej}= 21.25]; (*t*(151) = 4.76, *p*< .001).

In openness the accepted did not score statistically significantly higher than the rejected individuals, but there was a tendency for higher score among accepted individuals [M_{acc}=127.80, SD_{acc}=15.69], [M_{rej}=122.906, SD_{rej}= 16.65]; (t[151] = 1.86, p= .066).

In agreeableness the accepted scored higher than the rejected individuals [M_{acc}=137.08, SD_{acc}=14.49], [M_{rej}=123.578, SD_{rej}= 15.37]; (t(151) =5.53, p< .001).

In conscientiousness the accepted scored higher than the rejected individuals [M_{acc}=150.26, SD_{acc}=14.85], [M_{rej}=134.984, SD_{rej}= 17.47]; (t(151) =5.82, p< .001).

Neuroticism subscales

On neurotiscism subscales the accepted scored lower than rejected individuals on
N1 - anxiety [M_{acc}=9.99, SD_{acc}=4.03], [M_{rej}=12.73, SD_{rej}=4.71]; (t[151]=-3.87, p< .001), N2 - anger [M_{acc}=4.84, SD_{acc}=3.85], [M_{rej}=7.75, SD_{rej}=4.34]; (t[151]=-4.37, p< .001), N3 - depression [M_{acc}=3.67, SD_{acc}=2.89], [M_{rej}=7.16, SD_{rej}=4,32]; (t[151]=-5.97, p< .001), N4 - self-consciousness [M_{acc}=7.26, SD_{acc}=3.34], [M_{rej}=11.47, SD_{rej}=3.81]; (t[151]=-7.25 , p< .001), N5 - immoderation [M_{acc}=7.37, SD_{acc}=3.84], [M_{rej}=10.23, SD_{rej}=4.06]; (t[151]=-4.44, p< .001) and N6 - vulnerability [M_{acc}=4.28, SD_{acc}=2.98], [M_{rej}=7.09, SD_{rej}=3.51]; (t[151]=-5.34, p= .004).

Extraversion subscales

On extraversion subscales the accepted scored higher than rejected individuals on E1 - friendliness [M_{acc}=26.04, SD_{acc}=3.81], [M_{rej}=22.02, SD_{rej}=3.73]; (t[151]=6.51, p< .001), E2 - gregariousness [M_{acc}=20.04, SD_{acc}=4.62], [M_{rej}=17.67, SD_{rej}=5.42]; (t[151]=2.91, p< .004), E4 - activity level [M_{acc}=20.11, SD_{acc}=3.45], [M_{rej}=16.23, SD_{rej}=4.51]; (t[151]=6.03, p< .001) and E6 - cheerfulness [M_{acc}=23.43, SD_{acc}=4.32], [M_{rej}=20.63, SD_{rej}=5.87]; (t[151]=3.4, p< .001).

There was a tendency for a higher E3 - assertiveness score in the accepted individuals group [M_{acc}=19.00, SD_{acc}=4.02], [M_{rej}=17.63, SD_{rej}=4.53]; (t[151]=1.98, p= .050) and no difference in E5 - excitement-seeking was found (t[151]=-0.33, p= .745).

Openness subscales

In openness subscales the accepted applicants scored higher on O4 - adventurousness [M_{acc}=19.78, SD_{acc}=3.36], [M_{rej}=18.27, SD_{rej}=4.1]; (t[151]=2.50, p< .05; p= .014) and had tendencies towards higher scores in O5 - intellect [M_{acc}=24.4, SD_{acc}=4.01], [M_{rej}=23.17, SD_{rej}=4.13]; (t[151]=1.85, p= .066) and O6 - liberalism [M_{acc}=22.36, SD_{acc}=2.64], [M_{rej}=21.48, SD_{rej}=2.93]; (t[151]=1.93, p= . 056).

No differences were found in O1 - imagination, O2 - artistic interests or O3 - emotionality subscales. All statistical significances on those Openness subscales were between 0,177 and 0,340.

Agreeableness subscales

In agreeableness subscales the accepted individuals scored higher in A1 - trust [M_{acc}=23.47, SD_{acc}=3.9], [M_{rej}=19.7, SD_{rej}=4.77]; (t[151]=5.37, $p<$ .001), in A2 - morality [M_{acc}=26.62, SD_{acc}=3.52], [M_{rej}=22.91, SD_{rej}=3.97]; (t[151]=6.1, $p<$ .001), in A3 - altruism [M_{acc}=24.37, SD_{acc}=3.49], [M_{rej}=22.38, SD_{rej}=3.57]; (t[151]=3.46, $p<$ .001) and in A4 - cooperation [M_{acc}=23.25, SD_{acc}=3.13], [M_{rej}=20.89, SD_{rej}=3.65]; (t[151]=4.28, $p<$ .001).
There was a less pronounced, but still statistically significant difference for the accepted individuals to score higher in A6 - sympathy [M_{acc}=23.54, SD_{acc}=4.08], [M_{rej}=21.98, SD_{rej}=4.05]; (t[151]=2.33, $p<$0,05; $p=$ .021). No difference was found in A5 - modesty (t[151]=0,14, $p=$ .890).

Conscientiousness subscales

In conscientiousness the accepted individuals scored higher on C1 - self-efficacy [M_{acc}=24.84, SD_{acc}=2.96], [M_{rej}=22.47, SD_{rej}=3.42]; (t[151]=4.58, $p<$ .001), in C2 - orderliness [M_{acc}=23.15, SD_{acc}=3.72], [M_{rej}=20.55, SD_{rej}=5.54]; (t[151]=3.47, $p<$ .001), in C3 - dutifulness [M_{acc}=27.33, SD_{acc}=2.77], [M_{rej}=25.02, SD_{rej}=3.09]; (t[151]=4.84, $p<$ .001), in C4 - achievement striving [M_{acc}=25.78, SD_{acc}=2.77], [M_{rej}=23.02, SD_{rej}=3.84]; (t[151]=5.16, $p<$ .001) and in C5 - self-discipline [M_{acc}=25.37, SD_{acc}=3.28], [M_{rej}=21.02, SD_{rej}=4.69]; (t[151]=6.76, $p<$ .001). No difference was found in C6 - cautiousness subscale (t(151)=1.44, $p=$ .151).

Discussion

In the thesis at hand we proposed a set of core negative self- evaluations scales to measure negative and/or dysfunctional aspects of an individual's personality. The main interest was in a sample of 152 EAA applicants attempting to pass a selection phase to EAA. Applicants had filled in numerous personality and emotional status questionnaires which allowed us to analyze wheather the core negative self-evaluations scales had any predictive power when estimating applicants suitability to be reccommended to study high-demanding professions of pilots and air traffic controllers in EAA.

The first hypothesis focused on finding statistically significant differences between accepted and rejected individuals using the independent-variables *t*-test. The core negative self-evaluations questionnaires had in total four questionnaires and sixteen subscales for attention, control, self-esteem, narcissism and aspects of anxiety. Of the sixteen subscales, twelve of them could be used to statistically significantly differentiate between the group scores.

Results showed that suitable candidates scored lower on both attention questionnaire hindrances subscales (internal and external attention hindrances) and received higher score on attention control. On other scales they had lower scores on negative self-esteem and psychopathy subscales and higher scores on responsibility subscale.

Since the profession of a pilot or an air traffic controller is highly stressful and requires great competence, it was expected that Attention and Control questionnaires both measure critical qualities for the professions in question. Good attention control, and more specifically, ability to resist or ignore distracting stimuli, wheather it originates from the individual's own mind or external source, is invaluable especially in critical situations where lives may be at danger.

  Self-esteem was measured on four subscales, and showed that suitable candidates are less likely to think negatively of themselves, have lower psychopathic tendency scores and higher sense of responsibility. These all seem to be qualities of a person who is socially well adjusted, not just among his peers, but also intrapersonally and can therefore act as a valuable and contributing long-term group member even in a demanding situation.

Narcissism questionnaire measured statistically significantly lower scores among the accepted candidates group on the following Narcissism questionnaire scales: disappointment in others, sensitivity to catching others attention and egotripping benevolency. The content of the scales measure socially exploitative behaviours and is easy to see why an individual with tendencies to act

in ways described by the high scores of these subscales would be an unwanted future student or employee for any position.

State and Trait anxiety were also significantly lower on the acceptable group of applicants. It is generally known that the effects of stable high and frequently reoccuring anxiety episodes would hinder cognitive funtions during demanding and stresful tasks and general performance.

Our second hypothesis stated that core negative self-evaluations scales would help differentiate between candidates to be accepted or rejected more effectively than cognitive tests. While cognitive tests were not the main interest of this study, it became an interesting comparison point when core negative self-evaluations contruct performed better than expected. Suprisingly of the thirteen cognitive tests we had at our disposal, only one scale – complex coding task – gave higher differentiating score to the accepted individuals [M_{acc} = 105.03, SD_{acc} = 22,68], [M_{rej} = 96.14, SD_{acc}= -2.58, $p<$ .004]; (t[150]= -2.58, $p<$ .004). Another task (logical letter rows) had a noticeable tendency for the accepted applicants to perform better at, but the difference between groups was not statistically significant. Rest of the cognitive tasks did not produce statistically significant differences and all p -values were in the range from .100 to .707.

Personality traits and applicant suitability

In addition applicants could be differentiated by some of their personality traits as measured by EE.PIP-NEO. In fact this five-factor personality questionnaire served as one of the selection instruments and findings in the present study confirm the validity of its use for selection purposes, providing several interesting details to consider in its future applications. Suitable candidates had statistically significantly different scores on most neuroticism, agreeableness and consciensciousness measures compared to the rejected applicants group. Extraversion was less pronouced indicator and openess differed only by one subscale. Openess had very little bearing on deciding applicant suitability.

Overall profile of an accepted applicant was characterized by low neuroticism, high consciensciousness, high extraversion and high openness. Regarding core negative self-evaluations scale a good candidate had according to the principle of elimination of undesirable qualities strong attentional control and resistance to external hindraces of attention, strong internal locus of control, low state and trait anxiety and sufficient pro-social skills and attitudes.

References

Bringuier, S., Dadure, C., Raux, O., Dubois, A., Picot, M-C., & Capdevila, X. (2009). The Perioperative validity of the Visual Analog Anxiety Scale in children: A discriminant and useful instrument in routine clinical practice to optimize postoperative pain management. *Anesthesia & Analgesia, 109*(3), 737-744.

Davey, H. M., Barratt, A. L., Butow, P. N., & Deeks, J. J. (2007). A one-item question with a Likert or Visual Analog Scale adequately measured current anxiety. *Journal of Clinical Epidemiology, 60,* 356-360

Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111*(2), 225-236..

Dolan, M. C., & Rennie, C. E. (2006). Reliability, validity, and factor structure of the Swedish Youth Psychopathic Trait Inventory in a UK sample of conduct disordered boys. *The Journal of Forensic Psychiatry and Psychology, 17*(2), 217-229.

Grös, D. F., Antony, M. M., Simms, L. J., & McCabe, R. E. (2007). Psychometric properties of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA): Comparison to the State-Trait Anxiety Inventory (STAI). *Psychological Assessment, 19*(4), 369-381.

Grös, D. F., Simms, L. J., & Antony, M. M. (2010). Psychometric properties of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA) in friendship dyads. *Behavior Therapy, 41,* 277-284.

Hare, R. D., Harpur, T. J., Hakstian, A. R., Forth, A. E., Hart, S. D., & Newman, J. P. (1990). The Revised Psychopathy Checklist: Reliability and factor structure. *Psychological Assessment, 2,* 338-341.

Hornblow, A. R., & Kidson, M. A. (1976). The Visual Analogue Scale for anxiety: a validation study. Australian and New Zeeland Journal of Psychiatry, 10, 339-341.

Jonason, P. K., & Webster, D. G. (2010). The Dirty Dozen: A concise measure of the Dark Triad. *Psychological Assessment, 22*(2), 420-432.

Karpman, B. (1948). The myth of the psychopathic personality. *American Journal of Psychiatry, 104,* 523-534.

Kindler, C. H., Harms, C., Amsler, F., Ihde-Scholl, T., & Scheidegger, D. (2000). The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesthesia & Analgesia, 90,* 706-712.

Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutional population. *Journal of Personality and Social Psychology, 68,* 151-158.

Luuk, K., Luuk, A., & Aluoja, A. (2009). Predicting professional success of air traffic control personnel from their personality profile at admission to ab initio training. *The International Journal of Aviation Psychology*, 19(3), 235 - 251.

Luuk, A. (2013). Enesekohaste negatiivsete tuumikhinnangute skaala loomisest ja kasutamisest. Tartu. Unpublished manuscript.

Lynam, D. R., Whiteside, S., & Jones, S. (1999). Self-reported psychopathy: A validation study. *Journal of Personality Assessment, 73*(1), 110-132.

Millar, K., Jelicic, M., Bonke, B., & Asbury, A. J. (1995). Assessment of preoperative anxiety: comparison of measures in patients awaiting surgery for breast cancer. *British Journal of Anaesthesia, 74,* 180-183.

Miller, J. D., Few, L. R., Seibert, L. A., Lynam, D. R., Watts, A. & Zeichner, A. (2012). An examination of the Dirty Dozen measure of psychopathy: A cautionary tale about the costs of brief measures. *Psychological Assessment, 24*(4), 1048-1053.

Mõttus, R., Pullmann, H., & Allik, J. (2006). Toward more readable Big Five Personality Inventories. *European Journal of Psychological Assessment, 22*(3), 149-157.

Neumann, C., Hare, R. D., & Johansson, P. T. (2012). The Psychopathy Checklist-Revised (PCL-R), Low Anxiety, and Fearlessness: A Structural Equation Modeling Analysis. *Personality Disorders: Theory, Research, and Treatment*, Advance online publication. doi:10.1037/a0027886

Neumann, C., Wampler, M., Taylor, J., Blonigen, D. M., & Iacono, W. G. (2011). Stability and invariance of psychopathic traits from late adolescence to young adulthood. *Journal of Research in Personality, 45,* 145-152.

Ólafsson, R. P., Smári, J., Guðmundsdóttir, F., Ólafsdóttir, G., Harðardóttir, H. L., & Einarsson, S. M. (2011). Self reported attentional control with the Attentional Control Scale: Factor structure and relationship with symptoms of anxiety and depression. *Journal of Anxiety Disorders, 25,* 777-782.

Pullmann, H., Allik, J. (2000). The Rosenberg Self-Esteem Scale: its dimensionality, stability and personality correlates in Estonian. *Personality and Individual Differences, 28,* 701-715.

Pullmann, H., Allik, J., & Realo, A. (2009). Global Self-Esteem Across the Life Span: A Cross-Sectional Comparison Between Representative and Self-Selected Internet Samples. *Experimental Aging Research, 35,* 20–44.

Paulhus, D. L., & Williams, K. M. (2002). The dark triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality, 36,* 556-563.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80* (1, Whole No. 609).

Rauthmann, J. F., & Kolar, G. P. (2012). How ''dark'' are the Dark Triad traits? Examining the perceived darkness of narcissism, Machiavellianism, and psychopathy. *Personality and Individual Differences, 53,* 884-889.

Ree, M. J., French, D., MacLeod C., & and Locke, V. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA). *Behavioural and Cognitive Psychotherapy, 36,* 313-332.

Pincus, A. L., Ansell, E. B., Pimentel, C. A., Cain, N. M., Wright, A. G. C., & Levy, K. N. (2009). Initial construction and validation of the Pathological Narcissism Inventory. *Psychological Assessment, 21*(3), 365-379.

Van Dam, N. T., Gros, D. F., Earleywine, M., & Antony, M. M. (2013). Establishing a trait anxiety threshold that signals likelihood of anxiety disorders. *Anxiety, Stress & Coping: An International Journal, 26*(1), 70-86.

van Duinen, M., Rickelt, J., & Griez, E. (2008). Validation of the electronic Visual Analogue Scale of Anxiety. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 32*, 1045-1047.

Verwoerd, J., de Jong, P. J., & Wessel, I. (2008). Low attentional control and the development of intrusive memories following a laboratory stressor. *Journal of Psychopathology and Behavioral Assessment, 30*(4), 291-297.

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