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ESTONIAN NINTH GRADERS' PERSONALITY TRAITS' AND MOTIVATIONAL VARIABLES' INTERRELATIONS AND ASSOCIATIONS WITH GRADED PERFORMANCE

Master Thesis

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Abstract

Big Five personality traits combined with implicit theories of intelligence and expectancy-value factors were studied as predictors of academic achievement goals in four subject domains in a sample of 276 Estonian ninth grade students (155 girls and 121 boys). Of personality traits, Neuroticism and Conscientiousness had the strongest predictive power, with Neuroticism explaining a significant amount of variance in individual performance goals and Conscientiousness in mastery goals, respectively. In the second phase students' graded performance was predicted by measures of personality traits, implicit theories of intelligence, expectancy-value factors as well as individual and class-level achievement goals. Of personality traits, Neuroticism and Conscientiousness were once again the most stable predictors of the criteria across domains and genders. Extraversion had positive consequences for boys and negative for girls, and entity theories of intelligence were found to have a significant detrimental effect for girls but not for boys. Skepticism toward the usefulness of a subject for future success had direct associations with graded performance for boys alone. For girls the effect of low subject value was mediated by reporting lower levels of mastery goals.

Kokkuvõte

Viiefaktorilise isiksusemudeli, implitsiitsete intelligentsusteooriate ning ootuste ja väärtustega seotud tegurite olulisust saavutuseesmärkide ennustamisel uuriti 276-st Eesti üheksandate klasside õpilastest (155 tüdrukut ja 121 poissi) koosneval valimil. Isiksuseomadustest olid parimateks ennustajateks Neurootilisus ja Meelekindlus. Neurootilisus seletas olulise osa variatiivsusest individuaalsetes sooritusele suunatud eesmärkides ja Meelekindlus vastavalt meisterlikkusele suunatud eesmärkides. Teises etapis ennustati õpilaste hindeid isiksuseomaduste, intelligentsusteooriate, ootuste ja väärtustega seotud tegurite ning individuaalsel ja klassitasemel mõõdetud saavutuseesmärkide abil. Isiksusest olid õppeaineti ja sooti parimad ennustajad jällegi Neurootilisus ja Meelekindlus. Ekstravertsusel oli poistele soodne ja tüdrukutele ebasoodne mõju ning intelligentsuse pidamine muutmatuks omaduseks oli seotud halvemate hinnetega vaid tüdrukute puhul. Skeptilisus õppeaine vajalikkuse suhtes oli poiste hinnetega otse seotud, kuid tüdrukutel oli mõju vahendatud meisterlikkusele suunatud eesmärkidega.

Töö pealkiri: Eesti üheksandate klasside õpilaste isiksuseomaduste ja motivatsioonitegurite omavahelised seosed ja seotus koolihinnetega

INTRODUCTION

Although pure cognitive ability as measured by traditional intelligence tests is a solid corner-stone for academic success (Spinath, Freudenthaler, & Neubauer, 2010), it is evident, that individual differences in academic excellence cannot be explained by intellectual potential alone (Harackiewicz, Barron, Tauer, & Elliot, 2002) and that motivational variables among others contribute to the prediction of school achievement over and above intelligence (e.g. Steinmayr & Spinath, 2009). Clearly there are some individuals, whose personality, motivation and other varying prerequisites make them more fit for success in academic context. The better we understand the dynamic interactions between personality, academic-related perceptions, beliefs, and strategies, the closer we are to developing more effective teaching strategies as well as preventing failures in measuring up to requirements posed daily by school context. The present paper is focusing on clarifying the associations between Estonian ninth grade students' personality characteristics, academic motivation, implicit theories of intelligence, perceptions of self-efficacy and subject value, as well as excellence in school.

Personality, motivation, and academic-related beliefs as predictors of school achievement

Personality

The five-factor model of personality provides a meaningful taxonomy for studying individual differences not only for adults but also for adolescents (McCrae et al., 2002, Allik, Laidra, Realo, & Pullmann, 2004). The Big Five personality traits of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness are a good starting point to studies associating personality with a number of behaviors and outcomes also in educational contexts, as the results are at least personality-wise well comparable across samples. In addition to being associated with academic motivation (e.g. Bipp, Steinmayr, & Spinath, 2008; Komarraju, Karau, & Schmeck, 2009), personality has also been found to be a direct predictor of academic achievement (e.g. Laidra, Pullmann, & Allik, 2007; Spinath et al., 2010). Both of these lines of thought are studied in the present paper.

Achievement goals

Midgley, Kaplan, and Middleton (2001) have defined achievement goals as purposes for engagement in competence-relevant settings and traditionally, theorists within the achievement goal framework have distinguished between mastery goals and performance goals, with mastery goals' core essence being the aim to increase one's skills and knowledge whereas performance goals are characterized by demonstrating ability or avoiding demonstrating lack of competence.

Mastery goals have been shown to be associated with deeper learning strategies and a belief that achievement outcomes are largely attributable to effort (Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990). Some studies have posited positive correlations between mastery goals and graded performance (Abd-El-Fattah, 2006; Greene & Miller, 1996), while some have found no significant relations (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Skaalvik, 1997).

Performance goals on the other hand have been shown to be associated with surface processing of study material (Vermetten, Lodewijks, & Vermunt, 2001), low persistence in the face of failure (Skaalvik, 1997) as well as using maladaptive strategies such as cheating (Marshall, 1988), avoidance of help-seeking (Ryan & Pintrich, 1997) and learned helplessness (Martin, Marsh, & Debus, 2001).

As a counterpoint to attesting a positive value only to the mastery mindset Harackiewicz and colleagues have introduced a multiple goal perspective of pursuing both goals simultaneously with mastery goals being more predictive of continuous interest in class work, and adoption of performance goals predicting better grades (Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997; Harackiewicz et al., 2000; Harackiewicz, Barron, Tauer, & Elliot, 2002).

Implicit theories of intelligence

Another important component that has been relentlessly studied in association with academic motivation is that of implicit theories of intelligence, a concept developed by Dweck and Leggett (1988) in their social-cognitive theory of motivation.

Dweck (2008) suggests that students who believe that intelligence is fixed, worry about how much of this fixed intelligence they possess. Other students believe that intelligence is something that can be improved by education. Following Dweck's perspective, "entity" theorists are assumed to adopt performance goals seeking to gain

favourable and avoid unfavourable judgments about their competence. "Incrementalists" on the other hand adopt mastery goals, aiming at increasing their competence by developing new skills and deepening their understanding.

Studies conducted more recently, however, have suggested that implicit theories generally do not have such strong and straightforward associations neither with academic achievement nor with goals orientations. Bråten and Strømsø (2004) for example have reported generally weak and non-significant relations between intelligence beliefs and goal orientations. Dupeyrat & Mariné (2005) on the other hand demonstrated that while neither the incremental nor the entity theory significantly predicted a performance goal orientation, entity theory was the best negative predictor for a mastery goal orientation. Chen and Pajares (2010) recently found that incremental view of ability had direct and indirect effects on adaptive motivational factors, whereas fixed entity views had direct and indirect effects on maladaptive factors.

Expectancy-value theory

Theorists in the expectancy-value tradition postulate that individual's choices, persistence at tasks, and performance are a product of expectation of success, the value of the activity, and the reward (Wigfield & Eccles, 2000).

In the present study the operational definition of the self-efficacy construct involves students' beliefs about their academic competence with subject-level specificity as efficacy beliefs are believed to manifest themselves differently and with different implications in different contexts (Bong, 2001a). Even more so, Bong (2001b) has proven that when measured at different levels of specificity (e.g. task level, domain level), self-efficacy beliefs yield notably different values.

In recent studies Steinmayr and Spinath (2009) as well as Spinath and colleagues (2010) have once again proved that of the personality and motivational constructs, self-perceived ability contributes substantially beyond intelligence to the prediction of school achievement in all domains and for both genders. Elliot and Harackiewicz (1996) as well as Zimmerman (2000) have also argued that as perceived competence or academic self-efficacy by definition refers to judgments about the future, it may be an antecedent of goal adoption. Consistent with this argument Seifert and O'Keefe (2001) have shown that students, who feel confident in their ability, will be inclined to pursuing mastery goals

Subject specificity of motivational constructs

Although there are studies that have reported consistency in motivational constructs across achievement settings (Anderman & Midgley, 1997) as well as studies that focus on students' personal achievement goals and self-beliefs in school in general (Kaplan & Midgley, 1999; Skaalvik, 1997), contemporary academic motivation research is moving towards persisting that students' perceptions and motivation vary considerably by subject domain. More and more studies are conducted by limiting research settings and conclusions to particular subject areas such as literacy activities, Mathematics classroom, social studies, etc. (e.g. Meece & Miller, 2001; Pajares, Britner, & Valiante, 2000; Spinath et al., 2010). Bong (2001a) has shown that such motivational constructs as self-efficacy, task-value and achievement goal orientations demonstrate strong subject specificity. Her results also indicate that different constructs are differently correlated across domains.

Gender differences in motivational research

In a recent article Spinath and colleagues (2010) have shown on a sample of Austrian eight graders that boys tend to transfer their cognitive potential into academic achievement to a lesser extent than girls. In the same study significant gender differences were reported for almost all investigated personality and motivational variables. Also in Estonia, it has been shown that although there is a small difference in the results of the Progressive Matrices, favouring males from the age of 16 onwards (Lynn, Allik, Pullmann, & Laidra, 2004), girls outperform boys in terms of graded performance throughout elementary as well as secondary school (Pullmann & Allik, 2008).

Hence, although for some part, studies within the goal orientation framework, by ignoring the possible effect of gender (e.g. Abd-El-Fattah, 2006; Howell & Buro, 2009) seem to suggest that academic contexts and motivational constructs play a similar role for boys and girls, boys and girls at least at some levels seem to operate on different premises in the academic context. Studies testing for gender effects and indeed reporting the significance of such differences have shown that relations between gender and goal orientations for example may vary with regard to subject domain and specific goals (e.g. Steinmayr, Ziegler, & Träuble, 2010) as well as school level, appearing more in older grades (Anderman et al., 2001).

Hypotheses and goals of the present paper

With the present paper I aim to further clarify the associations between students' academic achievement goals, personality traits, perceived subject value, self-efficacy expectations and domain-specific graded performance on the sample of Estonian ninth grade students. More specifically, based on current research trends (e.g. Abd-El-Fattah, 2006; Bipp, Steinmayr, & Spinath, 2008; Spinath et al., 2010; Steinmayr et al., 2010) and my previous analyses (Aus, 2002; Aus 2004) the following hypotheses were posed:

- Personality traits (specifically Neuroticism and Conscientiousness) predict the levels of individual domain-specific mastery and performance goals;
- In addition to personality traits, implicit theories about intelligence and expectancy-value factors add to the explanation of variance in the levels of individual achievement goals reported;
- Personality traits, implicit theories about intelligence and expectancy-value factors have different predictive power gender-wise in explaining the variance in the levels of individual achievement goals for boys and girls;
- Motivational constructs and personality factors combined explain a significant amount of variance in school success;
- Motivational constructs and personality factors have different predictive power gender-wise in explaining academic achievement for boys and girls;
- Prediction models of individual mastery and performance goals as well as academic achievement convey gender-domain co-effects.

METHOD

Participants and procedure

The sample consisted of 351 students from 11 Estonian-speaking schools from different regions of Estonia. All students received permission slips to be filled out by their parents/custodians. Three students were denied permission to participate by their custodians. Of the rest 72 students refused to fill out the survey, filled out only parts of it or were clearly not giving truthful answers. With all things considered, 276 students were included in the analyses, 153 of whom were girls and 121 boys. At the time of testing, all participants, with the average age of 15.3 years (SD = .77), were studying in the ninth grade.

Test instruments were group-administered midway through the academic year in students' regular classrooms. Broad aims of the study were briefly explained. The teacher was in some cases present in the room but was not involved in administering the survey. Students were told that participating in the study was optional and that there was no right or wrong answers. They were also assured that their answers would be kept confidential. Students were instructed in the use of the anchored scales and encouraged to ask for clarification regarding unclear items. It took approximately 50 minutes to fill out the whole survey.

Measures

Some of the motivational scales (domain-specific individual achievement goals, self-efficacy expectations and perceptions of subject value) included in the analyses in the present study have been discussed in more detail in my previous papers (for reference, see Aus, 2002; Aus, 2004). Scales measuring domain-general class-level achievement goals, student's implicit theories of intelligence and personality traits are new to present analyses. Reliability estimates of all the used scales are reported in Table 1.

Motivational indices

Scales measuring motivational indices in the study were adopted from the Patterns of Adaptive Learning Survey (*PALS*) composed by Midgley et al. (2000). Motivational part of the survey included 4 times 32 items, which asked students about their motivational orientations, perceived classroom goal structure, academic self- efficacy beliefs and skepticism about the relevance of school-subjects. I modified the scales slightly by

making them more domain-specific in order to differentiate the scales across four different subject areas: Mathematics, Foreign language, Estonian language and Literature and Science. Five point Likert-type scales were used, items were anchored at 0 = "*Not at all true*," to 4 = "*Very true*."

Achievement goals. Achievement goals variables were coded so that a higher score meant stronger orientation toward the specified goal orientation – mastery, performance approach or performance avoidance orientation. Goals were measured on an individual as well as on a class-level. As discussed in more detail in the seminar paper (Aus, 2002), individual performance-approach and performance-avoidance items loaded on one factor and therefore analyses were carried out using the dichotomy of individual mastery versus individual performance goals.

Deviating from the line of reasoning in my previous studies, rather than imposing theoretical expectations on the data by confirmatory factor analyses, exploratory techniques were used to further clarify the construct validities of several class-level motivational items. Analyzing motivational constructs with principal components factor analysis both subject-specifically and subject-generally, lead us to the conclusion that the most stable and best explainable factors for further analyses were domain-specific self-efficacy beliefs (4 items), domain-specific scepticism about the subject value (4 items), domain-specific individual mastery goals (4 items), and domain-specific individual performance goals (8 items) as well as domain-general class-level mastery goals (one item in four separate domains that loaded on one domain-general factor: "*In our class it's OK to make mistakes as long as you are learning*"), domain-general class-level performance approach goals (one item in four separate domains that loaded on one domain-general factor: "*In our class, giving the right answers is more important than understanding why the answer is correct*"), domain-general class-level performance avoidance goals (one item in four separate domains that loaded on one domain-general factor: "*In our class, showing others that class work is not difficult for anyone, is really important*"), and domain-general class-level outcome goals (two items in four separate domains that loaded on one domain-general factor: "*In our class, getting good grades is the main goal*" and "*In our class, it's important to get high scores on tests*"). (See Aus, 2002 for reference about the factor structures of individual motivational constructs.) Factor loadings for all the class-level achievement orientation items presented during testing are reported in Table 1A in the Appendix and factor loadings for only those class-

level achievement orientation items that were used in further analyses in this paper are presented in Table 2A in the Appendix.

Domain-specific self-efficacy beliefs. Domain-specific ability self-perceptions were measured by self-efficacy scales, where a higher score indicated a student's higher confidence in his or her skills and efficaciousness in a specific subject.

Skepticism about the relevance of school-subjects. Concerning the scale for skepticism about the relevance of school subjects for future success, the higher the score, the less the student perceived the subject as valuable for his or her future success.

Implicit theories of intelligence

Students also responded to an 8-item scale about their implicit theories of intelligence developed by Dweck and Leggett (1988). Four items in the scale measured students' entity theories concerning the belief that intelligence is a fixed trait (sample item: "*You can learn new things, but you can't really change your basic intelligence*"). The four items used to measure the incremental theory of intelligence focused on the belief that intelligence is malleable, that is, that individuals can become more intelligent through effort (sample item: "*You can always significantly change your level of intelligence*") The entity and incremental items were presented in mixed order, and the same 5-point response scale ranging from 0 = "*Not at all true*," to 4 = "*Very true*" was used. Factor loadings for the items are presented in Table 3A in the Appendix.

Personality traits

Participants also completed the Estonian version of the NEO Five-Factor Inventory (NEO-FFI; Allik, Laidra, Realo, & Pullmann, 2004), which is a 60-item measure of the five major personality dimensions: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Each personality dimension is measured by 12 items on a 5-point Likert scale ranging from 0 = "*Strongly disagree*" to 4 = "*strongly agree*".

Academic achievement

Schools provided the students' final grades by the end of the school year. The grades in Mathematics, Science, Estonian language, and Foreign language were then used as a measure of subject-specific academic achievement. In Estonia generally a five-mark grading system is used, with 5 being the highest grade.

RESULTS

First the descriptive statistics of scales as well as intercorrelations between the variables under focus were inspected. Based on theoretical assumptions two sets of gender-specific hierarchical regression models predicting[1] the adoption of domain-specific individual mastery and performance goals were composed. In the second phase individual mastery and performance goals together with the Big Five personality traits and other relevant motivational factors were submitted to four-step hierarchical regression analyses in order clarify the factors contributing to the variance in boys' and girls' academic achievement in four separate subject domains.

Descriptive statistics, intercorrelations between variables and gender differences in predictors and criteria

Means and standard deviations of scales are reported in Table 1. Statistics concerning gender differences and the reliabilities of scales are presented in the same table. Based on these results further analyses were carried out for girls and boys separately to discover underlying gender-dynamics in the prediction of individual mastery and performance goals as well as academic achievement in four separate domains.

In order to check for multicollinearity, intercorrelations of personality traits and motivational measures were inspected and are presented in Tables 1–4 in the Appendix. As the intercorrelations were all well below .80, and care was taken to compose predictive regression models without highly redundant variables like domain-specific individual performance orientation and domain-general class-level avoidance orientation (e.g. $r=.64$ for boys in Math), as well as incremental and entity theories of intelligence ($r=-.64$ for girls and $r=.-60$ for boys), multicollinearity was not regarded as a remarkable problem.

[1] Here and in the following, we use the words "prediction" and "predict" without suggesting any kind of causal relations

Table 1. *Descriptive statistics of scales and gender differences in predictors and criteria*

	Boys		Girls			Cronbach α
	Mean	*SD*	*Mean*	*SD*	*t-value*	
Personality traits						
Neuroticism	29.34	10.16	33.59	11.31	–3.25***	.85
Extraversion	39.58	8.98	43.19	10.48	–3.03***	.85
Agreeableness	36.61	7.67	40.27	8.55	–3.71***	.75
Conscientiousness	36.71	9.10	37.10	9.25	–0.35	.80
Openness	29.84	8.71	37.07	10.15	–6.26***	.81
Domain-specific self-efficacy beliefs						
Mathematics	2.85	.92	2.69	1.19	1.20	.90
Estonian language	2.77	.87	3.22	.78	–4.51***	.85
Foreign language	2.91	.90	3.04	.94	–1.11	.88
Science	2.67	.89	2.32	.96	3.10***	.83
Scepticism about the subject value						
Mathematics	1.35	1.05	1.56	1.06	–1.71	.86
Estonian language	1.72	.96	1.66	1.08	.53	.83
Foreign language	1.40	1.03	1.28	1.03	.93	.83
Science	2.06	.96	2.53	.97	–4.02***	.82
Domain-specific individual mastery goals						
Mathematics	3.40	.63	3.49	.67	–1.10	.81
Estonian language	3.07	.73	3.34	.73	–3.11***	.84
Foreign language	3.29	.64	3.54	.58	–3.41***	.80
Science	3.14	.74	2.82	.82	3.39***	.81
Domain-specific individual performance goals						
Mathematics	2.05	1.09	1.71	1.08	2.66**	.94
Estonian language	1.92	1.00	1.89	1.11	.23	.93
Foreign language	2.11	1.15	1.95	1.12	1.10	.95
Science	1.96	.95	1.53	.93	3.78***	.91
Class-level achievement goals generalized across domains						
Class approach	1.83	1.00	1.61	1.00	1.85	.79
Class mastery	2.06	.94	2.28	1.04	–1.82	.80
Outcome goal	2.89	.66	2.70	.81	2.02*	.87
Class avoid	1.99	.88	1.63	.88	3.43***	.80
Implicit theories of intelligence						
Incremental theory	2.70	.87	2.78	.86	–.82	.86
Entity theory	1.37	.93	1.31	.90	.50	.83
Graded performance						
Mathematics	3.46	.78	3.84	.84	–3.82***	
Estonian language	3.49	.73	4.04	.79	–5.89***	
Foreign language	3.62	.74	4.08	.79	–5.03***	
Science	3.58	.69	3.84	.78	–2.88***	

NOTE: ***p<.001, **p<.01, *p<.05; Boys N=122 and girls N=155 in all scales, except for graded performance, where Boys N=120 and girls N=153.

Predicting levels of individual mastery and performance goals

Domain-specific regression models were set up for both genders separately to investigate whether any of the personality factors combined with self-efficacy beliefs, subject value, and implicit theories of intelligence incrementally contributed to the prediction of mastery versus performance goals. All of the independent as well as dependent variables were standardized for further analyses.

Mastery goals

Explanatory value of models predicting mastery orientation superseded performance models for both genders in all subjects, with R^2 ranging from .23 to .37 for mastery and from .07 to .24 for performance goals. The results are summarized in Tables 2 and 3.

Table 2. *Beta coefficients of three-step hierarchical multiple regression models with individual* ***mastery goals*** *in four subjects regressed on measures of personality, entity theory of intelligence and expectancy-value factors*

		Math		Foreign language		Estonian language		Science	
	Predictors	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
1	N	.09	−.02	.14	.20*	.06	.18	.08	−.03
	E	−.01	−.04	−.06	.04	−.07	.04	.00	−.08
	O	−.04	−.03	−.01	.08	.06	.09	.04	12
	A	.03	.02	.08	.14	.31***	.07	.07	.20*
	C	.47***	.35***	.38***	.19	.24**	.34***	.23*	15
	R^2	*.19*	*.13*	*.13*	*.07*	*.21*	*.12*	*.06*	*12*
2	N	.11	−.02	.15	.20*	.11	.18	.10	−.03
	E	−.02	−.04	−.06	.04	−.08	.04	−.00	−.08
	O	−.04	−.02	−.01	.08	.06	.09	.04	12
	A	.04	.02	.08	.14	.34***	.07	.08	.20*
	C	.50***	.35***	.39***	.19	.30**	.34***	.25*	.15
	Entity theory	.13	.03	.03	.02	.28***	−.00	.11	−.02
	R^2	*.21*	*.13*	*.14*	*.07*	*.28*	*.12*	*.07*	*12*
	Change in R^2	*.02*	–	*.01*	–	*.07*	–	*.01*	
3	N	.24**	.06	.21*	.23*	.15	.25**	.18	.04
	E	−.03	−.02	−.08	.04	−.10	−.04	−.02	−.05
	O	−.12	−.07	−.02	.00	.06	−.04	−.08	.01
	A	.10	−.01	.08	.11	.34***	.04	.12	16
	C	.50***	.37***	.35***	.18*	.31**	.35***	.24*	17*
	Entity theory	.14	.08	.01	.04	.29***	.01	.08	.02
	Self-efficacy	.38***	.28***	.32***	.38***	.12	.37***	.45***	.22**
	Scepticism	−.11	−.16*	−.09	−.06	−.15	−.33***	.04	−.32***
	R^2	*.36*	*.24*	*.24*	*.23*	*.32*	*.37*	*.24*	*.27*
	Change in R^2	*.15*	*.11*	*.10*	*.16*	*.04*	*.25*	*.17*	*.15*

NOTE: ***p<.001, **p<.01, *p<.05; Girls (N=155), Boys (N=122)

Table 3. *Beta coefficients of three-step hierarchical multiple regression models with individual* ***performance goals*** *in four subjects regressed on measures of personality, entity theory of intelligence and expectancy-value factors*

	Math		Foreign language		Estonian language		Science	
Predictors	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
N	.15	.15	.24	.22*	.22*	.34***	.25*	.23*
E	–.06	.04	–.04	.06	–.02	.06	.06	.13
O	–.06	–.05	.01	.00	–.02	.05	–.05	.07
A	–.20*	–.05	–.14	.07	–.11	–.03	–.13	.04
C	.18*	.18	.22	.15	.17	.21*	.22*	.12
R^2	*.07*	*.03*	*.08*	*.04*	*.06*	*.09*	*.08*	*.05*
N	.17	.16	.27**	.22*	.24*	.34	.26*	.23
E	–.06	.04	–.05	.06	–.02	.06	.05	.13
O	–.05	–.04	.01	.00	–.02	.05	–.05	.07
A	–.19	–.04	–.13	.07	–.10	–.03	–.13	.04
C	.21*	.18	.25*	.15	.19	.21	.23*	.12
Entity theory	.14	.04	.14	.04	.13	.01	.03	–.00
R^2	*.09*	*.03*	*.10*	*.04*	*.07*	*.09*	*.08*	*.05*
Change in R^2	*.02*	–	*.01*	–	*.01*	–		
N	.24*	.25**	.31**	.22*	.30**	.39***	.36***	.28**
E	–.07	.06	–.07	.06	–.08	.02	.05	.14
O	–.10	–.10	.00	–.03	–.01	–.03	–.15	–.00
A	–.16	–.07	–.13	.05	–.08	–.04	–.08	.01
C	.19	.20*	.22*	.15	.16	.21*	.24*	.13
Entity theory	.13	.10	.13	.05	.11	–.00	.00	.03
Self-efficacy	.25**	.33***	.25**	.17	.29**	.28***	.40***	.19*
Scepticism	.02	–.16*	–.11	–.06	–.11	–.09	–.05	–.17*
R^2	*.14*	*.17*	*.17*	*.07*	*.16*	*.17*	*.24*	*.12*
Change in R^2	*.05*	*.14*	*.07*	*.03*	*.09*	*.08*	*.16*	*.07*

NOTE: ***p<.001, **p<.01, *p<.05; Girls (N=155), Boys (N=122)

Personality. As expected, the strongest positive predictors of mastery orientation were Conscientiousness and self-efficacy beliefs. For boys, Conscientiousness consistently showed stronger predictive power than for girls, with the exception of the Estonian subject domain, where Conscientiousness was a stronger predictor of mastery goals for girls. Neuroticism, surprisingly, was a weak to moderate positive predictor of mastery goals for both genders in all subjects. Comparing the coefficients with zero-order correlations revealed that regression results for Neuroticism would need further investigation as to what has contributed to the instability of the personality trait's predictive power, whether it be its relatively high intercorrelation with Conscientiousness (r=-.49 for boys, and r=-.52 for girls, p<.001) or possible mediating effects with other factors. Agreeableness was a weak to marginal positive predictor of mastery goals, reaching statistically significant predictive power only in the Estonian model for boys

Expectancy-value. Self-efficacy was universally the strongest positive predictor of mastery goals, except for the Estonian model for boys, where it was only marginally related to mastery orientation. In line with zero-order correlations, scepticism had statistically significant negative predictive power in all mastery orientation models for girls, except for the Foreign language, and no significant explanatory power in boys' mastery orientation models.

Implicit intelligence theories. In order to avoid problems with multicollinearity, highly intercorrelated entity and incremental theories of intelligence were not included in the models simultaneously. Models with entity theory are discussed and reported, as incremental theory did not explain significant amounts of variance in any of the models and only slightly improved the overall explanatory value of the models predicting performance orientation for girls in the subject domains of Estonian and Foreign language (change in $R^2 = 0.02$), and mastery orientation for girls in Estonian (change in $R^2 = 0.01$). Correlation analysis revealed that intelligence theories showed mostly weak to marginal and subject-wise rather inconsistent linear associations with both domain-specific mastery orientation and domain-specific performance orientation, with correlations reaching statistical significance only at the level of $p<.05$ in Foreign language and Estonian for girls and in Estonian for boys (see Tables 4A–7A in the Appendix). Regression models confirmed the results, showing that with personality traits and expectancy-value factors held fixed, intelligence theories had neither consistent nor significant incremental predictive power, except for the entity theory predicting levels of mastery orientation for boys in Estonian language.

Performance goals

Personality. As opposed to Conscientiousness being the strongest predictor for mastery orientation, Neuroticism had the best predictive power in performance goal models for both genders in all subjects. Conscientiousness showed consistently weaker associations with performance goals than with mastery goals, and with all other variables held fixed, Openness was in all the models a negative weak to marginal predictor of performance orientation. Contrary to mastery goals, Agreeableness was mainly negatively associated with performance goals (more consistently for boys than for girls).

Expectancy-value. Similarly to predicting mastery orientation, self-efficacy beliefs were found to account for a significant amount of the performance orientation variance with the only exception of the Foreign language model for girls. Scepticism revealed

another combined effect of domain and gender by being a stronger negative predictor of performance goals for girls in Math and Science, and in the language subjects for boys.

Implicit intelligence theories. With personality traits and expectancy-value factors held fixed, intelligence theories had neither consistent nor significant incremental predictive power in any of the models.

Zero-order correlations between grades and hypothesized predictors

Correlation analysis results between graded performance and personality traits, expectancy-value factors, motivational constructs, and implicit theories of intelligence are summarized in Table 4.

Table 4. *Correlations between graded performance and predictor variables*

	Boys (*N*=120)				Girls (*N*=153)			
	Math	*Estonian language*	*Foreign language*	*Science*	*Math*	*Estonian language*	*Foreign language*	*Science*
Personality traits								
Neuroticism	−.29***	−.21*	−.22*	−.21*	−.14	−.17*	−.11	−.08
Extraversion	.06	.13	.19*	.10	−.07	−.12	−.06	−.00
Agreeableness	.10	−.01	−.03	.06	.02	.02	.00	.19*
Conscientiousness	.21*	.15	.25**	.12	.09	.23**	.14	.12
Openness	.07	.03	.13	.15	.09	.15	.11	.11
Domain-specific self-efficacy beliefs								
Mathematics	.44***				.44***			
Estonian language		.29**				.21**		
Foreign language			.37***				.32***	
Science				.43***				.37***
Scepticism about the subject value								
Mathematics	−.17				−.06			
Estonian language		−.21*				−.05		
Foreign language			−.23**				−.07	
Science				−.18*				−.05
Domain-specific individual mastery goals								
Mathematics	.30***				.15			
Estonian language		.01				.12		
Foreign language			.16				.21**	
Science				.11				.15
Domain-specific individual performance goals								
Mathematics	.16				−.06			
Estonian language		.06				−.04		
Foreign language			.11				−.08	
Science				.13				−.06

	Boys (*N*=120)				Girls (*N*=153)			
	Math	*Estonian language*	*Foreign language*	*Science*	*Math*	*Estonian language*	*Foreign language*	*Science*
Class-level achievement goals generalized across domains								
Class mastery	–.04	–.11	.03	.10	.14	.08	.15	.05
Class approach	–.14	–.05	–.04	–.19*	–.25**	–.23**	–.29***	–.21**
Class avoidance	–.00	.05	.01	–.02	–.21**	–.08	–.17*	–.19*
Class outcome	–.07	–.03	–.01	–.09	–.17*	–.17*	–.13	–.23**
Implicit theories of intelligence								
Incremental theory	–.08	–.11	–.04	–.13	.03	.13	–.08	–.01
Entity theory	–.11	–.04	.02	–.09	–.33***	–.35***	–.22**	–.34***

NOTE: ***p<.001, **p<.01, *p<.05

Personality. Although grades were negatively correlated with Neuroticism for both genders in all subject domains, for boys the associations were somewhat stronger, reaching statistical significance in all domains. Extraversion on the other hand demonstrated gender differences in the valence of the relationship, showing weak to moderate positive correlations with grades in all subjects for boys and weak to marginal negative correlations in all subjects for girls. Agreeableness demonstrated less stable trends across subjects and the association with grades was significantly positive only for girls in Science. Conscientiousness was marginally to significantly positively correlated with grades in all subjects for both genders, reaching statistical significance in Math (r=.21, p<.05) and Foreign language (r=.25, p<.01) for boys and in Estonian language (r=.23, p<.01) for girls. Openness was weakly to marginally positively correlated with grades in all domains for both genders, but none of the associations were statistically significant.

Expectancy-value. Self-efficacy beliefs, as expected demonstrated the most stable positive associations with graded performance, reaching statistical significance at the level of p<.001 in all subjects except for Estonian language, where the association was somewhat weaker, although significant at the level of p<.01.

Scepticism about the usefulness of specific subjects for future success was negatively associated with all grades for both genders, but the correlations were notably stronger for boys for whom the associations reached statistical significance in all the subjects, except for Mathematics, were the relationship was marginal.

Individual achievement goals. Domain-specific individual mastery orientation was in all cases positively correlated with graded performance, but demonstrated statistically significant levels only in Math for boys (r=.30, p<.001) and in Foreign language for girls

(r=.21, p<.01). The subject domain, for which grades showed the weakest association with individual mastery goals, was the Estonian language for boys.

For individual performance goals the associations differed in valence once again, with girls demonstrating negative associations between performance orientation and grades, as apposed to positive associations showed by boys.

Class-level achievement goals. Domain-general class-level achievement goals were more strongly associated with grades for girls than for boys, with class-level approach, avoidance, and outcome goals being significantly negatively correlated with grades for girls across all domains, except for class avoidance orientation in the Estonian and outcome goals in the Foreign language. For boys, class-level goals' associations with grades reached statistical significance only for approach orientation in Science (r= -.19, p<.05).

Implicit intelligence theories. Of implicit intelligence theories, the entity theory, i.e. believing that intelligence is a fixed trait, and for girls only, was significantly negatively associated with academic achievement.

Predicting academic achievement

In order to investigate the incremental predictive validity of personality traits and different motivational constructs on subject specific academic achievement, school performance was separately predicted in four domains. For all domains a four-step hierarchical regression analysis was conducted, in which subject specific GPA scores were regressed on the Big Five personality traits as the most inherently stable factors in the first step, implicit theories of intelligence as a more general belief system compared to motivational indices in the second step, self-efficacy beliefs, subject value and domain-specific achievement goal orientations in the third, and three domain-general class-level achievement goal orientations in the fourth step.

Table 5. *Beta coefficients regression models with* ***school performance*** *regressed on measures of personality, intelligence theory, expectancy-value factors as well as achievement goals*

	Math		**Foreign language**		**Estonian language**		**Science**	
Predictors	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
N	–.25*	–.20	–.14	–.12	–.18	–.19*	–.20	–.02
E	–.01	–.17	.11	–.15	.07	–.26**	.04	–.10
O	.06	.11	.14	.13	.04	.16*	.15	.08
A	–.03	–.04	–.16	–.08	–.09	–.10	–.03	.18
C	.10	.03	.21*	.14	.09	.23*	.01	.06
R^2	*.10**	*.05*	*.12***	*.06*	*.06*	*.14****	*.07*	*.05*

	Math		Foreign language		Estonian language		Science	
Predictors	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*
N	−.27**	−.21*	−.14	−.13	−.19	−.20*	−.22*	−.03
E	−.01	−.18*	.11	−.16	.07	−.28***	.04	−.11
O	.06	.08	.14	.10	.03	.13	.15	.05
A	−.04	−.08	−.16	−.11	−.10	−.15	−.04	14
C	.08	.02	.21*	.13	.08	.21*	−.01	.04
Entity theory	−.10	−.34***	.04	−.22**	−.04	−.35***	−.10	−.32***
R^2	*.10**	*.16****	*.13**	*.10***	*.06*	*.26****	*.08*	*.15****
Change in R^2	–	*.11*	*.01*	*.04*	–	*.12*	*.01*	*10*
N	−.21	−.06	−.10	−.09	−.11	−.13	−.11	.05
E	−.01	−.18*	.10	−.16	.01	−.30***	.03	−.10
O	.00	.01	.11	.04	.04	.07	.05	−.05
A	.03	−.08	−.12	−.12	−.06	−.15	.01	.09
C	−.03	.05	.15	.12	.08	.23*	.02	.04
Entity theory	−.14	−.29***	.02	−.22**	−.03	−.37***	−.12	−.29***
Mastery	.15	.07	.12	.13	−.07	.00	−.06	.04
Performance	.13	−.18*	.07	−.13	.01	−.09	.03	−.14
Self-efficacy	.31***	.46***	.15	.28**	.25*	.22**	.40***	.35***
Scepticism	−.07	.07	−.13	.04	−.20*	−.01	−.07	.02
R^2	*.25****	*.31****	*.20***	*.21****	*.15**	*.30****	*.23****	*.25****
Change in R^2	*.15*	*.15*	*.07*	*.11*	*.09*	*.04*	*.15*	*.10*
N	−.21	−.03	−.09	−.05	−.11	−.13	−.11	.06
E	−.02	−.21**	.12	−.18*	.02	−.33***	.01	−.13
O	−.01	.00	.13	.02	.06	.06	.02	−.06
A	.02	−.08	−.12	−.12	−.09	−.15	.00	.09
C	−.03	.04	.15	.11	.08	.22*	.03	.03
Entity theory	−.11	−.28***	.02	−.21**	−.01	−.36***	−.10	−.28***
Mastery	.11	.03	.15	.11	−.02	−.02	−.11	.00
Performance	.17	−.10	.05	−.03	.04	−.01	.08	−.05
Self-efficacy	.33***	.46***	.14	.28***	.23*	.23**	.38***	.34***
Scepticism	−.04	.06	−.15	.05	−.22*	−.01	−.07	.00
Class approach	−.13	−.20**	.08	−.25**	−.02	−.19*	−.15	−.16
Class mastery	−.07	−.06	−.04	.00	−.15	−.10	.07	−.06
Outcome goal	.01	−.08	−.05	−.06	−.08	−.10	−.01	−.15
R^2	*.30****	*.38****	*.20**	*.27****	*.18*	*.34****	*.25***	*.30****
Change in R^2	*.05*	*.07*	–	*.06*	*.03*	*.04*	*.02*	*.05*

NOTE: ***p<.001, **p<.01, *p<.05; Girls (N=153), Boys (N=120)

All variables in the models simultaneously explained for 38%, 27%, 34%, and 30% of the total variance in Math, Foreign language, Estonian language, and Science respectively for girls, and 30%, 20%, 18%, and 25% respectively for boys (see Table 3). In all the subjects the final models showed a better fit for girls, explaining a larger proportion of the variance in academic performance.

Personality. Results from the first regression step in all subjects revealed that personality alone explained a relatively small amount of the variance in domain-specific GPA. For girls, the five personality factors significantly accounted for the variance in academic performance in Estonian, $F(5,147)=4.70$ $p<.001$, and for boys in Math. $F(5,114)=2.40$ $p<.04$ and Foreign language, $F(5,114)=3.22$ $p<.01$.

Taken separately, Neuroticism, as expected, was a negative and Conscientiousness a positive predictor of academic performance. In line with correlation results, Extraversion was a significant to marginal negative predictor of academic achievement for girls in all subjects, while for boys the effect of Extraversion ranged from weakly negative in Math to marginally positive in Foreign language.

For both boys and girls the negative effect of Neuroticism was moderated by the inclusion of self-efficacy beliefs in the model. In order to test for the mediating effect of self-efficacy beliefs between Neuroticism and graded performance, Sobel test was used to tell, whether self-efficacy beliefs significantly carried the influence of Neuroticism as an independent variable to academic achievement. Results of the test attested to the significant mediating effect of self-efficacy beliefs; the reduction in variance explained by Neuroticism was significant in all the subjects for boys and in Math and Science for girls. The results concerning the mediating effect of self-efficacy beliefs are summarized in Table 6.

For boys the positive effect of Conscientiousness was moulded into a weak negative effect with the inclusion of motivational variables. The marginal effects of Openness in the first step of the regression models dissolved into weak associations with the academic performance with other motivational constructs held fixed.

Given the controversial results of domain-specific individual mastery orientation and Conscientiousness as predictors of achievement in Mathematics for boys, Sobel test was used once again to test for possible mediating effects. Sobel test attested for a significant mediating effect of mastery orientation between Conscientiousness and academic achievement in Math for boys ($z=2.34$, $p<.01$).

Table 6. *Mediating effects of self-efficacy beliefs between Neuroticism and graded performance in four subjects*

Subject Domain	Boys (N=122)	Girls (N=153)
Mathematics	–2.62**	–2.70**
Foreign language	–2.50**	–1.50
Estonian language	–2.08*	–1.80
Science	–2.04*	–2.44**

NOTE: ***p<.001, **p<.01, *p<.05

Expectancy-value. Ability self-perceptions, as expected, had the highest shares of uniquely explained variance in academic achievement, except for the model of Estonian for girls, where entity theory and Extraversion were even stronger predictors of school performance.

Scepticism toward the usefulness of school subjects demonstrated marginal to significant negative predictive power for boys in all subjects besides Mathematics, but showed only weak associations with grades for girls.

Implicit intelligence theories. As incremental and entity theories of intelligence were strongly intercorrelated, they were not included in the regression models simultaneously in order to prevent problems with multicollinearity. Models with the entity theory as a predictor of academic achievement are reported, as it explained more variance in the dependent variable in most of the models. Incremental theory did not explain a significant amount of the variance in any of the models and only slightly improved the overall explanatory value of the model predicting graded performance in Foreign language for boys (change in R^2 = 0.07). Entity beliefs on the other hand were strong and stable negative predictors of grades in all subjects for girls. For boys the predictive power of entity beliefs was either weak or marginal.

Individual achievement goals. With personality traits and other motivational variables held fixed, domain specific performance goals had no significant incremental predictive power in the models, but different trends between boys and girls were evident: namely, for girls individual performance goals contributed to grades negatively in all the subjects, while the associations were positive for boys. The strongest although marginal effects for both genders appeared in the subject domain of Mathematics.

Class-level achievement goals. Class-level performance approach orientation had stronger incremental predictive power for girls than for boys, being a significant predictor

for academic achievement for girls in all subjects except for Science, where the predictive power was marginal.

With other variables held fixed, class-level mastery and outcome goals demonstrated no significant incremental predictive power for either genders, but the positive zero-order correlation between class-level mastery orientation and graded performance for girls was transformed into weak negative predictive power in the regression models.

DISCUSSION

Present analyses, adding to evidence from recent research (Spinath, et al., 2010; Steinmayr, & Spinath, 2009) clearly suggests that personality as well as motivational factors play either direct or mediated roles in school context, and that the roles are somewhat different for boys and for girls and also across subject domains.

Predicting individual achievement goals

Lately it has been proposed that the relationship between implicit theories and academic achievement is mediated by an adoption of mastery versus performance goal orientation (e.g. Kornilova, Kornilov, & Chumakova, 2009). This hypothesis was tested on present data by checking whether tendencies of conveying mastery and/or performance goals where explained by implicit intelligence theories as well as personality and domain-specific expectancy-value factors.

Studies of the association between implicit theories and goal orientations have yielded mixed inconsistent results (e.g. Chen & Pajares, 2010; Howell & Buro, 2009) suggesting that these relationships may be not as strong or straightforward as predicted in Dweck's theory. In the present analyses we were more successful in predicting the levels of mastery than performance goals, but the incremental predictive power of implicit intelligence theories was relatively weak across subject domains, with the only significant, but surprisingly controversial result of entity theory being a strong positive predictor of mastery orientation for boys in the subject of Estonian language.

One would expect the entity theory to be a negative predictor of mastery goals or in case of no linear relationship, convey weak insignificant associations at the very best. The reason for finding a strong positive association between boys thinking intelligence is a fixed trait and reporting the desire to acquire new skills in the subject of Estonian language, is rather unclear. For boys, in contrast with other subject domains. Agreeableness was also significantly positively associated with adopting mastery goals in

Estonian. The sought after explanation might hence lie somewhere in the complex interrelations between a mastery goal mindset, the personality trait of Agreeableness, and implicit intelligence theories requiring further analysis. Another explanation that can be hypothesized is the overall deviant patterns of association Estonian language as a domain presented throughout entire data analysis.

Contrary to elementary school, secondary school is probably a time when the least amount of effort is put into school work associated with the Estonian language, as the most important skills in the domain, namely reading and writing have more or less been acquired by this level of schooling. It can be assumed therefore that in the domain of Estonian students operate on the premises of already acquired skills and don't think there is any significant intelligence-altering new wisdom that can be learned. Hence they might not associate mastery orientation in Estonian with the same level of deep-processing of study material and significant mental effort like in the other subjects.

In line with logical thought, Neuroticism was a strong positive predictor of performance goals for both genders in all subjects and Conscientiousness showed the strongest predictive power for mastery goals. The more anxious the student, the more he or she is inclined toward regarding the demonstration of ability and good performance or avoiding looking stupid compared to others as important, while more conscientious students are more prone to value learning *per se* or at least tend to regard it as more "socially desirable", and hence report it more likely.

For girls zero-order correlations showed notably stronger negative associations between Neuroticism and domain-specific mastery goals in Science and Math than in the Foreign language and Estonian. For girls, hence, the traditionally more masculine undertone of Science and Math might let anxiousness interfere more with focusing on mastery goals than in the more feminine subjects of languages.

Attesting even more to the inherent differences between subjects, results from the seminar paper (Aus, 2002) also demonstrated that girls had significantly less faith in their abilities in Math and Science than in the language subjects, and also significantly lower self-efficacy beliefs in Science compared to boys, although in terms of academic achievement girls significantly outperformed boys in both of these domains.

Predicting academic achievement

Although Kornilova and colleagues (2009) as an example have shown that goal orientations have no direct impact on academic achievement and neither do implicit theories of intelligence, their results like the results of many other studies in motivational research were obtained from a mainly female sample of college students, and cannot therefore be generalized to students in elementary or secondary school.

In a better comparable study Steinmayr and Spinath (2009) investigated motivational constructs on a sample of 11th and 12th graders and found that domain-specifically assessed ability self-concepts and subject value explained most of the predicted domain-specific achievement variance, while mastery orientation showed weak positive predictive power and performance goals did not add to the variance explanation.

Results from the present analyses comply with results from the latter article concerning self-efficacy beliefs, but elaborate on the topic by adding the dimension of gender differences to the analysis. When analyzing the predictive power of motivational constructs separately for boys and girls, it becomes apparent, that academic achievement is gender-wise associated with different constructs and relations between achievement and motivation show different patterns for boys and girls.

Present results demonstrated that for boys lower subject value was a direct predictor of worse grades. For girls, the more sceptical they were of the usefulness of a subject, the less inclined they were toward adopting subject-specific mastery goals, while their graded performance was left unaffected. Hence, it would be too simplified to think that girls are indifferent toward subject value and generally study diligently no matter what. Although girls' grades might not suffer as a direct effect of regarding a subject domain useless in nature, subject value might latently, through a lower level of mastery goals, affect the level of deep processing girls invest into learning.

Gender-specific analysis also elaborated on the predictive power of performance goals on academic achievement. Although associations between individual performance goals and graded performance were statistically insignificant for both genders, for boys the relations were consistently positive, while the associations were negative for girls. It can be argued in line with Patrick, Ryan, & Pintrich (1999) that for girls the inclination toward demonstrating one's ability in comparison to others has negative consequences, whereas for boys the effect is more positive in nature.

The differences become even more evident when analyzing class-level performance goals of perceiving the classroom as inclined toward demonstrating superior ability measured by grades and correct responses to teachers' questions. Such classrooms, or at least perceiving a classroom as performance orientated, appear to be significantly more detrimental for girls' than for boys' GPA.

In a more recent article by Spinath and colleagues (2010) predictors of academic achievement were analyzed with gender-differences in mind. Similarly to results from the present study they found significant sex differences in almost all investigated personality and motivational variables. Consistent with their results personality factors in our study were also better predictors of grades for girls than for boys. Specific trends where though somewhat different. Namely, for Austrian eighth graders participating in the study, boys' Neuroticism had no noteworthy relations with grades, whilst in our study higher Neuroticism was associated with worse academic outcomes especially for boys.

Another interesting difference concerns the effect of Extraversion on graded performance. High levels of Extraversion were shown to be a disadvantage for Austrian boys and an advantage for girls. Present data suggests quite the opposite for Estonian ninth graders. Namely, extraverted nature seems to be detrimental for girls' graded performance, whereas for boys, Extraversion was associated with better academic outcomes in all subjects, but most of all in languages. Perhaps in Estonia girls who are more outgoing tend to get into conflict with the teachers, whereas more outgoing boys are favoured by teachers or perceived as verbally more intelligent. On the other hand as girls reported significantly higher mean levels of Extraversion than boys (in line with research, e.g. Allik et al., 2004), the results might not be well comparable between genders. More extraverted boys might just be a tiny bit more active than their less gregarious same-sex peers, while in the girls sample higher level of Extraversion might in fact express itself in behaviours that are too much to bear for the teachers.

Yet another interesting result underlining the importance of stressing gender-differences in motivational research, concerns implicit intelligence theories' association with academic achievement. It was found that while for boys, consistently with previous research (Dupeyrat & Mariné, 2005) neither regarding intelligence as a fixed nor as a malleable trait showed direct associations with academic success, for girls, surprisingly, entity theory of intelligence was a significant negative predictor of grades in all subject domains. Hence, if a girl thinks that intelligence is a fixed quality and she cannot do much to change it she is more likely to have a lower GPA. It might be that holding a

negative view about the malleability of intelligence makes girls, more than boys give up trying when difficulties arise, and therefore hinders them from reaching full academic potential. It is of course impossible to say, based on present data, whether the line of reasoning doesn't in fact work the other way around, that is if girls, who do not excel in school have adopted an entity view of fixed intelligence levels because of that. Experimental studies have indeed shown that it is possible to improve academic performance by manipulating students' implicit theories (e.g. Da Fonseca et al., 2010).

Limitations and practical implications of the study

Limitations

Although the major assumptions of multiple regression analysis were not transgressed against as variables with the strongest intercorrelations were not submitted to regression models simultaneously, and the number of variables in regression models complied with the rule of having at least 10 to 20 times as many observations as variables, the estimates in the models might not have been as stable as would be desired. Predictive models in the study can be said to indicate how well the predictors as a whole predicted the outcome variables, but they might not have given infallible or easily interpretable results about each and every individual predictor under focus. With that in mind, conclusions were drawn only based on results that showed more consistent patterns across subject domains and/or were confirmed by other analyses. For future reference, path analysis or structural equation modelling might be a more appropriate method for studying the complex interrelations as well as mediations between motivational and other constructs predicting academic achievement (Preacher & Hayes, 2004).

Even though present data, being cross-sectional in nature provides no information about the causal effects between variables, it does reflect the amount of shared and unique variance in explaining dependent variables. As the analyses replicated some results from other similar studies as well as revealed some interesting trends and significant gender-differences that showed consistent patterns across different subject domains, they can therefore be regarded as more or less trustworthy and implications regarding the importance of considering gender differences and subject specificity in motivational processes can be made.

Implications

In educational contexts factors that either motivate or impair girls might not do the trick for boys and vice versa. Promoting the view of intelligence being a quality that can be altered by hard work and effort might for example be especially important for girls. Also, factors that at first might not seem too detrimental for girls' academic achievement, such as scepticism toward the subject value, might mask their negative effect in mediated relationships and/or hidden manifestations of lessened interest in mastering a subject while still performing up to the standards for getting good grades.

Also, although mastery orientation showed no consistent relations with academic achievement as measured by grades, enhancing the mastery mindset should in any way be regarded as inessential. Grades, although undoubtedly significant in school context, are a composition of complex evaluations besides cognitive ability, and might not always reflect the level of deeper understanding of subject material, which pursuing mastery goals still inherently aims at. Considering that mastery orientation has also been shown to influence students' overall emotional well-being and coping (e.g. Elliot & Harackiewicz, 1996; Harackiewicz et al., 2000; Kaplan & Maehr, 1999; Kaplan & Midgley, 1999), its lack of direct associations with graded performance should no be overemphasized.

As the other side of the same coin, consequences of performance goals of demonstrating superior ability or avoiding looking stupid compared to others might not be all that detrimental for boys, as given the opportunity to compete with others might force them to put more effort into studying. As Martin and his fellow-researchers (Martin et al., 2001) argue, possible benefits that are gained through a focus on competition and relative ability cannot be rejected, but an overly competitive focus at the expense of mastery can incur certain academic costs in the long run.

Promoting academic self-efficacy, a construct closely intertwined with most of motivational and outcome measures may be advised. In addition to merely reflecting academic ability, self-efficacy has by O'Mara, Marsh, Craven, & Debus (2006), and Steinmayr and Spinath (2009) among others been argued to also work the other way around by being a prerequisite to getting better grades. A subtle distinction that has to be kept in mind though is that praise for intelligence has been shown to have more negative consequences for students' motivation and performance than praise for effort (Mueller & Dweck, 1998).

I dare to conclude that academic achievement, in addition to being gender-specific in nature, also relies on different associations between personality factors and motivation from one domain to another. Therefore, teachers of Mathematics and Estonian language, for example should not depend on similar teaching methods and motivational pep-talk, but rather consider the different implications their subject domains per se have on children and work on the gender and personality specific differences in the dynamic interplay between the subject domain's perceived value and relatedness to future success, students' individual achievement goals, self-efficacy beliefs, implicit theories of intelligence, and different implications of perceiving the classroom as mastery or performance orientated.

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Appendix

Table 1A. *Rotated factor loadings from exploratory factor analysis for all the items of class-level achievement goals*

	Factors						
	1	2	3	4	5	6	7
Foreign language							
Meie klassis on väga oluline võõrkeele tunnis mitte rumal näida	**.77**	.09	.04	.11	.19	.18	[illegible]
Meie klassis on oluline võõrkeele tunnis teiste kuuldes mitte valesti vastata	**.68**	.09	.19	.24	.28	.15	[illegible]
Meie klassis on oluline võõrkeeles teistest mitte kehvem olla	**.68**	.14	.07	.13	.36	.17	[illegible]
Meie klassis on oluline teistele näidata. et võõrkeel pole kellelegi raske	.35	.11	.11	.06	**.65**	.19	[illegible]
Meie klassis on võõrkeele tunnis kõige tähtsamal kohal head hinded	.40	**.62**	.26	.02	−.02	−.00	[illegible]
Meie klassis on väga oluline võõrkeele tunnis õigesti vastata	**.56**	.28	.13	.21	−.02	.19	[illegible]
Meie klassis on oluline võõrkeele tunnis kontrolltööde eest häid tulemusi saada	.37	**.74**	.10	.03	.06	.00	[illegible]
Meie klassis on võõrkeele tunnis olulisem õigesti vastata. kui aru saada. miks antud vastus õige on	.15	.13	**.67**	.03	.14	.12	[illegible]
Science							
Meie klassis on väga oluline füüsika tunnis mitte rumal näida	.25	−.02	−.06	**.56**	.44	.25	[illegible]
Meie klassis on oluline füüsika tunnis teiste kuuldes mitte valesti vastata	.30	.03	.23	**.61**	.15	.13	[illegible]
Meie klassis on oluline füüsika tunnis teistest mitte kehvem olla	.36	.07	.13	**.50**	.41	.22	[illegible]
Meie klassis on oluline teistele näidata. et füüsika pole kellelegi raske	.10	−.02	.08	.37	**.68**	.01	[illegible]
Meie klassis on füüsika tunnis kõige tähtsamal kohal head hinded	−.01	.45	.11	**.64**	.01	.12	[illegible]
Meie klassis on väga oluline füüsika tunnis õigesti vastata	.17	.21	.08	**.68**	.13	.04	[illegible]
Meie klassis on oluline füüsika tunnis kontrolltööde eest häid tulemusi saada	−.07	**.65**	.09	.35	.10	.18	[illegible]
Meie klassis on füüsika tunnis olulisem õigesti vastata. kui aru saada. miks antud vastus õige on	.10	−.01	**.76**	.10	.06	.03	[illegible]
Estonian language							
Meie klassis on väga oluline eesti keele tunnis mitte rumal näida	.36	.14	.11	.08	.27	**.68**	[illegible]
Meie klassis on oluline eesti keele tunnis teiste kuuldes mitte valesti vastata	.35	.11	.24	.16	.28	**.65**	[illegible]
Meie klassis on oluline eesti keeles teistest mitte kehvem olla	.38	.14	.16	.12	.41	**.52**	[illegible]
Meie klassis on oluline teistele näidata. et eesti keel pole kellelegi raske	.10	.13	.17	.09	**.75**	.32	[illegible]
Meie klassis on eesti keele tunnis kõige tähtsamal kohal head hinded	−.00	**.68**	.17	.14	.05	.36	[illegible]
Meie klassis on väga oluline eesti keele tunnis õigesti vastata	.08	.21	.16	.18	.11	**.75**	[illegible]
Meie klassis on oluline eesti keele tunnis kontrolltööde eest häid tulemusi saada	.06	**.78**	−.09	−.04	.18	.17	[illegible]
Meie klassis on eesti keele tunnis olulisem õigesti vastata. kui aru saada. miks antud vastus õige on	.02	.13	**.77**	.10	.06	.16	[illegible]
Mathematics							
Meie klassis on väga oluline matemaatika tunnis mitte rumal näida	.39	.11	.07	.18	.30	32	.55
Meie klassis on oluline matemaatika tunnis teiste kuuldes mitte valesti vastata	.35	.07	.21	.21	.30	.21	.59
Meie klassis on oluline matemaatikas teistest mitte kehvem olla	.39	.12	.10	.16	.43	.21	.54

	Factors						
	1	2	3	4	5	6	7
Meie klassis on oluline teistele näidata. et matemaatika pole kellelegi raske	.16	.12	.15	.00	**.69**	06	.42
Meie klassis on matemaatika tunnis kõige tähtsamal kohal head hinded	.14	**.67**	.04	.21	.01	.07	.38
Meie klassis on väga oluline matemaatika tunnis õigesti vastata	.17	.29	.18	.21	.05	.31	**.64**
Meie klassis on oluline matemaatika tunnis kontrolltööde eest häid tulemusi saada	.02	**.78**	.07	.09	.08	–.07	.34
Meie klassis on matemaatika tunnis olulisem õigesti vastata. kui aru saada. miks antud vastus õige on	.05	.08	**.80**	.05	.12	08	.14
Explained variance	3.54	4.15	2.80	2.55	3.35	2.66	2.25

NOTE: Factor loadings above .50 are highlighted in bold print.

Table 2A. *Rotated factor loadings from exploratory factor analysis for domain-general class-level goal orientations*

	Factors			
	1	2	3	4
Foreign language				
Meie klassis on OK võõrkeele tunnis valesti vastata, peaasi, et midagi uut õpitakse	.04	**.79**	–.04	.03
Meie klassis on oluline teistele näidata, et võõrkeel pole kellelegi raske	.15	–.06	.77	.10
Meie klassis on võõrkeele tunnis kõige tähtsamal kohal head hinded	**.65**	–.03	.09	.26
Meie klassis on oluline võõrkeele tunnis kontrolltööde eest häid tulemusi saad	**.76**	.03	.09	.10
Meie klassis on võõrkeele tunnis olulisem õigesti vastata, kui aru saada, miks antud vastus õige on	.17	.01	.13	**.69**
Science				
Meie klassis on OK füüsika tunnis valesti vastata, peaasi, et midagi uut õpitakse	–.13	**.73**	–.07	.12
Meie klassis on oluline teistele näidata, et füüsika pole kellelegi raske	.05	–.05	.77	.08
Meie klassis on füüsika tunnis kõige tähtsamal kohal head hinded	**.57**	–.08	.12	.13
Meie klassis on oluline füüsika tunnis kontrolltööde eest häid tulemusi saad	**.69**	–.00	.05	.08
Meie klassis on füüsika tunnis olulisem õigesti vastata, kui aru saada, miks antud vastus õige on	.03	–.11	.10	**.75**
Estonian language				
Meie klassis on OK eesti keele tunnis valesti vastata, peaasi, et midagi uut õpitakse	.01	**.79**	.09	.05
Meie klassis on oluline teistele näidata, et eesti keel pole kellelegi raske	.16	.07	**.78**	.17
Meie klassis on eesti keele tunnis kõige tähtsamal kohal head hinded	**.73**	.02	.10	.18
Meie klassis on oluline eesti keele tunnis kontrolltööde eest häid tulemusi saad	**.77**	.01	.04	.10
Meie klassis on eesti keele tunnis olulisem õigesti vastata, kui aru saada, miks antud vastus õige on	.18	–.13	.11	**.77**
Mathematics				
Meie klassis on OK matemaatika tunnis valesti vastata, peaasi, et midagi uut õpitakse	–.05	**.83**	–.02	.10
Meie klassis on oluline teistele näidata, et matemaatika pole kellelegi raske	.15	.01	**.75**	.15
Meie klassis on matemaatika tunnis kõige tähtsamal kohal head hinded	**.76**	–.10	.11	.04
Meie klassis on oluline matemaatika tunnis kontrolltööde eest häid tulemusi saad	**.78**	–.02	.07	.05
Meie klassis on matemaatika tunnis olulisem õigesti vastata, kui aru saada, miks antud vastus õige on	.11	–.10	.15	**.80**
Explained variance	4.29	2.54	2.53	2.52

NOTE: Factors 1, 2, 3, and 4 have been operationalized as class level outcome coal, class-level mastery goal, class-level performance-avoid goal, and class-level performance-approach goal respectively. Factor loadings above .50 are highlighted in bold print.

Table 3A. *Rotated factor loadings from exploratory factor analysis for implicit theories of intelligence*

	Factors	
	1	2
Incremental view		
Inimene saab oma intelligentsuse taset alati olulisel määral muuta	**–.77**	-.20
Iga inimene saab oma intelligentsuse taset oluliselt muuta	**–.80**	-.38
Inimene saab isegi oma intelligentsuse baastaset märkimisväärselt muuta	**–.76**	-.32
Hoolimata inimese intelligentsuse baastasemest, on seda alati võimalik suurel määral muuta	**–.86**	-.20
Entity view		
Inimene võib küll uusi asju õppida, kuid intelligentsuse baastase on praktiliselt muutmatu	.17	**.74**
Kui päris aus olla, ei saa inimene oma intelligentsuse taset muuta	.32	**.79**
Intelligentsus on omadus, mida ei saa eriti muuta	.42	**.75**
Igale inimesele on antud kindel annus intelligentsust ning seda on praktiliselt võimatu muuta	.20	**.80**
Explained variance	2.88	2.69

NOTE: Factor loadings above .70 are highlighted in bold print.

Table 4A. *Intercorrelations between variables hypothesized to predict academic achievement in Mathematics*

	N	E	O	A	C	SE	S	M	P	CM	AP	AV	OG	IT	ET
Personality traits															
N		-.21	-.03	-.31	-.49	-.28	.06	-.15	.14	-.07	.11	.06	.19	.04	-.03
E	-.41		.07	-.07	.14	.12	-.05	.03	-.05	.05	-.13	.02	.04	.03	.04
O	-.06	.16		.22	.09	.18	.02	-.00	-.09	.15	-.19	-.00	-.06	-.06	-.05
A	-.40	.31	.18		.34	.01	.08	.15	-.20	-.01	-.15	-.08	-.15	.09	-.12
C	-.52	.29	.14	.43		.16	.08	.43	.02	-.02	-.09	-.02	.05	.23	-.16
Value x Expectancy model															
Self-efficacy (SE)	-.25	.12	.16	.14	.13		-.07	.38	.18	.10	.00	.06	-.07	.01	-.16
Scepticism (S)	.05	.03	-.10	-.13	-.03	-.24		-.07	.03	-.02	.26	.03	-.05	-.01	.16
Achievement goals															
Mastery (M)	-.19	.07	.02	.16	.35	.33	-.22		.18	.13	-.20	.10	.09	.04	-.01
Performance (P)	.07	.00	-.03	-.03	.08	.30	-.19	.27		-.05	.38	.64	.23	.08	.04
Class mastery (CM)	-.17	-.05	.10	.06	.10	.19	.09	.10	-.02		.02	.08	-.10	-.02	-.07
Class approach (AP)	.25	-.15	-.10	-.11	-.14	-.05	-.03	-.16	.28	-.35		.23	.30	.09	.05
Class avoid (AV)	.07	-.07	-.04	.08	.07	.12	-.06	.13	.53	-.10	.39		.19	.14	.05
Outcome goal (OG)	.11	-.05	-.04	-.10	-.08	.02	-.17	.07	.27	-.05	.29	.36		.11	.05
Implicit intelligence theories															
Incr. theory (IT)	.01	.16	.12	.11	.18	-.02	.14	.04	.04	.01	.07	.01	.11		-.60
Entity theory (ET)	.07	-.12	-.13	-.17	-.11	.03	.05	.05	.12	.10	.19	.23	.06	-.64	

NOTE: Results for boys (N=122) are presented above the diagonal with coefficients higher than .19 significant at p<.05 and coefficients higher than .23 significant at p<.01. Results for girls (N=155) are presented below the diagonal with coefficients higher than .16 significant at p<.05 and coefficients higher than .22 significant at p<.01.

Table 5A. *Intercorrelations between variables hypothesized to predict academic achievement in Estonian*

	N	E	O	A	C	SE	S	M	P	CM	AP	AV	OG	IT	ET
Personality traits															
N		-.21	-.03	-.31	-.49	-.25	.13	-.14	.18	-.07	.11	.06	.19	.04	-.03
E	-.41		.07	-.07	.14	.28	-.00	-.07	-.03	.05	-.13	.02	.04	.03	.04
O	-.06	.16		.22	.09	-.07	-.09	.14	-.04	.15	-.19	-.00	-.06	-.06	-.05
A	-.40	.31	.18		.34	-.02	-.08	.40	-.13	-.01	-.15	-.08	-.15	.09	-.12
C	-.52	.29	.14	.43		.22	.02	.32	.02	-.02	-.09	-.02	.05	.23	-.16
Expectancy-value model															
Self-efficacy (SE)	-.24	.22	.29	.15	.19		-.01	.14	.24	-.08	.09	.17	.20	.07	.10
Scepticism (S)	.08	-.17	-.14	-.14	-.03	-.19		-.12	-.05	-.19	.11	-.08	.06	-.00	.10
Achievement goals															
Mastery (M)	-.05	.10	.14	.17	.30	.42	-.39		.08	.21	-.15	.09	.13	.01	.19
Performance (P)	.22	-.02	.06	-.05	.05	.23	-.11	.34		.02	.36	.69	.27	.12	.10
Class mastery (CM)	-.17	-.05	.10	.06	.10	.13	.14	.02	-.22		.02	.08	-.10	.01	.10
Class approach (AP)	.25	-.15	-.10	-.11	-.14	-.09	-.01	-.07	.35	-.35		.23	.30	.07	.19
Class avoid (AV)	.07	-.07	-.04	.08	.07	.10	-.06	.22	.57	-.10	.39		.19	.01	.23
Outcome goal (OG)	.11	-.05	-.04	-.10	-.08	.06	-.07	.11	.28	-.05	.29	.36		.11	.06
Implicit intelligence theories															
Incr. theory (IT)	.01	.16	.12	.11	.18	.10	-.02	.17	.20	-.02	.09	.14	.11		-.60
Entity theory (ET)	.07	-.12	-.13	-.17	-.11	.00	.14	-.05	-.00	-.07	.05	.05	.05	-.64	

NOTE: Results for boys (N=122) are presented above the diagonal with coefficients higher than .19 significant at p<.05 and coefficients higher than .23 significant at p<.01. Results for girls (N=155) are presented below the diagonal with coefficients higher than .16 significant at p<.05 and coefficients higher than .22 significant at p<.01.

Table 6A. *Intercorrelations between variables hypothesized to predict academic achievement in Foreign language*

	N	E	O	A	C	SE	S	M	P	CM	AP	AV	OG	IT	ET
Personality traits															
N		-.21	-.03	-.31	-.49	-.30	-.08	-.06	.19	-.07	.11	.06	.19	.04	-.03
E	-.41		.07	-.07	.14	.12	-.08	-.05	-.06	.05	-.13	.02	.04	.03	.04
O	-.06	.16		.22	.09	.08	.05	.03	-.01	.15	-.19	-.00	-.06	-.06	-.05
A	-.40	.31	.18		.34	.11	.02	.17	-.14	-.01	-.15	-.08	-.15	.09	-.12
C	-.52	.29	.14	.43		.22	.00	.33	.04	-.02	-.09	-.02	.05	.23	-.16
Expectancy-value model															
Self-efficacy (SE)	-.13	.09	.21	.13	.12		-.05	.33	.20	.07	-.08	.02	.03	.05	.11
Scepticism (S)	-.08	-.03	-.14	-.19	-.01	-.30		-.12	-.12	.06	.04	-.01	-.10	.03	.17
Achievement goals															
Mastery (M)	.03	.07	.13	.16	.17	.41	-.21		.16	.08	-.20	-.03	.06	.07	-.05
Performance (P)	.09	.03	.03	.06	.08	.18	-.12	.18		.02	.26	.61	.19	.09	.11
Class mastery (CM)	-.17	-.05	.10	.06	.10	.07	.06	-.01	-.11		.02	.08	-.10	.01	.10
Class approach (AP)	.25	-.15	-.10	-.11	-.14	-.04	.02	-.06	.33	-.35		.23	.30	.07	.19
Class avoid (AV)	.07	-.07	-.04	.08	.07	.08	.03	.13	.52	-.10	.39		.19	.01	.23
Outcome goal (OG)	.11	-.05	-.04	-.10	-.08	.03	-.14	.10	.32	-.05	.29	.36		.11	.06
Implicit intelligence theories															
Incr. theory (IT)	.01	.16	.12	.11	.18	.04	-.11	.10	.18	-.02	.09	.14	.11		-.60
Entity theory (ET)	.07	-.12	-.13	-.17	-.11	-.07	.23	-.03	.02	-.07	.05	.05	.05	-.64	

NOTE: Results for boys (N=122) are presented above the diagonal with coefficients higher than .19 significant at p<.05 and coefficients higher than .23 significant at p<.01. Results for girls (N=155) are presented below the diagonal with coefficients higher than .16 significant at p<.05 and coefficients higher than .22 significant at p<.01.

Table 7A. *Intercorrelations between variables hypothesized to predict academic achievement in Science*

	N	E	O	A	C	SE	S	M	P	CM	AP	AV	OG	IT	ET
Personality traits															
N		-.21	-.03	-.31	-.49	-.20	.14	-.05	.18	-.07	.11	.06	.19	.04	03
E	-.41		.07	-.07	.14	.10	.05	.01	.04	.05	-.13	.02	.04	.03	04
O	-.06	.16		.22	.09	.25	.10	.07	-.06	.15	-.19	-.00	-.06	-.06	05
A	-.40	.31	.18		.34	.01	.05	.13	-.15	-.01	-.15	-.08	-.15	.09	12
C	-.52	.29	.14	.43		.09	.13	.21	.06	-.02	-.09	-.02	.05	.23	16
Expectancy-value model															
Self-efficacy (SE)	-.23	.18	.36	.28	.23		-.22	.41	.33	.11	-.10	.15	-.02	-.13	09
Scepticism (S)	.09	.02	-.12	-.07	.00	-.18		-.01	-.08	.03	.02	-.12	.06	.11	08
Achievement goals															
Mastery (M)	-.17	.06	.17	.28	.25	.34	-.36		.27	.09	-.19	.08	.07	-.03	06
Performance (P)	.09	.10	.11	.06	.07	.21	-.17	.31		.04	.27	.54	.17	.07	01
Class mastery (CM)	-.17	-.05	.10	.06	.10	.08	.04	.07	-.03		.02	.08	-.10	.01	10
Class approach (AP)	.25	-.15	-.10	-.11	-.14	-.07	.00	-.19	.25	-.35		.23	.30	.07	19
Class avoid (AV)	.07	-.07	-.04	.08	.07	.10	-.04	.19	.48	-.10	.39		.19	.01	23
Outcome goal (OG)	.11	-.05	-.04	-.10	-.08	-.04	-.08	.06	.22	-.05	.29	.36		.11	06
Implicit intelligence theories															
Incr . theory (IT)	.01	.16	.12	.11	.18	.13	.06	.11	.14	-.02	.09	.14	.11		69
Entity theory (ET)	.07	-.12	-.13	-.17	-.11	-.18	.08	-.08	-.03	-.07	.05	.05	.05	-.64	

NOTE: Results for boys (N=122) are presented above the diagonal with coefficients higher than .19 significant at p<.05 and coefficients higher than .23 significant at p<.01. Results for girls (N=155) are presented below the diagonal with coefficients higher than .16 significant at p<.05 and coefficients higher than .22 significant at p<.01.