Self-estimates of abilities are a better reflection of individuals' personality traits than of their abilities and are also strong predictors of professional interests

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Highlights

- Ability self-estimates (SEs) exhibit strong correlations with personality traits.
- Personality predicts SEs independently of measured abilities and grades.
- In most domains, personality explains more variance in SEs than abilities do.
- Interests are mostly a function of self-estimated and not true abilities.

Abstract

In several meta-analyses, self-estimates of abilities have been shown to correlate surprisingly low with individuals' real (i.e., psychometrically assessed) abilities. We recently confirmed this in a study where we investigated the accuracy of self- and peer-estimates of six central abilities (verbal, numerical, spatial intelligence, interpersonal and intrapersonal competence, creative/divergent thinking). Here, we describe two studies: In study 1, we first investigated, to which extent self-estimates of adolescents' central abilities can be predicted from three sources: relevant school grades, the pertinent psychometric ability itself, and personality (big five traits and narcissism). We found that self-estimates are a stronger reflection of the individuals' personality than their abilities per se. Second, we wanted to assess to what degree (professional) interests, which might guide career decisions in adolescents/young adults, are predicted by self-estimated and psychometrically assessed abilities. We found that professional interests are mostly a function of self-estimates and not of 'true' abilities, a finding that we replicated in study 2 with young adults. Given the strong associations between self-estimates and personality and past findings showing that abilities are better predictors of professional success than personality traits are, this might be non-optimal.

Keywords: Intelligence, Emotional Intelligence, Creativity, Self-estimates, Grades, Interests, Adolescents

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1. Introduction

1.1. The validity of self-estimates of abilities

Most people have experienced situations in which they had to assess their own abilities, skills or competencies. We constantly make such assessments. Some of these have minor consequences for our lives. However, when we ask ourselves questions like: "Do I have the necessary skills to be successful in this domain?", before deciding on a degree or career to pursue, our judgment might have severe impacts on our future. Several authors have pointed out that self-estimates shape important life choices (Ackerman & Wolman, 2007; Ehrlinger & Dunning, 2003). And although there is a vast number of objective measures of abilities, self-estimates are widely used in applied fields of psychology, such as career counseling (Freund & Kasten, 2012), also because they are more economical than psychometric tests (Herreen & Zajac, 2018). And the self-perspective might provide useful information that goes beyond objective test performance (Ackerman & Wolman, 2007; Freund & Kasten, 2012). Therefore, the accuracy of self-estimates is of theoretical and practical relevance.

Since the first studies on the accuracy of self-estimates that were conducted more than 100 years ago (for an overview see Ackerman & Wolman, 2007; Neubauer & Hofer, in press), a vast amount of research has accumulated, well documented in several meta-analyses. The first meta-analysis on this topic by Mabe and West (1982) investigated diverse abilities and reported small to medium associations between self-estimates and performance measures of abilities (r_{mean} = .29), but also that results varied strongly between studies (*SD* = .25). More recently, Freund and Kasten (2012) focused on the accuracy of self-assessed verbal, numerical, spatial, and overall intelligence. They reported a positive, albeit only moderate, association between self-estimates and psychometric measures (r_{mean} = .32, 95 % CI [.28, .37]), with an accuracy advantage for numerical intelligence. Finally, the meta-synthesis by

Zell and Krizan, which assembled results from 22 meta-analyses published between 1982 and 2012, confirmed the low to moderate relationship between self-estimates and objective measures (r_{mean} = .29), again with a wide variation between abilities (*r*s ranging from .09 to .63).

We recently investigated the accuracy of adolescents' self-estimates of six different abilities that can be considered relevant for professional success (Neubauer, Pribil, Wallner, & Hofer, 2018): verbal, numerical, and spatial intelligence, creativity, and intra- and interpersonal emotional management abilities [with the latter two being conceptually similar to emotional intelligence and referring to the ability to manage/regulate one's own (intrapersonal) and other's (interpersonal) emotions; see Freudenthaler & Neubauer, 2005]. Most correlations between self-estimated and measured abilities were at best medium-sized, with higher correlations for numerical and interpersonal abilities and quite low correlations for verbal and spatial abilities (particularly in young adolescents). Interestingly, for verbal intelligence, estimates obtained from the participants' classmates surpassed self-estimates in accuracy.

The repeatedly reported low (to medium) associations between self-estimated and objectively measured abilities stimulates the question, what sources individuals rely on when they judge their own abilities.

1.2. Self-estimates of abilities, personality, and grades

One possible source of individual variations in ability self-estimates might be personality (see e.g., Furnham, Kidwai, & Thomas, 2001). Two recent studies have shown that self-estimates of several intelligence factors correlate higher with personality traits than with psychometric ability measures. In Herreen and Zajac (2018), general intelligence (*G)*, fluid intelligence (*Gf*), and visual-processing ability (*Gv*) showed the typically low correlations of .2–.3 with self-estimates, whereas some of the Big Five traits correlated up to .53 with self-estimates. From regression analyses the authors concluded "…that self-estimated

Gf and *Gv* more strongly reflect one's personality than their actual cognitive performance ability" (Herreen & Zajac, 2018, p. 12). Generally, extraversion and openness were associated with over-estimation and neuroticism with under-estimation of one's own abilities (see also Williams, Rau, Suchy, Thorgusen, & Smith, 2017).

The notion that self-estimates are more representative of personality than of ability per se was already raised by Ackerman and Wolman (2007), based on the considerable associations they found between self-estimates of ability and variables pertaining to self-concept/self-esteem. In school, self-concept variables have often been assessed to ascertain how much trust pupils have in their subject-specific abilities. Self-concept is usually highly correlated with grades in the pertinent subject (e.g., Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). In a pilot study, we found correlations of .69 and .70 for verbal self-concept * language grades and numerical self-concept * math grades, respectively (Baumgartner, 2019). We also observed high to extremely high correlations of verbal/numerical self-estimates with language/math self-concept (.66 and .80, respectively), suggesting that for the latter self-estimates and self-concept seem practically redundant. Taken together, this suggests that self-estimates likely also display considerable correlations with grades.

The outline above raises two relevant questions that – to our knowledge – have hitherto not been studied: Are self-estimates in relevant abilities rather a function of pertinent grades in school or of the relevant ability? And can personality traits add further incremental variance to the prediction of self-estimates over and above grades/psychometric abilities? The first main aim of the present work is to provide answers to these questions.

1.3. Self-estimates, measured abilities, and interests

All the findings reported so far suggest that psychometric abilities and self-estimates are not the same. Indeed, some authors argue that self-estimates might also provide information that is additionally useful to the one obtained with performance measures (Ackerman & Wolman, 2007; Freund & Kasten, 2012). Especially for adolescents and undergraduates, self-

estimates of abilities might also be an important source driving their (professional) interests that in turn might influence choices of university majors and, finally, career choices. We also know from a recent meta-analysis that correlations between (cognitive) abilities and professional interests (based on the RIASEC model) are mostly rather low (rho=|.02| to |.35|; see Pässler, Beinicke, & Hell, 2015). The two exceptions to these figures are numeric and spatial ability, which correlate at rho=.47 with Realistic interests in adults over 19 years.

This empirical fact fuels the following questions: What drives professional interests: psychometric abilities per se or individuals' perceptions of them? And are both sources – when considered conjointly – related to professional interests? The answer seems to be of high practical importance, because inaccurate self-estimates might drive an individual's professional interest in a direction that might not be a good choice, considering the individual's specific ability profile. The relevance of this question is underlined by the finding that cognitive abilities (i.e., intelligence) correlate considerably higher with professional success (according to several meta-analyses around .5 to .6; Schmidt & Hunter, 1998, 2004; Hülsheger & Maier, 2008; Strenze, 2007) than professional interests do (between .2 and .35; Van Iddekinge et al., 2011; Nye et al., 2012). The same is true for personality traits, which also usually correlate between .1 and .3 with professional success according to meta-analyses (Judge et al., 1999; Barrick, Mount & Judge, 2001).

1.4. The current research

This research investigated determinants of ability self-estimates and the validity of these self-estimates as predictors of interests in two studies. Unlike many studies on the self-estimate*ability relationship, we did not only focus on classical cognitive intelligence factors (verbal, numerical, and spatial intelligence) but also tested three other performance domains that can be considered relevant for the choice of future majors and vocational decisions: creativity and, inter- and intrapersonal emotional management abilities (EMA).

In study 1, we aimed to answer the following research questions (RQs) in adolescents around 17 years of age, who are close to major career/educational decisions:

RQ 1: What predicts self-estimates of abilities in the school context: Grades, abilities, or traits?

To answer RQ 1, we investigated the unique contributions of grades and measured abilities when predicting verbal and numerical self-estimates. In the other domains, grades were not included as there are no directly corresponding school subjects for these abilities. We then analyzed whether and which personality traits add further incremental variance to the prediction of self-estimates over and above psychometric abilities (and grades). Here, we chose to include the Big Five personality traits and narcissism, with the latter having repeatedly been associated with overly positive self-views (e.g., Grijalva & Zhang, 2016).

RQ 2: How well can interests be predicted by self-estimated and measured abilities? Can measured abilities predict interests over and above self-estimated abilities?

We investigated RQ 2 by entering first self-estimates and then measured abilities into hierarchical regression analyses predicting interests in domains that are based on an extension of Holland's RIASEC model (1959; Murko, 2016).

In study 2, we aimed to replicate findings on RQ 2 in a sample of young adults (university students) and with more well-established measures of intelligence, personality, and interests.

2. Study 1

2.1. Method

2.1.1. Participants

329 individuals from nine different higher secondary schools were tested. However, due to data loss and missing data only data from 319 pupils were available for analyses. 136 of them were pupils of one of four general higher secondary schools (89 female), 114 went to one of two schools with a business/tourism focus (108 female), and 69 went to one of three

schools with a technical focus (4 female). They were between 15 and 21 years old (M = 16.77, SD = 1.24). Participants were offered to receive ipsative feedback on their performance in the ability tests.

2.1.1. Measures

2.1.1.1. Verbal, numerical, and spatial intelligence

Verbal, numerical, and spatial intelligence were measured via three tests that had specifically been developed to assess intelligence in adolescents and that had shown satisfactory reliabilities and validities in past studies (spatial: Edelsbrunner, 2012; verbal: Kasnik, 2012; numerical: Konrad, 2012). The test for verbal intelligence was *similarities* (time limit: 6 minutes), numerical intelligence was assessed via *number series* (time limit: 11 minutes), and *assembling figures* (time limit: 7 minutes) was used to measure spatial intelligence. Each test contained 20 items and the number of correct items per test was used to represent verbal, numerical, and spatial intelligence. Internal consistency was quite low for verbal intelligence (α = .58) and satisfactory to good for spatial (α = .75) and numerical intelligence (α = .88).

2.1.1.2. Creativity

Creativity – operationalized as creative potential – was assessed with a paper-pencil version of the Alternative Uses Task (Benedek, Mühlmann, Jauk, & Neubauer, 2013; Guilford, 1967). Participants were asked to come up with creative, unconventional, and original ideas for the objects umbrella, plastic bottle, and shoe within two minutes per object. Additionally, participants were asked to highlight their three most creative ideas per object. Originality was then calculated using the subjective top-scoring method (Benedek et al., 2013). For this, the top-3 ideas marked by participants were rated on a scale ranging from 0 (not creative) to 3 (very creative) by two independent raters. Mean originality over both ratings per person and over all objects was then computed and used for all analyses. Interrater reliabilities were high ($\kappa_{umbrella}$ = .82, κ_{bottle} = .82, κ_{shoe} = .83).

2.1.1.3. Emotional management abilities

Intra- and interpersonal emotional management abilities (EMA) were each measured with the respective subscale of the adolescent form of the typical-performance emotional management test (TEK-J 2.0; Riedrich, 2012; Freudenthaler, Neubauer, & Becker, 2006). The 13-item intrapersonal EMA subscale assesses a person's ability to manage their own emotions; the 17-item interpersonal EMA subscale assesses the ability to manage the emotions of others. Each item consists of a description of an emotional situation and four different response alternatives, which had been rated based on their adequacy by experts in the field of emotions during scale construction. Responses were recoded according to their adequacy, which ranged from 1 (least adequate handling of the situation) and 4 (most adequate handling). Due to the heterogeneity inherent to situational judgment tests like this (e.g., Libbrecht & Lievens, 2012; McDaniel, Hartman, Whetzel, & Grubb, 2007), we report omega total – a model-based reliability estimate that represents the total reliable variance of a test (see Revelle & Condon, 2019) – as a measure of internal consistency. It was quite low for intrapersonal EMA ($\omega_t = .51$), higher for interpersonal EMA ($\omega_t = .74$) and generally within the range that can be expected for situational judgment tests (McDaniel et al., 2007). Mean response adequacy over all items per subscale was used in all relevant analyses.

2.1.1.4. Self-estimated abilities

Self-estimates for the six performance domains were measured with a questionnaire containing 9-10 items per domain (Neubauer et al., 2018). Items referred to different aspects of each ability (example item for verbal intelligence: "It is easy for me to find a synonym for a word."). Participants responded on a Likert-like scale ranging from 1 (strongly disagree) to 5 (strongly agree). Internal consistencies were satisfactory to good ($\alpha_{verbal} = .88$; $\alpha_{numerical} = .95$; $\alpha_{spatial} = .87$; $\alpha_{creativity} = .83$; $\alpha_{intra} = .7$; $\alpha_{inter} = .81$). Scale means were used for analyses.

2.1.1.5. Interests, Big Five, and narcissism

Interests and Big Five personality traits were measured with the respective scales of the short version of the aptitude-based vocational interest test for adolescents (BeBIT-M; Murko, 2016; Neubauer, 2018). Openness (α = .48), conscientiousness (α = .82), extraversion (α = .76), agreeableness (α = .71), and emotional stability (α = .64) were assessed with four items per domain. The interest scale includes nine interest domains, with six of them being similar to the RIASEC interests [assembly/crafts (α = .88) ~ Realistic; science (α = .89) ~ Investigative; art/culture (α = .79) ~ Artistic; commercial (α = .83) ~ Enterprising; office (α = .77) ~ Conventional] and three comprising novel interests [IT/tech (α = .91), law/security (α = .82), and tourism/service (α = .73)], each of them being measured with four items. Both the interest and the Big Five scales had response alternatives ranging from 1 (not at all) to 5 (very).

Narcissism was assessed with the 16-item Narcissistic Personality Inventory (Ames, Rose, & Anderson, 2006; German version: Schütz, Marcus, & Sellin, 2004), which uses dichotomous items (0 = low narcissism response, 1 = high narcissism response). The sum of all responses was used as narcissism score. Internal consistency was adequate (α = .71).

2.1.1.6. Grades

Participants reported the grades they received in German, English, and mathematics in their latest annual report. Grades in German and English correlated at .57 and were averaged to obtain a mean language grade. In the Austrian system, grades range from 1 to 5 with lower numbers indicating better performance.

2.1.2. Procedure

Data collection was a two-step process: an online survey and a performance testing session. One week before the performance testing session, participants received a link to the online survey, which contained the BeBIT-M and the questionnaire on self-estimated abilities and took about 15 minutes to complete. Performance testing sessions lasted for around 100

minutes and took place in schools. At the beginning, participants received a written instruction and provided their informed consent. They then provided ability estimates for two of their peers, data which was collected for another project. Afterwards, participants completed a demographic questionnaire, before the actual performance testing started. The timed verbal, numerical, and spatial intelligence scales, as well as the AUT, were then completed. Finally, participants could respond to the TEK-J 2.0 and the NPI-16 at their own pace. The study protocol was approved by the local ethics committee and the school council.

2.2. Results

Descriptive statistics and intercorrelations of all main variables of both studies can be found on the Open Science Framework (https://osf.io/2h7us/). For both research questions, we computed Pearson correlations between all relevant variables and then conducted hierarchical linear regression analyses. Assumptions of multiple linear regressions were tested and – in most cases – met. Some analyses indicated problems with non-normality of errors, heteroscedasticity, and outliers. Therefore, we used bootstrapping with 2000 iterations for regressions and – due to the non-normality of some variables – also correlations. Confidence intervals were calculated using the percentile method and confidence intervals for R^2 and ΔR^2 were adjusted based on the corrections proposed by Algina, Keselman, and Penfield (2008). All interpretations regarding significance of single predictors are based on the bootstrapping confidence intervals of their beta weights. We used R (R Core Team, 2019) with the psych package (Revelle, 2019) for scale analyses, the wboot package (Weiss, 2016) for bootstrapping of correlations, and the apaTables package (Stanley, 2018) for bootstrapping in hierarchical regressions.

2.2.1. Research question 1: Predictors of self-estimates of abilities

2.2.1.1. Correlative findings

Numerical self-estimates correlated with at -.458 (bootstrapped 95% CI [-.537, -.374]) with the mathematics grade and verbal self-estimates correlated at -.455 with the mean language grade (bootstrapped 95% CI [-.539, -.368]). Correlations between self-estimates of abilities, corresponding measured abilities, and personality traits can be found in Table 1. All correlations between self-estimates and corresponding abilities were significant, with the majority constituting only small to medium effects. Self-estimates in each domain correlated with between four and all six personality traits. All correlations but the one between self-estimated interpersonal EMA and narcissism were positive and most were small to medium, with the exception of high correlations between openness and self-estimated creativity (and tendentially also verbal ability) and of agreeableness and extraversion with self-estimated interpersonal EMA.

Insert Table 1 about here

2.2.1.1. Multiple Regressions

For RQ 1, we conducted six hierarchical regression analyses (one per domain) with self-estimates as outcome. First, we entered gender and school type as control variables. We then entered relevant measured abilities (and – in the case of verbal and numerical self-estimates – grades). In the third step, all personality traits showing significant zero-order correlations with the respective self-estimate were added to the model. Results can be seen in Table 2. The control variables gender and school type accounted for a significant amount of variance in self-estimates of numerical, spatial, and interpersonal abilities, as well as in self-estimates of creativity. For self-estimated verbal and numerical abilities, adding the relevant grade and objectively measured ability accounted for more than 20 percent of additional variance and both predictors provided independent contributions. For self-estimates in other domains,

adding the relevant objectively measured ability resulted in significant increases in explained variance of between 2.5 and 14.3 percent. The addition of personality traits to the final model also accounted for significant amounts of incrementally explained variance of between 8.5 and 37.3 percent.

Considering the final models, higher self-estimates of verbal abilities are predicted by better grades in German/English, higher openness, and higher narcissism. Higher self-estimated numerical abilities are associated with being male, attending a general high school (vs. a touristic one), having higher numerical abilities, having better grades in math, and being higher in conscientiousness and emotional stability. Being male, having higher spatial abilities and being more conscientious and extraverted predict higher self-estimated spatial abilities. Higher openness, agreeableness, and narcissism are associated with higher self-estimated creativity. Higher self-estimated intrapersonal abilities are predicted by higher measured ability in this domain, extraversion, agreeableness, emotional stability, and narcissism. Finally, self-estimated interpersonal abilities are positively associated with the measured ability in this domain, extraversion, and agreeableness.

Insert Table 2 about here

2.2.1. Research question 2: Predictors of interests

2.2.1.1. Correlative findings

Correlations of interests with measured and self-estimated abilities are displayed in Table 3. Interests for all domains show significant and partially medium to high correlations with self-estimates (up to .5). Conversely, measured abilities display mostly only low and few significant relationships with interests.

Insert Table 3 about here

2.2.1.2. Multiple Regressions

For RQ 2, hierarchical regressions with interests as outcome were conducted. After control variables, we entered all self-estimates (step 2) and measured abilities (step 3) that showed significant zero order correlations with the given interest domain. No third step was added for interest domains that did not show any significant correlations with measured abilities. Results are shown in Table 4. The control variables gender and (dummy-coded) school type were entered in the first step and accounted for a significant amount of variance in interests of all domains. In the second step, self-estimated abilities accounted for variance in interests over and above control variables in all domains, with increases in explained variance ranging from 2.5 to 29 percent. Adding measured abilities in the third step only accounted for additionally explained variance for interests in the domain office (1.9%).

Insert Table 4 about here

In the final model, interests in assembly/crafts were predicted by being male, attending a technically oriented school, and having higher self-estimated numerical and spatial as well as higher measured spatial intelligence. Scientific interests were associated with being male and higher self-estimated verbal and numerical abilities. Being more interested in art/culture was predicted by being female, having lower self-estimated numerical intelligence and higher self-estimated as well as measured creativity. Higher interests in the health/social domain were predicted by being female, attending a general rather than a technical school, and having higher self-estimated interpersonal abilities. Attending a non-general school and having higher self-estimated numerical intelligence predicted higher commercial interests. Interest in the domain office are predicted by attendance to a non-general school, higher self-estimated interpersonal abilities and lower measured verbal intelligence. Higher IT/tech interests are

predicted by gender (male > female), school type (technical > general), and higher self-estimated numerical and spatial abilities. For interests in the domain tourism/service no predictor reached significance. Interests in law/security can be predicted from higher self-estimated verbal intelligence.

2.3. Brief discussion

Regarding research question 1, we found that there were considerable correlations between both grades and personality traits and ability self-estimates. Corresponding measured abilities showed only small to medium correlations with self-estimates – with the exception of self-estimates in the numerical and the interpersonal domain. Moreover, personality traits could contribute to the explanation of variance in ability self-estimates over and above pertinent performance measures and – in the case of verbal and numerical abilities – grades. For research question 2, we found that most interests correlated higher with self-estimated than with measured abilities. Hierarchical regressions also showed that measured abilities contribute only little (0.4 to 1.9% variance) to the explanation of interests over and above control variables and self-estimated abilities (only in three out of nine models an objectively measured ability made a unique contribution).

3. Study 2

In study 2 we aimed to replicate the results of study 1 in an adult sample and using the well-known RIASEC model (Holland, 1959). For this, we analyzed data from a project that focused on the accuracy of self-estimates in different fields of study (Hofer & Neubauer, 2020).

3.1. Method

3.1.1. Participants

Two-hundred university students between 18 and 34 years (M = 23.03, SD = 3.49) participated in study 2. One non-native speaker was excluded because of lack of language proficiency. 102 of the remaining participants studied a technical-mathematical subject (51

women) and 97 a linguistic subject (49 women). All participants received a small compensation (€ 17.50) and could again request ipsative feedback on their performance in the ability tests.

3.1.2. Measures

3.1.2.1. Verbal, numerical, and spatial intelligence

Verbal, numerical, and spatial intelligence were each assessed with one subscale – comprising 20 items – of the *Intelligenz-Struktur-Test 2000-R* (I-S-T 2000 R; Liepmann, Beauducel, Brocke, & Amthauer, 2007). All subscales – that is, similarities for verbal intelligence (time limit: 9 minutes), number series for numerical intelligence (time limit: 10 minutes), and figure selection for spatial intelligence (time limit: 7 minutes) – were presented and instructed as proposed by the test authors. Reliability of sum scores was relatively low for verbal intelligence ($\alpha = .52$) and acceptable to good for spatial ($\alpha = .77$) and numerical intelligence ($\alpha = .91$).

3.1.2.2. Creativity

Creativity was again operationalized as creative potential measured via the Alternative Uses Task (Benedek et al., 2013; Guilford, 1967). In this study, we used a computerized version of the test (Jud, 2018). Participants had 2.5 min each to come up with 'original, clever, unconventional, interesting or funny' uses of the same everyday objects used in study 1 (i.e., umbrella, plastic bottle, and shoe). We assessed originality of ideas by letting five independent raters judge the creativity of each idea on a scale from 0 (not creative) to 3 (very creative). To minimize the influence of fluency on originality scores, a max-three originality score was computed for each object by calculating the mean originality of the three most highly rated ideas per object and participant (see e.g., Smeekens & Kane, 2016). Inter-rater reliabilities were good for all three objects ($\alpha_{umbrella} = .85$; $\alpha_{bottle} = .84$; $\alpha_{shoe} = .84$). Mean max-three originality over all three objects was used as primary measure of creativity.

3.1.2.3. Emotional management abilities

Intra- and interpersonal emotional management abilities (EMA) were measured with the respective subscales of the typical-performance emotional management test (TEMT; Freudenthaler & Neubauer, 2005). 18 items measured intrapersonal EMA and 24 items interpersonal EMA (see study 1 for a more detailed description of the item format and scoring). Internal consistency was again rather low (intra: $\omega_t = .63$; inter: $\omega_t = .61$) but within the range that can be expected for situational judgment tests (see also study 1).

3.1.2.4. Self-estimated abilities

Self-estimated verbal, numerical, and spatial intelligence, creativity, and intra- and interpersonal abilities were measured with a slightly adapted version of the questionnaire (Neubauer et al., 2018) used in study 1 (items that had referred to school-specific situations, were adapted for an adult sample). In addition, items with low item-total correlations in previous studies (Neubauer et al., 2018) were eliminated or replaced. The resulting subscales had nine to ten items each and the subscale means had acceptable to good internal consistencies ($\alpha_{verbal} = .86$; $\alpha_{numerical} = .95$; $\alpha_{spatial} = .87$; $\alpha_{creativity} = .83$; $\alpha_{intra} = .69$; $\alpha_{inter} = .8$).

3.1.2.5. Interests

Interests were measured with the Allgemeine Interessen-Struktur-Test (AIST-R; Bergmann & Eder, 2005), which assesses educational and vocational interests based on the RIASEC model (Holland, 1959). The test comprises six different interest dimensions (10 items each): Realistic (R, practical-technical), Investigative (I, intellectual-investigative), Artistic (A, artistic-linguistic), Social (S), Enterprising (E, entrepreneurial), and Conventional (C, organizational-administrative). Responses are made on a Likert-like scale ranging from 1 (not interesting to me at all) to 5 (very interesting to me). Reliabilities of scale means were good ($\alpha_R = .87$; $\alpha_I = .81$; $\alpha_A = .88$; $\alpha_S = .87$; $\alpha_E = .9$; $\alpha_C = .88$).

3.1.3. Procedure

Participants were tested in groups of up to six people in a computer-testing room (total test time 90 mins.). They received a written instruction and provided their written informed consent. Then, they completed the subscales of the paper-pencil I-S-T 2000 R. After a 3-min break, participants completed the computerized AUT. All other tests, that is the TEMT, the scales for ability self-estimates, two scales that are not relevant for the present work [an unpublished scale for self-worth contingencies and the German Rosenberg's self-esteem scale (von Collani & Herzberg, 2003)], and the AIST-R were presented via an online-survey tool. The study had been approved by the local ethics committee.

3.2. Results

Our analysis strategy mirrored the one used for research question 2 in study 1. Here, gender and study type (linguistic vs. technical/mathematical) were included as control variables.

3.2.1. Correlative findings

As can be seen in Table 5, all RIASEC interests showed some significant correlations with both self-estimated and measured abilities, apart from Conventional interests, which only correlated with self-estimated abilities. Verbal intelligence showed no significant correlations with interests for any domain. Correlations between measured abilities and interests were low to medium in size, while self-estimates partially showed large to very large correlations with interests. Most notable are the correlations of self-estimated verbal intelligence and creativity with Artistic interests. Self-estimated numerical and spatial intelligence also displayed medium-to-high correlations with Realistic (and Investigative) interests. A similarly high relationship emerged for self-estimates of interpersonal ability and Social interests.

Insert Table 5 about here

3.2.1. Multiple regressions

As can be seen in Table 6, the control variables gender and study type accounted for a significant amount of variance in Realistic, Investigative, and Artistic interests, but not in Social, Enterprising, and Conventional interests. Adding ability self-estimates in the second step leads to a significant – and partially quite substantial – increase of explained variance (10 to 30%) in all interests. When measured abilities were added in the third step, this again resulted in only slight (and partially negligible) increases of explained variance (0.2 to 5%), which only reached significance for Investigative interests.

Looking at the final models in step 3 (step 2 for Conventional), higher Realistic interests are associated with being male, studying a technical/mathematical subject, and having higher self-estimates of spatial intelligence and lower self-estimates of interpersonal EMA. Higher Investigative interests can be predicted by studying a technical/mathematical subject, having higher self-estimated numerical and measured interpersonal abilities. Spatial intelligence was also a significant predictor of Investigative interests, albeit with a coefficient of the opposite direction of its zero-order correlation, suggesting a potential suppression effect. Being female, studying a linguistic subject and having higher self-estimated verbal intelligence and creativity are associated with higher Artistic interests. Only self-estimated interpersonal EMA can significantly (and positively) predict Social interests. Having higher enterprising interests is associated with being male and having higher self-estimated verbal and measured intrapersonal abilities. Finally, Conventional interests can be predicted by self-estimated verbal and numerical abilities.

Insert Table 6 about here

3.3. Brief discussion

Study 2 confirmed the strong associations between self-estimated abilities and interests. Self-estimates accounted for a significant amount of variance in all six interest domains (between 15 and 58%, including also gender and study type). Realistic and especially Artistic interests can be explained very well, whereas Conventional showed the lowest degree of explanation. Only for Investigative interests could measured abilities explain variance over and above self-estimates. When self-estimated and measured abilities were entered into the same model, out of all performance variables only intrapersonal EMA (for Enterprising) and interpersonal EMA (for Investigative) could account for unique variance. In contrast, most self-estimates remained significant predictors even when measured abilities were added.

4. General discussion

In this paper we wanted to study two research questions, with the first one focusing on predictors of self-estimates in the school context and the second one pertaining to the validity of self-estimates as compared to measured abilities in predicting interests.

4.1. RQ 1: Predicting ability self-estimates from measured ability, grades, and personality

The low associations between self-estimates and abilities when compared to those with grades and personality traits were remarkable: Self-estimates showed mostly small correlations with corresponding abilities (between .19 and .25) with only two exceptions being .42 for numerical and .50 for interpersonal abilities. This largely confirms our earlier findings (Neubauer et al., 2018). In contrast, – apart from numerical and interpersonal abilities – self-estimates show (partially much) larger correlations with some personality traits: The strongest correlates are openness for verbal (.50) and creativity (.61) self-estimates, conscientiousness for numerical and spatial self-estimates (both .32), emotional stability for intrapersonal self-estimates (.40), and agreeableness for interpersonal self-estimates (.64). Correlations between self-estimates and respective grades – which were only available for the

verbal und numerical domain – were at around .46 and, thus, also surpassed correlations with abilities, particularly for the verbal domain.

These findings were substantiated in a multiple regression where the variance in self-estimates that could be explained by measured abilities (and – for verbal and numerical self-estimates – grades) in addition to control variables was at best medium. It mostly lay under 6% (spatial, creativity, and interpersonal self-estimates), with higher values for interpersonal (14%), and especially verbal (22%) and numerical (25%) self-estimates. In turn, with the exception of these two latter abilities, adding personality traits in step 3 added 9 to 37% of explained variance and resulted in total predictions between 28% (intrapersonal) and 53% (interpersonal). In four out of six abilities – again with verbal and numerical abilities being the exceptions – the additional amount of variance in self-estimates explained by the Big Five and narcissism surpassed the one accounted for by measured abilities (and grades). These findings can generally be considered in line with the aforementioned studies by Herreen and Zajac (2018) and Williams and colleagues (2017), thereby again indicating that personality might be a similarly strong or even stronger predictor of self-estimates than abilities.

4.2. RQ 2: Predicting interests from self-estimated and measured abilities

We investigated research question 2 in two samples: In study 1, we tested adolescents using a test for professional interests that was adopted for this particular age group. In study 2, university students were tested based on the most-widely known model of professional interests (RIASEC). The similarity of findings suggests that our replication was successful and our findings are quite robust. In both studies, self-estimates show more and mostly higher correlations with interests than abilities do. In hierarchical regressions, adding self-estimates after control variables resulted in significant incrementally explained variance in interests (between 3 and 29% in study 1 and between 10 and 30% in study 2) for all interest domains. Moreover, between studies, results for those interest areas that are directly comparable between the two interest measures are quite similar, with the overall explained variance after

adding self-estimates in Study 1 vs. 2 being as follows: assembly/craft vs. Realistic 47 vs. 44%; scientific vs. Investigative 26 vs. 29%; art/culture vs. Artistic 35 vs. 58%; health/social vs. Social 27 vs. 22%; commercial vs. Enterprising 16 vs. 25%; office vs. Conventional 6 vs. 15%. It can be seen that craft/Realistic, scientific/Investigative, and art/culture/Artistic interests can generally be explained in larger parts by self-estimated abilities. However, particularly office/Conventional interests can only be predicted weakly from self-estimates of abilities. The prediction of interests in tourism and law/security interests in study 1 was even weaker.

Most remarkable, however, is the – across both studies well-replicating – finding that tested abilities seem to have rather small relationships with professional interests. Added in step 3 after control variables and self-estimated abilities, the performance, as measured by psychometric ability tests, provides only (very) small increments in the explanation of professional interests (between 0.4% and 1.9% in study 1 and between 0.2% and 5% in study 2). Although causality cannot be inferred from our cross-sectional data, a tentative conclusion could be that the professional interests a person develops seem to be much less driven by their abilities per se than by their perception of these abilities. And how people perceive their abilities is – as shown in study 1 – a function of their school grades (in verbal and numerical areas) and foremost of their personality (Big 5 and Narcissism), but in most domains only to a weak extent of their ‘true abilities’.

4.3. Implications and limitations

From these findings we would infer the following problem: Adolescents and young adults might base their vocational decisions mostly on their perception of their abilities (which themselves seem to be mostly personality-dependent) and only to a small extent on their true abilities. These self-perceptions, in turn, do not seem to be very accurate, as can be seen in our findings reported here and before (Neubauer et al., 2018), as well as in recent meta-analyses (Freund & Kasten, 2012; Zell & Krizan, 2014). This raises the question,

whether potential misestimations of one's own abilities might induce non-optimal or even wrong vocational choices, an issue that should be a studied in future research.

This study comes with some limitations. The largest restriction of study 1 is probably the use of non-published (but nevertheless psychometrically sound and valid) measures for abilities, personality traits, and interests. We used these tests because they were specifically developed for adolescents and due to a lack of availability of published tests focusing on this age group (in German language). However, all tests that were applied had been shown to be psychometrically sound in earlier studies and showed mostly satisfying reliabilities in this work. A second restriction (of study 1) is that – despite the large sample – we could not compute multi-level analyses, which would have considered the nested structure of the sample. Since these analyses would have required a larger number of classes (and schools) to be adequately powered, they were beyond the scope of this study. In hierarchical regressions, we instead controlled for school type, which accounted for a considerable amount of variance in some analyses. Additionally, the successful replication of results on research question 2 in our second study, which used well-established psychometric measures and contained no nested structure, speaks for the robustness of our results.

4.4. Conclusion

Summarizing, this work showed that self-estimates of abilities are less a function of the ability level per se than of personality. Moreover, our two studies suggest that adolescents' and young adults' professional interests rather reflect their self-perceptions of abilities (and therefore their personality) than their 'true abilities'. This could be a problem insofar as abilities usually are better predictors of individuals' professional success than personality traits.

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Tables

Table 1

Correlations between Self-Estimated Abilities, Personality, and Corresponding Measured Abilities (Study 1)

	SE Verbal	SE Numerical	SE Spatial	SE Creativity	SE Intrapersonal	SE Interpersonal
Openness	.499**	.135*	.173*	.611**	.225**	.324**
	[.397, .595]	[.019, .242]	[.047, .292]	[.531, .682]	[.100, .345]	[.209, .437]
Conscientiousness	.138*	.321**	.324**	.134*	.196**	.183**
	[.013, .253]	[.214, .426]	[.218, .419]	[.024, .246]	[.079, .303]	[.074, .288]
Extraversion	.179*	.026	.149*	.312**	.314**	.501**
	[.051, .301]	[-.088, .132]	[.035, .248]	[.188, .427]	[.188, .434]	[.415, .587]
Agreeableness	.041	-.011	.124*	.274**	.354**	.642**
	[-.078, .166]	[-.126, .106]	[.004, .240]	[.156, .382]	[.247, .461]	[.565, .711]
Emotional Stability	.129*	.256**	.287**	.119	.403**	.239**
	[.001, .247]	[.152, .360]	[.164, .404]	[-.003, .229]	[.290, .502]	[.132, .344]
Narcissism	.277**	.257**	.253**	.302**	.133*	-.132*
	[.181, .372]	[.155, .354]	[.136, .364]	[.204, .395]	[.022, .229]	[-.246, -.022]
Measured Ability	.223**	.415**	.214**	.188**	.248**	.504**
	[.125, .320]	[.325, .503]	[.103, .320]	[.086, .291]	[.148, .341]	[.398, .600]

Note. 95% CIs are based on bootstrapping with 2000 samples (percentile method). Measured ability reflects the objective performance in the corresponding domain.

** indicates $p < .001$, * indicates $p < .05$

Table 2

Hierarchical Multiple Regressions Predicting Self-Estimated Abilities from Pertinent Measured Abilities and Grades, and Personality Traits (Study 1)

	SE Verbal			SE Numerical			SE Spatial		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.004 [.00,.04]			.157** [.10,.24]			.104** [.05,.19]	
Gender	-.02 [-.17, .12]			-.26** [-.39, -.13]			-.29** [-.43, -.16]		
School (General vs. Touristic)	-.06 [-.19, .07]			-.18** [-.29, -.07]			-.14* [-.25, -.03]		
School (General vs. Technical)	-.04 [-.17, .11]			.02 [-.11, .14]			-.12 [-.25, .02]		
Step 2		.227** [.16,.32]	.223** [.15, .31]		.402** [.32,.49]	.245** [.18, .32]		.129** [.07,.22]	.025** [.00, .06]
Gender	-.09 [-.23, .04]			-.17** [-.28, -.05]			-.26** [-.38, -.13]		
School (General vs. Touristic)	.05 [-.07, .18]			-.19** [-.28, -.10]			-.13* [-.25, -.03]		
School (General vs. Technical)	-.02 [-.14, .11]			.05 [-.05, .17]			-.10 [-.24, .04]		
Measured Ability	.13* [.02, .23]			.18** [.08, .27]			.16** [.05, .27]		
Grade	-.44** [-.54, -.35]			-.42** [-.50, -.34]					
Step 3		.395** [.32,.51]	.168** [.10, .25]		.487** [.42,.57]	.085** [.04, .15]		.303** [.24,.41]	.173** [.11, .27]
Gender	-.04 [-.16, .09]			-.17** [-.30, -.04]			-.32** [-.45, -.19]		
School (General vs. Touristic)	.02 [-.09, .13]			-.14** [-.23, -.04]			-.06 [-.17, .04]		
School (General vs. Technical)	.04 [-.06, .15]			.08 [-.03, .20]			-.07 [-.19, .07]		
Measured Ability	.06 [-.03, .15]			.17** [.08, .25]			.14** [.05, .23]		
Grade	-.34** [-.43, -.24]			-.37** [-.46, -.28]					
Openness	.36** [.25, .47]			.07 [-.03, .16]			.04 [-.08, .15]		
Conscientious-ness	-.01 [-.13, .11]			.19** [.10, .28]			.30** [.19, .40]		
Extraversion	.03 [-.08, .13]						.13* [.01, .26]		
Agreeableness							.04 [-.09, .19]		
Emotional Stability	.01 [-.09, .11]			.11* [.02, .20]			.06 [-.06, .18]		
Narcissism	.16** [.06, .25]			.10* [-.01, .20]			.10 [-.01, .22]		

	SE Creativity			SE Intrapersonal			SE Interpersonal		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.029* [.01,.08]			.009 [.00,.05]			.158** [.10,.24]	
Gender	.05 [-.10, .19]			.02 [-.11, .15]			.29** [.16, .44]		
School (General vs. Touristic)	-.05 [-.17, .07]			-.07 [-.19, .05]			-.02 [-.14, .09]		
School (General vs. Technical)	-.15* [-.30, -.01]			-.09 [-.21, .04]			-.15* [-.29, -.01]		
Step 2		.059** [.02,.13]	.030** [.01, .07]		.064** [.03,.13]	.055** [.02, .11]		.300** [.21,.41]	.143** [.07, .23]
Gender	.07 [-.09, .21]			-.02 [-.16, .12]			.15* [.01, .29]		
School (General vs. Touristic)	-.09 [-.20, .04]			-.03 [-.15, .09]			.00 [-.10, .10]		
School (General vs. Technical)	-.13 [-.27, .02]			-.06 [-.19, .08]			-.12 [-.24, .02]		
Measured Ability	.18** [.07, .27]			.24** [.14, .34]			.41** [.29, .52]		
Grade									
Step 3		.431** [.36,.53]	.373** [.29, .47]		.275** [.20,.39]	.211** [.14, .31]		.532** [.46,.63]	.232** [.16, .33]
Gender	.07 [-.04, .19]			.01 [-.12, .14]			.10 [-.03, .23]		
School (General vs. Touristic)	-.06 [-.16, .05]			.05 [-.06, .16]			.07 [-.01, .15]		
School (General vs. Technical	-.06 [-.16, .06]			-.01 [-.12, .12]			-.07 [-.18, .04]		
Measured Ability	.01 [-.07, .10]			.18** [.09, .29]			.18** [.07, .30]		
Grade									
Openness	.50** [.41, .59]			.00 [-.12, .12]			.05 [-.05, .15]		
Conscientious-ness	-.04 [-.14, .07]			.02 [-.09, .13]			.05 [-.03, .14]		
Extraversion	.04 [-.08, .16]			.14* [.01, .27]			.15** [.05, .25]		
Agreeableness	.11* [.00, .22]			.15* [.03, .26]			.40** [.29, .51]		
Emotional Stability				.26** [.14, .38]			.05 [-.03, .14]		
Narcissism	.23** [.14, .32]			.18** [.07, .28]			.00 [-.09, .09]		

Note. Gender was scored as 0 = male and 1 = female. School type (general vs. touristic) was scored as 0 = general and 1 = touristic. School type (general vs. technical) was scored as 0 = general and 1 = technical. SE = Self-Estimate. Grade is the mean between English and German grades when the outcome is SE verbal and the mathematic grade when the outcome is SE numerical. Measured ability is the objectively measured ability level in the domain of the outcome. Values in brackets indicate 95% percentile confidence intervals based on 2000 bootstrapping samples. Bootstrapping confidence intervals for R^2 and ΔR^2 are adjusted based on the corrections proposed by Algina, Keselman, and Penfield (2008). * indicates $p < .05$. ** indicates $p < .01$.

Table 3

Correlations between Interests and Measured and Self-Estimated Abilities (Study 1)

Interest	Verbal Intelligence	Numerical Intelligence	Spatial Intelligence	Creativity	Intra-personal EMA	Inter-personal EMA	SE Verbal	SE Numerical	SE Spatial	SE Creativity	SE Intra-personal	SE Inter-personal
Commercial	-.026	.073	.054	.023	-.021	-.058	.160*	.269**	.221**	.072	.131*	-.009
	[-.133, .085]	[-.032, .179]	[-.062, .167]	[-.080, .124]	[-.124, .081]	[-.164, .048]	[.044, .272]	[.163, .370]	[.111, .325]	[-.044, .186]	[.022, .242]	[-.129, .106]
Health/Social	.015	-.177*	-.067	.056	.123*	.320**	-.054	-.120*	-.062	.081	.156*	.442**
	[-.099, .121]	[-.274, -.071]	[-.174, .048]	[-.050, .160]	[.016, .227]	[.207, .423]	[-.175, .066]	[-.234, -.003]	[-.168, .049]	[-.034, .195]	[.036, .272]	[.349, .530]
Scientific	.075	.106	.201*	.111	.013	-.077	.271**	.415**	.204**	.165*	.047	-.069
	[-.025, .183]	[-.005, .216]	[.099, .308]	[-.001, .225]	[-.096, .120]	[-.185, .037]	[.161, .380]	[.316, .513]	[.103, .304]	[.055, .270]	[-.069, .165]	[-.184, .046]
IT/Tech	-.017	.300**	.157*	-.132*	-.121*	-.323**	.072	.437**	.326**	-.083	-.088	-.328**
	[-.124, .094]	[.202, .399]	[.045, .269]	[-.257, -.008]	[-.228, -.010]	[-.422, -.217]	[-.033, .181]	[.347, .527]	[.224, .420]	[-.200, .036]	[-.200, .021]	[-.429, -.227]
Art/Culture	.100	-.145*	-.052	.212**	.023	.145*	.298**	-.204**	-.082	.516**	.125*	.218**
	[-.009, .206]	[-.251, -.030]	[-.168, .065]	[.113, .303]	[-.084, .128]	[.035, .251]	[.194, .396]	[-.311, -.086]	[-.198, .032]	[.434, .588]	[.021, .234]	[.118, .312]
Tourism/Service	-.055	-.065	-.066	.065	-.005	.139*	-.063	.013	.046	-.018	.149*	.213**
	[-.164, .058]	[-.171, .045]	[-.167, .032]	[-.050, .171]	[-.107, .105]	[.027, .241]	[-.172, .048]	[-.097, .129]	[-.064, .157]	[-.133, .093]	[.035, .258]	[.100, .311]
Law/Security	.063	.018	-.052	-.015	-.020	.019	.197**	.074	.113*	.090	.078	.115
	[-.042, .166]	[-.083, .122]	[-.157, .056]	[-.124, .092]	[-.142, .092]	[-.090, .126]	[.090, .305]	[-.042, .180]	[.003, .223]	[-.027, .205]	[-.038, .195]	[-.000, .223]
Assembly/Crafts	-.010	.280**	.244**	-.065	-.016	-.250**	.040	.500**	.354**	-.047	-.065	-.266**
	[-.118, .100]	[.187, .376]	[.137, .340]	[-.179, .045]	[-.120, .088]	[-.367, -.130]	[-.073, .149]	[.416, .579]	[.259, .447]	[-.173, .076]	[-.170, .046]	[-.382, -.154]
Office	-.131*	-.094	-.095	-.052	.093	.086	-.027	.030	.050	-.066	.122*	.174**
	[-.241, -.009]	[-.199, .021]	[-.200, .009]	[-.152, .046]	[-.012, .204]	[-.015, .187]	[-.139, .088]	[-.076, .135]	[-.058, .160]	[-.173, .034]	[.006, .228]	[.069, .276]

Note. SE = Self-Estimates; EMA = Emotional Management Abilities; 95% CIs are based on bootstrapping with 2000 samples (percentile method).

** indicates $p < .001$, * indicates $p < .05$

Table 4

Hierarchical Multiple Regressions Predicting Interests from Self-Estimates, Pertinent Measured Abilities and Grades, and Personality Traits (Study 1)

	Assembly/Crafts			Scientific			Art/Culture		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.356** [.27,.46]			.093** [.05,.17]			.058** [.03,.11]	
Gender	-.38** [-.51, -.24]			-.25** [-.41, -.10]			.21** [.08, .36]		
School (General vs. Touristic)	-.08 [-.17, .02]			-.02 [-.14, .11]			-.03 [-.16, .10]		
School (General vs. Technical)	.24** [.11, .37]			.06 [-.09, .20]			-.06 [-.18, .07]		
Step 2		.466** [.40,.56]	.110** [.06, .18]		.255** [.19,.36]	.162** [.10, .25]		.348** [.28,.44]	.290** [.22, .37]
Gender	-.23** [-.37, -.10]			-.18* [-.33, -.03]			.15* [.01, .28]		
School (General vs. Touristic)	-.01 [-.10, .08]			.05 [-.07, .17]			-.04 [-.16, .07]		
School (General vs. Technical)	.24** [.12, .36]			.07 [-.07, .20]			.02 [-.09, .12]		
SE Verbal				.19** [.06, .32]			.07 [-.04, .19]		
SE Numerical	.28** [.18, .38]			.34** [.22, .45]			-.23** [-.33, -.13]		
SE Spatial	.15** [.05, .24]			-.05 [-.16, .08]					
SE Creativity				.08 [-.06, .21]			.53** [.40, .64]		
SE Intra-personal							-.06 [-.18, .06]		
SE Inter-personal	-.08 [-.19, .02]						-.05 [-.18, .07]		
Step 3		.474** [.41,.57]	.008 [.00, .04]		.260** [.20,.36]	.006 [.00, .03]		.364** [.31,.46]	.016 [.00, .05]
Gender	-.24** [-.38, -.10]			-.17* [-.32, -.02]			.17* [.03, .30]		
School (General vs. Touristic)	-.01 [-.10, .08]			.05 [-.07, .16]			-.07 [-.18, .04]		
School (General vs. Technical)	.25** [.12, .37]			.08 [-.06, .21]			.04 [-.07, .15]		
SE Verbal				.20** [.07, .32]			.05 [-.06, .17]		
SE Numerical	.27** [.15, .38]			.31** [.19, .43]			-.25** [-.35, -.14]		
SE Spatial	.13* [.03, .22]			-.05 [-.17, .07]					
SE Creativity				.07 [-.06, .20]			.51** [.40, .62]		
SE Intra-personal							-.04 [-.16, .08]		
SE Inter-personal	-.07 [-.17, .04]						-.05 [-.19, .08]		
Verbal I.									
Numerical I.	-.05 [-.14, .04]						.02 [-.09, .13]		
Spatial I.	.10* [.00, .20]			.08 [-.03, .18]					
Creativity							.14** [.04, .24]		
Intrapersonal EMA									
Interpersonal EMA	-.02 [-.13, .09]						-.02 [-.13, .09]		

	Health/Social			Commercial			Office		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.173**			.072**			.028*	
		[.11,.25]			[.03,.14]			[.01,.08]	
Gender	.27**			-.22**			.07		
	[.13, .41]			[-.36, -.07]			[-.07, .20]		
School (General vs. Touristic)	-.07			.14*			.15*		
	[-.19, .05]			[.02, .27]			[.02, .29]		
School (General vs. Technical)	-.22**			.13			.11		
	[-.35, -.09]			[-.01, .26]			[-.02, .24]		
Step 2		.269**	.096**		.159**	.088**		.059**	.031**
		[.20,.37]	[.05, .17]		[.11,.25]	[.05, .16]		[.03,.13]	[.01, .08]
Gender	.17*			-.14			.02		
	[.04, .29]			[-.28, .01]			[-.13, .16]		
School (General vs. Touristic)	-.06			.20**			.16*		
	[-.18, .05]			[.09, .32]			[.03, .28]		
School (General vs. Technical)	-.17**			.14*			.14*		
	[-.29, -.05]			[.01, .28]			[.01, .27]		
SE Verbal				.10					
				[.00, .21]					
SE Numerical	.01			.20**					
	[-.10, .13]			[.08, .32]					
SE Spatial				.08					
				[-.06, .20]					
SE Creativity									
SE Intra-personal	-.08			.11			.05		
	[-.20, .06]			[-.02, .23]			[-.08, .17]		
SE Inter-personal	.38**						.16*		
	[.25, .51]						[.01, .30]		
Step 3		.273**	.004					.078**	.019*
		[.22,.38]	[.00, .03]					[.04,.16]	[.00, .06]
Gender	.15*						.04		
	[.01, .28]						[-.11, .17]		
School (General vs. Touristic)	-.07						.17**		
	[-.18, .06]						[.05, .30]		
School (General vs. Technical)	-.17**						.15*		
	[-.29, -.06]						[.03, .28]		
SE Verbal									
SE Numerical	.03								
	[-.09, .15]								
SE Spatial									
SE Creativity									
SE Intra-personal	-.06						.04		
	[-.19, .07]						[-.09, .17]		
SE Inter-personal	.35**						.15*		
	[.21, .49]						[.01, .30]		
Verbal I.							-.14*		
							[-.25, -.03]		
Numerical I.	-.03								
	[-.14, .08]								
Spatial I.									
Creativity									
Intrapersonal EMA	-.04								
	[-.14, .06]								
Interpersonal EMA	.07								
	[-.06, .19]								

	IT/Tech			Tourism & Service			Law/Security		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.561**			.045**			.005	
		[.47,.65]			[.02,.10]			[.00,.04]	
Gender	-.44**			.08			.04		
	[-.55, -.33]			[-.06, .23]			[-.10, .18]		
School (General vs. Touristic)	-.06			.05			-.08		
	[-.14, .02]			[-.07, .18]			[-.21, .05]		
School (General vs. Technical)	.36**			-.12			.00		
	[.24, .47]			[-.26, .02]			[-.13, .13]		
Step 2		.608**	.047**		.070**	.025*		.049**	.044**
		[.54,.69]	[.02, .09]		[.04,.14]	[.01, .07]		[.02,.12]	[.01, .10]
Gender	-.34**			.05			.07		
	[-.46, -.22]			[-.11, .21]			[-.07, .20]		
School (General vs. Touristic)	-.02			.06			-.06		
	[-.10, .06]			[-.07, .18]			[-.19, .07]		
School (General vs. Technical)	.36**			-.09			.01		
	[.25, .47]			[-.23, .04]			[-.12, .13]		
SE Verbal							.18**		
							[.07, .29]		
SE Numerical	.15**								
	[.07, .24]								
SE Spatial	.13**						.08		
	[.03, .23]						[-.03, .19]		
SE Creativity									
SE Intra-personal				.08					
				[-.06, .22]					
SE Inter-personal	-.08			.11					
	[-.16, .01]			[-.04, .25]					
Step 3		.612**	.004		.071**	.000			
		[.55,.70]	[.00, .03]		[.04,.15]	[.00, .01]			
Gender	-.34**			.05					
	[-.46, -.22]			[-.11, .22]					
School (General vs. Touristic)	-.01			.06					
	[-.09, .08]			[-.07, .19]					
School (General vs. Technical)	.35**			-.09					
	[.24, .47]			[-.23, .04]					
SE Verbal									
SE Numerical	.17**								
	[.07, .27]								
SE Spatial	.12**								
	[.02, .22]								
SE Creativity									
SE Intra-personal				.08					
				[-.07, .23]					
SE Inter-personal	-.07			.10					
	[-.16, .03]			[-.07, .26]					
Verbal I.									
Numerical I.	-.03								
	[-.12, .05]								
Spatial I.	.03								
	[-.06, .13]								
Creativity	-.05								
	[-.14, .04]								
Intrapersonal EMA	-.01								
	[-.09, .06]								
Interpersonal EMA	-.01			.02					
	[-.11, .08]			[-.10, .14]					

Note. Gender was scored as 0 = male and 1 = female. School type (general vs. touristic) was scored as 0 = general and 1 = touristic. School type (general vs. technical) was scored as 0 = general and 1 = technical. SE = Self-Estimate. EMA = Emotional Management Abilities. I. = Intelligence. Values in brackets indicate 95% percentile confidence intervals based on 2000 bootstrapping samples. Bootstrapping confidence intervals for R^2 and ΔR^2 are adjusted based on the corrections proposed by Algina, Keselman, and Penfield (2008). * indicates $p < .05$. ** indicates $p < .01$.

Table 5

Correlations between RIASEC Interests and Measured and Self-Estimated Abilities (Study 2)

RIASEC domain	Verbal Intelligence	Numerical Intelligence	Spatial Intelligence	Creativity	Intra-personal EMA	Inter-personal EMA	SE Verbal	SE Numerical	SE Spatial	SE Creativity	SE Intra-personal	SE Inter-personal
R	.041	.213*	.348**	.099	.112	.054	-.245**	.492**	.413**	-.087	-.006	-.231**
	[-.091, .178]	[.077, .336]	[.230, .449]	[-.041, .232]	[-.022, .241]	[-.104, .206]	[-.375, -.103]	[.372, .601]	[.274, .525]	[-.223, .051]	[-.140, .127]	[-.360, -.092]
I	.087	.164*	.155*	.124*	.238**	.207*	-.004	.492**	.225*	.078	.151*	-.033
	[-.058, .232]	[.014, .298]	[.028, .279]	[.013, .236]	[.095, .369]	[.075, .335]	[-.162, .152]	[.378, .588]	[.084, .356]	[-.085, .235]	[.004, .300]	[-.171, .107]
A	.018	-.137	-.135	.211*	.061	.126	.575**	-.385**	-.018	.617**	.200*	.271**
	[-.127, .166]	[-.274, .002]	[-.264, .003]	[.071, .345]	[-.065, .186]	[-.005, .251]	[.481, .655]	[-.504, -.268]	[-.162, .114]	[.546, .684]	[.059, .338]	[.132, .400]
S	-.040	-.125	-.036	.045	.212**	.168*	.199*	-.143	.126	.233*	.261**	.453**
	[-.175, .091]	[-.263, .026]	[-.192, .112]	[-.081, .176]	[.082, .342]	[.037, .299]	[.019, .371]	[-.286, -.001]	[-.012, .262]	[.076, .379]	[.106, .402]	[.320, .565]
E	-.097	-.093	-.018	.125*	.306**	-.013	.315**	.010	.256*	.347**	.311**	.286**
	[-.240, .054]	[-.243, .062]	[-.153, .127]	[.010, .234]	[.184, .424]	[-.166, .131]	[.192, .433]	[-.132, .162]	[.112, .397]	[.201, .478]	[.170, .444]	[.141, .417]
C	.099	.090	.108	.103	.127	.092	.215*	.255*	.192*	.094	.118	-.034
	[-.022, .224]	[-.062, .238]	[-.031, .239]	[-.018, .225]	[-.010, .264]	[-.048, .228]	[.076, .344]	[.110, .391]	[.046, .330]	[-.077, .249]	[-.054, .274]	[-.196, .115]

Note. SE = Self-Estimates; EMA = Emotional Management Abilities; R = Realistic; I = Investigative; A = Artistic; S = Social; E = Enterprising; C = Conventional. 95% CIs are based on bootstrapping with 2000 samples (percentile method).
** indicates $p < .001$, * indicates $p < .05$

Table 6

Hierarchical Multiple Regressions Predicting RIASEC Interests from Self-Estimated and Measured Abilities (Study 2)

	Realistic			Investigative			Artistic		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.309** [.22,.41]			.181** [.09,.29]			.267** [.17,.39]	
Gender	-.23** [-.34, -.12]			-.11 [-.23, .01]			.22** [.10, .33]		
Study Type	.51** [.40, .60]			.41** [.29, .52]			-.47** [-.58, -.36]		
Step 2		.435** [.35,.54]	.126** [.07, .22]		.288** [.20,.42]	.106** [.05, .19]		.575** [.50,.66]	.307** [.22, .42]
Gender	-.13* [-.23, -.02]			-.05 [-.18, .08]			.20** [.10, .29]		
Study Type	.29** [.13, .45]			.16 [.00, .32]			-.24** [-.36, -.13]		
SE Verbal	-.08 [-.20, .04]						.26** [.14, .38]		
SE Numerical	.15 [-.01, .31]			.37** [.21, .52]			-.07 [-.19, .06]		
SE Spatial	.32** [.20, .45]			.05 [-.06, .16]					
SE Creativity							.43** [.32, .54]		
SE Intra-personal				.16* [.01, .29]			-.04 [-.15, .07]		
SE Inter-personal	-.15* [-.28, -.02]						-.06 [-.18, .07]		
Step 3		.439** [.37,.56]	.004 [.00, .03]		.338** [.26,.47]	.050* [.02, .12]		.577** [.50,.67]	.002 [.00, .02]
Gender	-.14* [-.25, -.03]			-.06 [-.18, .07]			.20** [.11, .30]		
Study Type	.27** [.11, .44]			.19* [.01, .34]			-.25** [-.37, -.12]		
SE Verbal	-.07 [-.20, .05]						.25** [.14, .37]		
SE Numerical	.18* [.00, .38]			.44** [.27, .61]			-.07 [-.19, .07]		
SE Spatial	.31** [.18, .44]			.06 [-.05, .18]					
SE Creativity							.42** [.30, .52]		
SE Intra-personal				.04 [-.14, .21]			-.04 [-.16, .07]		
SE Inter-personal	-.16* [-.29, -.01]						-.05 [-.18, .08]		
Numerical I.	-.08 [-.22, .06]			-.10 [-.25, .05]					
Spatial I.	.03 [-.10, .15]			-.15* [-.27, -.02]					
Creativity				.11 [.01, .21]			.05 [-.05, .15]		
Intrapersonal EMA				.07 [-.07, .22]					
Interpersonal EMA				.14* [.02, .26]					

	Social			Enterprising			Conventional		
Predictor	β	R^2	ΔR^2	β	R^2	ΔR^2	β	R^2	ΔR^2
Step1		.027 [.00,.10]			.027 [.00,.09]			.023 [.00,.08]	
Gender	.02 [-.12, .16]			-.16* [-.29, -.03]			.05 [-.09, .18]		
Study Type	-.16* [-.30, -.02]			.00 [-.14, .13]			.14* [.01, .28]		
Step 2		.216** [.14,.36]	.189** [.11, .31]		.247** [.17,.39]	.221** [.14, .34]		.151** [.08,.28]	.128** [.06, .23]
Gender	-.06 [-.18, .06]			-.19** [-.31, -.07]			.08 [-.06, .21]		
Study Type	-.05 [-.19, .09]			.11 [-.03, .25]			.03 [-.14, .22]		
SE Verbal	.02 [-.16, .20]			.20* [.01, .37]			.26** [.12, .39]		
SE Numerical							.26** [.08, .43]		
SE Spatial				.13 [-.01, .28]			.12 [-.02, .25]		
SE Creativity	.05 [-.13, .25]			.15 [-.03, .33]					
SE Intra-personal	-.01 [-.18, .16]			.07 [-.10, .24]					
SE Inter-personal	.44** [.27, .60]			.16 [.00, .31]					
Step 3		.229** [.15,.38]	.013 [.00, .05]		.265** [.19,.41]	.017 [.00, .06]			
Gender	-.04 [-.16, .09]			-.17* [-.30, -.05]					
Study Type	-.06 [-.20, .09]			.11 [-.03, .25]					
SE Verbal	.02 [-.17, .19]			.21* [.02, .38]					
SE Numerical									
SE Spatial				.11 [-.04, .26]					
SE Creativity	.06 [-.13, .25]			.16 [-.02, .35]					
SE Intra-personal	-.10 [-.28, .09]			-.02 [-.21, .17]					
SE Inter-personal	.43** [.26, .60]			.16* [.00, .32]					
Numerical I.									
Spatial I.									
Creativity				-.02 [-.12, .10]					
Intrapersonal EMA	.12 [-.01, .26]			.16* [.02, .30]					
Interpersonal EMA	.03 [-.09, .16]								

Note. Gender was scored as 0 = male and 1 = female. Study type was score as 0 = linguistic and 1 = technical/mathematical. SE = Self-Estimate. I. = Intelligence. EMA = Emotional Management Abilities. Values in brackets indicate 95% percentile confidence intervals based on 2000 bootstrapping samples. Bootstrapping confidence intervals for R^2 and ΔR^2 are adjusted based on the corrections proposed by Algina, Keselman, and Penfield (2008).
* indicates $p < .05$. ** indicates $p < .01$.