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# A longitudinal study on the stability of self-estimated intelligence and its relationship to personality traits☆

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ABSTRACT

The present study investigated the stability of fluid self-estimated intelligence (SEI) directly, one, and two weeks after the administration of an IQ test in $N = 238$ German high school students (tested group, TG) in comparison to $N = 316$ untested high school students (control group, CG). Multigroup latent change analysis indicated that, in comparison to the CG, the TG had a significant latent decrease in SEI from before to after having taken an IQ test ($d = 0.36$), and again a significant latent increase in SEI one week later ($d = 0.28$). There was no significant difference in the change from the first and the second week after the IQ test. Results further showed that more accurate SEI was obtained only directly after IQ test participation, but not one or two weeks later, possibly due to self-serving processes. Additionally, we found that extraverted persons displayed a substantially lower decrease in SEI from pre- to posttest, and their SEI rebound effect between posttest and follow-up was significantly smaller.



## 1. Introduction

Accurate knowledge of one's own skills and abilities plays an important role in predicting future behavior and success. For example, some studies have found that persons who overestimate their competence pursue careers for which they are underqualified (Camerer & Lovallo, 1999), whereas persons who underestimate their competence fail to pursue careers in which they could succeed (Ehrlinger & Dunning, 2003). In addition, several studies have shown that self-estimates of abilities are important predictors of future performance (e.g., school achievement) even after controlling for IQ (Spinath, Spinath, Harlaar, & Plomin, 2006). However, although a relatively large number of studies has been conducted on the measurement, validity, and gender differences in self-estimated intelligence (SEI), few studies have examined changes in SEI across time. However, studies on the stability as well as malleability of SEI are important for both theoretical and practical reasons: Only longitudinal studies investigating the effects of intelligence test administration can provide reliable information on whether SEI becomes more precise, and provide insight into the stability of SEI changes. Because SEI plays an important role in practical settings, e.g., in career counseling where it is routinely used and conveys important information beyond objective test scores (Hirschi & Läge, 2008), a more thorough and longitudinal analysis of the malleability of SEI and its validity is needed.

## 2. Literature review

### 2.1. Validity and accuracy of self-estimated intelligence

Meta-analyses investigating the relationship between objective and self-estimated intelligence (SEI) found significant albeit moderately sized correlations around $r = 0.33$–$0.34$ (Freund & Kasten, 2012; Mabe & West, 1982). Numerous single studies revealed similar correlation coefficients between SEI and psychometric intelligence measures (Furnham, Kidwai, & Thomas, 2001; Paulhus, Lysy, & Yik, 1998), ratings of others (Chamorro-Premuzic, Arteche, Furnham, & Trickot, 2009), or school grades (Rammstedt & Rammsayer, 2002).

A large body of research showed an absolute discrepancy between self-estimated and psychometric values of intelligence: A general bias of overestimation could be found in the majority of studies (Paulhus et al., 1998; von Stumm, 2014). In order to increase the accuracy of SEI, experiences with objective intelligence tests might serve as orientation for evaluating one's own abilities and, thus, help people to estimate their intelligence more accurately. In the meta-analysis by Mabe and West (1982), the experience with former intelligence tests was a significant moderator for the relationship between SEI and objective intelligence. Ackerman and Wolman (2007) also showed that the correlation between self-estimated mathematical and spatial intelligence significantly increased after the participation in an intelligence test. They also interpreted these effects in the sense that the test serves

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as implicit feedback for the test takers with respect to their test performance. In contrast, a more recent meta-analysis of Freund and Kasten (2012) only found a marginally non-significant moderator effect for the presentation of an intelligence test before estimating one's own intelligence. Accordingly, Chamorro-Premuzic and Furnham (2006) assessed the SEI before and after an intelligence test and found neither higher correlations between SEI and objective intelligence after taking the test, nor a significant absolute difference between SEI values before and after the test. Consequently, it seems useful to investigate the stability or changes of SEI over time.

### 2.2. Stability of self-estimated intelligence

There are only few studies investigating the stability of SEI (Ackerman & Wolman, 2007; Cruise & Lewis, 2006; Swami, 2012). With respect to the assessment of the stability of a construct (e.g. intelligence), it is important to distinguish between covariance stability and mean stability. Covariance stability refers to the stability of interindividual differences over time. Mean stability refers to the overall stability of a group. Covariance stability can be high even when mean stability is low (e.g. when most individuals change by the same amount). Similarly, mean stability can be high although covariance stability is low (e.g. when each individual changes, but the differences cancel out on average). Stability of interindividual differences can for example be investigated by means of test-retest correlations. Mean stability can be studied by comparing the means of repeatedly measured tests.

So far, the question of stability of SEI has not been satisfactorily answered given that only few studies have employed repeated measurements of SEI. Rammstedt and Rammsayer (2002) reported covariance stability in the form of test-retest correlations of $r = 0.53$ to $r = 0.82$ depending on the self-estimated facet of intelligence. Swami (2012) conducted a longitudinal study investigating the stability of SEI over three measurement points (after six and after twelve months) regarding covariance and mean stability. The correlations between the measurement points ranged between $r = 0.08$ (self-estimated spatial intelligence) and $r = 0.80$ (self-estimated musical intelligence). With respect to mean stability, SEI slightly decreased with mostly small effect sizes over the three measurement points.

Considering the positive effect of taking an IQ test on the validity of SEI, Storek and Furnham (2016) found a significant decrease in self-estimations on mathematical and spatial intelligence after having taken an IQ test as well as a higher correlation between mathematical performance and SEI after the IQ test indicating a more valid SEI. Ackerman and Wolman (2007) also found that after administering an IQ test, two SEI measures showed significant decreases, whereas covariance stability was generally relatively high. Additionally, the validity of SEI increased – partially significant – from pre- to posttest. The study by Ackerman and Wolman (2007) therefore supports the fact that the validity of SEI can be improved by providing people with an anchor in the form of an IQ test, although this does not seem to generally be the case (Zell & Krizan, 2014). At the same time, SEI seems to decrease after a test, reducing its overestimation. Therefore, the question arises whether taking an IQ test can reduce an overestimation bias and whether this correction is stable, or only temporary in nature.

### 2.3. The effect of personality traits on the stability of self-estimated intelligence

SEI and its accuracy are also related to personality traits such as the Big Five. Several studies indicated that neuroticism and agreeableness are negatively correlated with SEI (Furnham & Buchanan, 2005; Furnham, Moutafi, & Chamorro-Premuzic, 2005; Visser, Ashton, & Vernon, 2008), whereas extraversion (Furnham et al., 2001, 2005; Visser et al., 2008), conscientiousness (Furnham et al., 2005; Visser et al., 2008) and openness to experience (Visser et al., 2008) are positively correlated to SEI. Personality traits are not only related to the absolute estimation of intelligence, they are also correlated with the validity or accuracy of self-estimates (Soh & Jacobs, 2013). Jacobs, Szer, and Roodenburg (2012) showed that the Big Five moderate the relationship between self-estimated and psychometrically measured intelligence. Low extraversion led to more accurate self-estimates of own fluid and visual intelligence, high agreeableness led to more accurate self-estimates of fluid intelligence. Neuroticism did not moderate the accuracy of SEI in any of the studies. In addition, in Soh and Jacobs' (2013) study, high openness to experience was related to a higher accuracy of SEI for males. Thinking one step ahead, it is an interesting question, whether personality traits influence *changes* in SEI or its *stability* respectively, which is part of the present study.

### 2.4. Aims and hypothesis

The present study investigates the mean stability of SEI over four measurement time points in three consecutive weeks with an intelligence test administered in the first week.

Although people tend to overestimate their abilities (Paulhus et al., 1998), performing an intelligence test helps to anchor own abilities resulting in more valid and more accurate self-estimations (Ackerman & Wolman, 2007; Mabe & West, 1982). Nevertheless, such a correction of a positively biased self-estimation might lead to cognitive dissonance and, thus, to self-serving processes (Jussim, Yen, & Aiello, 1995), again resulting in revisions of the SEI adjustments. We assume that taking an IQ test will directly lead to a mean decrease in SEI, but we hypothesize that this mean decrease in SEI will return to pretest levels due to self-serving processes.

**Hypothesis 1.** Compared to the control group (CG), the tested group (TG) taking an IQ test between the first (pre) and the second (post) measure of SEI shows a significant decrease in SEI from pre- to post-measure, followed by a significant increase in SEI from post- to a follow-up-measure one week later.

Because personality traits can affect SEI, they might also influence changes in SEI. Based on existing results indicating that high extraversion, low agreeableness and low openness to experience lead to overestimations of own abilities, we assume that more open persons are also more open to intellectual activities and feedback (Furnham, Swami, Arteche, & Chamorro-Premuzic, 2008), and that extraverted and less agreeable persons are less susceptible to revisions of positively biased self-estimations due to more self-confidence (Watson, Suls, & Haig, 2002).

**Hypothesis 2.** Extraversion, agreeableness and openness to experience significantly affect the change of SEI from pre- to post-measure as well as from post- to follow-up-measure. Higher extraversion predicts lower change of SEI, whereas higher agreeableness and openness to experience predict higher change in SEI.

## 3. Method

### 3.1. Participants

Two groups participated in this study, a TG of $n = 238$ (43.7% males; mean age = 17.42 years [$SD = 1.14$]) and a CG consisting of $n = 316$ students (44.1% males; mean age = 16.76 years [$SD = 1.33$]) from the 11th, 12th and 13th school grade in Germany. The testings took place in the schools in groups of 20 to 50 individuals. The participants received no payment for attendance.

### 3.2. Materials

#### 3.2.1. Self-estimated intelligence

The Inventory of Self-Estimated Intelligence (ISI; Rammstedt & Rammsayer, 2002) consists of 11 items. Every item represents one