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Discrepancies Between Implicit and Explicit Self-concepts of Intelligence Predict Performance on Tests of Intelligence

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Abstract: Three studies investigated the correspondence between implicit and explicit self-concepts of intelligence and how that correspondence is related to performance on different intelligence tests. Configurations of these two self-concepts were found to be consistently related to performance on intelligence tests in all three studies. For individuals who self-reported high intelligence (high explicit self-concept), a negative implicit self-concept (measured with the Implicit Association Test) led to a decrease in performance on intelligence tests. For participants whose self-report indicated a low self-concept of intelligence, positive automatic associations between the self and intelligence had a similar effect. In line with a stress hypothesis, the results indicate that any discrepant configuration of self-concepts will impair performance. Importantly, the prediction of performance on intelligence tests by the self-concept of intelligence was shown to be independent of self-esteem (Study 3). Copyright © 2011 John Wiley & Sons, Ltd.

Key words: implicit self-concept; explicit self-concept; Implicit Association Test; intelligence

INTRODUCTION

Individuals' views of themselves, whether as capable or inept, intelligent or unskilled, are implicated throughout everyday life. People make some judgments quickly and without a great deal of cognitive effort, such as deciding whether they can drive through an intersection before a stoplight changes from yellow to red without even thinking through the question 'Can I safely drive across the street before the light changes?' Other judgments appear to involve more introspection about knowledge, skills and abilities, such as deciding 'How much do I need to study to earn an A on my final exam?' In the present paper, we argue that the specific interplay of an individual's automatic associations with the more deliberate and self-reflective judgments about that individual's own intelligence are systematically related to performance on intelligence tests.

Intelligence is one of the basic requirements for succeeding in life (Kuncel, Hezlett, & Ones, 2004; Schmidt & Hunter, 2004) and is commonly measured using performance tests of intelligence. Granted that individuals receive feedback on their intelligence quite often throughout their lives (e.g., in school or at work), several researchers have raised the question of whether individuals can accurately and reliably self-report their own intelligence (e.g., Holling & Preckel, 2005; Paulhus, Lysy, & Yik, 1998). The results of empirical research on the validity of self-reports of intellectual ability vary, but most studies have found moderate to strong correlations between self-reported and performance-based assessments of intelligence (Mabe & West, 1982; Paulhus & Morgan, 1997).

In the present research, the goal was to explore whether the relation between these self-reports and actual performance on intelligence tests is affected by individuals' automatic associations regarding their own intelligence. Building on a dual process model of information processing (Strack & Deutsch, 2004), we contend that individuals differ not only in the degree to which they explicitly claim to be intelligent (explicit representation), but also in the extent to which they automatically associate their concept of 'self' with intelligence-related attributes such as 'smart' (implicit representation). Importantly, these two representations may be consistent or may contradict each other. Based on a stress model of discrepant self-representations (e.g., Bem & Allen, 1974; Cacioppo, Gardner, & Berntson, 1997), we propose that any discrepant configuration of explicit and implicit self-representation will lead to an impaired outcome (i.e. actual performance on tests of intelligence).

EXPLICIT AND IMPLICIT SELF-CONCEPTS OF INTELLIGENCE

The concept of the self has been examined frequently and in various domains. Researchers have defined the self-concept as the connection of the concept of self with one or more attribute concepts (e.g., Asendorpf, Banse, & Mücke, 2002; Greenwald et al., 2002). Thus, the self-concept of intelligence (SCI) can be

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seen as the total strength of connections of the concept of who one is with attributes such as aptitude or stupidity.

A large and growing body of literature has examined *self-estimates* of various self-concepts, including self-estimated intelligence (for a review, see Furnham & Rawles, 1999). In line with current dual system models of information processing (e.g., Strack & Deutsch, 2004), we adopted the perspective that these self-estimates are based on propositional structures that result from reflective information processing such as 'I am an intelligent person!' An intelligence estimate obtained using a direct measurement technique, such as an individual's self-report of his or her own intelligence (i.e. a self-estimate), can be referred to as an explicit self-concept of intelligence (eSCI).

According to dual system models (e.g., Strack & Deutsch, 2004), this eSCI should be complemented by an implicit self-concept of intelligence (iSCI). In contrast to the propositional nature of an eSCI, an iSCI is thought to be based on associative structures that result from automatic information processing, such as spontaneously associating the self with intelligence. These automatic associations are generally assessed using indirect methods, most often based on response time latencies that are difficult to intentionally or consciously control (Fazio & Olson, 2003; Petty, Fazio, & Briñol, 2008).

DISCREPANT SELF-CONCEPTS

Following from the dual process perspective that implicit and explicit associations function rather independently (Gawronski & Bodenhausen, 2006; Grumm, Nestler, & von Collani, 2009), it is conceivable that individuals may explicitly judge themselves as intelligent but fail to automatically associate themselves with intelligence. In contrast, individuals may have an automatic association between the self and intelligence but deny or downplay their own intelligence in explicit self-ratings. Despite the continuous nature of both implicit and explicit self-concepts, we propose using a working framework that posits four different prototypes of the intelligence self-concept (see Table 1) in analogy to proposals in the self-esteem domain (e.g., Schröder-Abé, Rudolph, Wiesner, & Schütz, 2007). In this framework, individuals can have (i) a consistently high SCI (high eSCI and high iSCI); (ii) a fragile SCI (high eSCI and low iSCI); (iii) a modest SCI (low eSCI and high iSCI); or (iv) a consistently low SCI (low eSCI and low iSCI).

Holding ambivalent or incompatible attitudes, feelings, beliefs and behavioural tendencies (e.g., Bem & Allen, 1974; Cacioppo et al., 1997) has been determined to often be experienced as unpleasant and may result in adverse outcomes, such as internal tensions and negative emotions (e.g., Briñol, Petty, & Wheeler, 2006; Carver & Scheier, 1981). The effects of concordant and discrepant implicit and explicit self-associations have been intensively investigated in the domain of self-esteem (Bosson, Brown, Zeigler-Hill, & Swann, 2003; Jordan, Spencer, Zanna, Hoshino-Brown, & Correll, 2003). In line with a stress hypothesis (Zubin & Spring, 1977), it has been found that discrepancies between implicit and explicit self-esteem are related to negative outcomes (Schröder-Abé, Rudolph, Wiesner, et al., 2007).

Table 1. The four possible combinations of implicit and explicit self-concept of intelligence

		Implicit self-concept of intelligence	
		High	Low
Explicit self-concept of intelligence	High	Consistently high	Fragile
	Low	Modest	Consistently low

More specifically, Schröder-Abé, Rudolph, Wiesner, et al. (2007) found evidence that discrepancies between implicit and explicit self-esteem are related to defensiveness, anger expression and problems with psychological health. In their research, this finding was true for both types of discrepancies, the combination of low explicit with high implicit self-esteem and the combination of high explicit with low implicit self-esteem.

THE PRESENT RESEARCH

We transmitted the findings on the relation between discrepant self-esteem and emotional outcomes to the realm of discrepant self-concepts of intelligence and actual performance on intelligence tests. We tested the moderating effect of the previously unacknowledged iSCI. In line with previous findings (Mabe & West, 1982; Paulhus & Morgan, 1997), we predicted that individuals' explicit estimates of their intelligence would be significant predictors of their performance on intelligence tests. However, related to the stress hypothesis, iSCI was expected to moderate this relation such that whenever the iSCI contradicted the eSCI, performance was expected to be weaker. More specifically, we presumed that individuals with a fragile SCI (high eSCI and low iSCI; in the upper right quadrant of Table 1) would have lower performance-based assessment of intelligence results than individuals with a consistently high SCI (upper left quadrant). Accordingly, individuals with a modest SCI (lower left quadrant) should show even worse performance than participants with a consistently low SCI (lower right quadrant). To test this hypothesis, three studies were conducted. In each study, assessment of participants' eSCI and iSCI was followed by a standard intelligence test focusing on crystallized intelligence (Study 1), fluid intelligence (Study 2) or both (Study 3).

In all three studies, the resulting performance-based assessment of intelligence scores were regressed on eSCI, iSCI and their interaction with the following hypotheses. In line with previous findings (Mabe & West, 1982; Paulhus & Morgan, 1997), the self-reported estimate of intelligence was expected to be at least partially accurate (i.e. we expected a main effect of eSCI on performance-based assessment of intelligence score; Hypothesis 1). Importantly, the stress hypothesis predicted that this effect would be moderated by iSCI (Hypothesis 2). In detail, participants with a fragile SCI were expected to have lower intelligence test scores than participants with a consistently high SCI (Hypothesis 2a), and individuals with a modest SCI were expected to perform

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worse than those with a consistently low SCI (Hypothesis 2b). In Study 3, we additionally assessed explicit and implicit self-esteem to establish that the observed effects were independent from or incremental to matters of self-esteem (Hypothesis 3).

STUDY 1

Study 1 was also conducted with the goal of establishing a psychometrically sound measure of individual differences on iSCI and to test its moderating effect. Intelligence was operationalized as participants' performance on a test of crystallized intelligence, which is defined as the ability to use specific, acquired knowledge.

Method

Participants

Seventy-four students (63 women, 11 men) of a variety of majors at the University of Koblenz-Landau participated in this study in exchange for monetary compensation. Their average age was 21.7 years ($SD = 4.0$).

Measures

Implicit self-concept of intelligence. First, participants completed an Implicit Association Test on the SCI (SCI-IAT; e.g., Greenwald, McGhee, & Schwartz, 1998). Target and attribute stimuli and task sequence for the SCI-IAT are presented in Table 2. The SCI-IAT was scored according to the improved scoring algorithm (D600) proposed by Greenwald, Nosek, and Banaji (2003); the scoring algorithm reflects the mean reaction time difference between two critical blocks (initial combined task vs. reversed combined task) in individual effect size units. For the purpose of estimating its internal consistency, the IAT was split into four parts by applying the scoring algorithm separately to these four subsets, and then Cronbach's alpha was calculated and examined (see also Greenwald et al., 2003).

Explicit self-concept of intelligence. An eight-item, short version of the standardized inventory for measuring self-estimated intelligence (Rammstedt & Rammsayer, 2002) was used to assess participants' eSCI. The items reflected seven primary mental abilities postulated by Thurstone (1938). An eighth item reflected general intelligence (*g*; Spearman, 1904). For each type of intelligence, a short description was provided (e.g., word fluency: 'efficient and adequate expression of words'). Participants responded to the items by using a visual analogue scale (scaled from 0 to 100) to indicate how well each type of intelligence characterized them.

Performance-based assessment of intelligence. Intelligence was assessed using a multiple-choice vocabulary test (MWTA; Mehrfachwahl-Wortschatztest Form A; Lehrl, Merz, Burkard, & Fischer, 1991). The MWTA consists of 34 items of increasing difficulty. Scores on the MWTA can range from 0 to 34 and are then recalculated into typical IQ scores with a mean of 100 and a standard deviation of 15. In each trial, examinees were shown a list of five words (one real word and four non-words) and were asked to choose the real word from the list.

Procedure

The study was conducted in the laboratory in group sessions of up to five individuals. Upon arrival, participants were seated at individual computer stations where they completed the SCI-IAT followed by the questionnaire measure of eSCI. Finally, participants completed the intelligence test, and then they were debriefed and thanked. All questionnaires, the SCI-IAT and the intelligence tests were computer administered.

Results

Internal consistencies (Cronbach's alpha) associated with each variable, descriptive statistics of each variable and intercorrelations between the variables are presented in Table 3. Reliabilities were satisfactory for all measures. Results from the SCI-IAT and the eSCI were found to be independent (i.e. they were not significantly correlated). No gender differences on either the eSCI or iSCI were found. Internal consistency of the MWTA ($\alpha = .83$) did not differ from the internal consistencies reported by Lehrl et al. (1991; α's > .83).

Table 2. Implicit Association Test of the self-concept of intelligence: Task sequence and stimuli

Block	No. of trials	Task	Response key assignment		Items
			Left key	Right key	
1	20	Attribute discrimination	Intelligent	Stupid	Intelligent, bright, clever, able, wise, stupid, dumb, foolish, silly, dense
2	20	Target discrimination	Me	Not me	Me, my, mine, self, not me, you, yours, theirs, it
3	60	Initial combined task	Intelligent or me	Stupid or not me	Intelligent, bright, clever, able, wise, me, my, mine, self, stupid, dumb, foolish, silly, dense, you, yours, theirs, it
4	20	Reversed target discrimination	Not me	Me	You, yours, theirs, it, me, my, mine, self
5	60	Reversed combined task	Intelligent or not me	Stupid or me	Intelligent, bright, clever, able, wise, you, yours, theirs, it, stupid, dumb, foolish, silly, dense, me, my, mine, self

Note: The original German stimuli can be obtained from the authors.

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Table 3. Descriptive statistics and correlations for all variables in Study 1

	(1)	(2)	(3)
(1) iSCI (IAT, D measure)	—		
(2) eSCI	0.02	—	
(3) Crystallized intelligence (MWTA)	0.05	0.45**	—
#	NA	8	34
α	0.84	0.86	0.83
M	0.56	55.24	99.81
SD	0.30	13.1	16.28
Min	–0.07	12	75
Max	1.30	100	137

Note: $n = 74$. #, number of items; α, internal consistency (Cronbach's alpha); eSCI, explicit self-concept of intelligence; IAT, Implicit Association Test; iSCI, implicit self-concept of intelligence; MWTA, multiple-choice vocabulary test.
**$p < .01$.

All variables were centred, and the cross product of iSCI and eSCI was calculated to create the interaction term for the regression analysis (Aiken & West, 1991). The hypotheses were tested by regressing crystallized intelligence test scores on iSCI, eSCI and their interaction term, $R^2 = .31$. The analysis revealed a significant main effect of eSCI, $\beta = .41$, $t(70) = 4.08$, $p < .01$. Individuals with a high eSCI performed significantly better than individuals with a low eSCI (supporting Hypothesis 1). Importantly, this effect was qualified by a significant two-way interaction between iSCI and eSCI, $\beta = .33$, $t(70) = 3.25$, $p < .01$ (supporting Hypothesis 2). Simple slope analysis revealed that individuals with a high eSCI showed a significant positive relationship between iSCI and MWTA, $\beta = .36$, $t(70) = 2.43$, $p < .05$ (see Figure 1). In line with the stress hypothesis (and Hypothesis 2a), individuals high on both types of SCI achieved significantly higher scores on the MWTA than participants with a fragile SCI (high eSCI and low iSCI). The relationship between iSCI and MWTA among individuals with a low eSCI, defined as an eSCI at least one standard deviation below the mean, was negative and significant, $\beta = -.31$, $t(70) = 2.14$, $p = .05$, suggesting that individuals with a consistently low SCI performed better than individuals with a modest SCI (low eSCI and high iSCI). The latter result supported Hypothesis 2b.

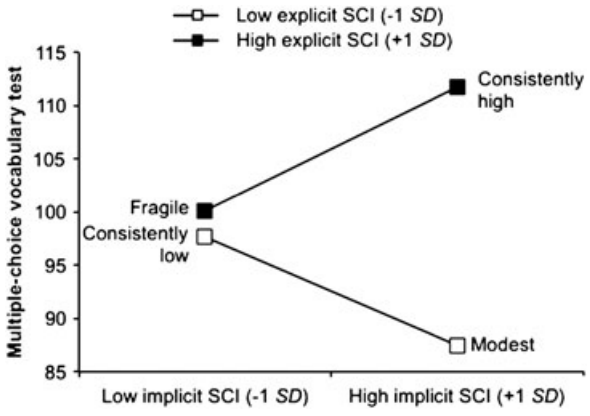

Figure 1. Predicted values for the multiple-choice vocabulary test (Study 1) as a function of explicit self-concept of intelligence and implicit self-concept of intelligence. SCI, self-concept of intelligence.

Discussion

The results supported our hypotheses: eSCI was a significant predictor of performance-based assessment of intelligence (Hypothesis 1), but this was qualified by an interaction with iSCI (Hypothesis 2). Furthermore, it was found that fragile individuals (those with a high eSCI and a low iSCI) performed worse on an intelligence test than individuals with a consistently high SCI (Hypothesis 2a). Individuals with a modest SCI (low eSCI and high iSCI) performed worse than individuals with a consistently low SCI (Hypothesis 2b). Despite the fact that these results are fully in line with our prediction, they might be seen as only preliminary support; thus, it seemed warranted to replicate these findings with a different performance-based assessment of intelligence.

STUDY 2

To replicate the findings from Study 1 and to further extend them with respect to the intelligence construct, in Study 2, the Advanced Progressive Matrices (Raven, Raven, & Court, 2003) were used as a measure of intelligence. This test is widely used and generally considered to be an assessment of fluid intelligence (Raven et al., 2003). In contrast to crystallized intelligence, fluid intelligence is defined as the ability to draw inferences and understand the relationships of various concepts, independent of acquired knowledge.

Method

Participants

Fifty-one students (38 women, 13 men) of a variety of majors at the University of Koblenz-Landau were recruited to participate in this study in exchange for monetary compensation. Their average age was 21.8 years ($SD = 2.4$).

Constructs and measurement instruments

The measures of iSCI and eSCI employed in Study 2 were identical to those used in Study 1.

Performance-based assessment of intelligence

Intelligence was assessed using the Advanced Progressive Matrices (Raven et al., 2003), a test of non-verbal inductive reasoning. Each of the 48 items on the test consists of a figure with three rows and three columns in which the lower, right-hand entry is left out. Eight possible solutions are provided. Participants are given the task of selecting the solution that correctly completes both the rows and columns in the figure.

Procedure

The procedure used in Study 2 was very similar to the procedure used in Study 1. First, participants completed the SCI-IAT, then filled in the questionnaires on eSCI and demographic data and, finally, completed the Raven Matrices.

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After completing all of the computer-administered measures, participants were fully debriefed and thanked.

Results

The descriptive statistics and internal consistency statistics (Cronbach's alpha) for all measures in Study 2 are reported in Table 4. The internal consistency levels of all of the measures were adequate. Table 4 also presents the intercorrelations of the measures. The measures of iSCI and eSCI were not found to be significantly correlated with each other. As in Study 1, no gender differences regarding eSCI and iSCI were found. The internal consistency of the Raven Matrices ($\alpha = .79$) did not differ from the internal consistencies reported by Raven et al. (2003; α's $> .79$). To determine whether iSCI and eSCI were related to the Raven Matrices scores, a multiple regression analysis was conducted.

Performance-based assessment of intelligence

Paralleling the analysis used in Study 1, all variables were centred, and the cross product of iSCI and eSCI was calculated to create the interaction term for the regression analysis (Aiken & West, 1991). Performance-based assessment of intelligence scores were regressed on iSCI, eSCI and their interaction term, $R^2 = .28$. The main effect of eSCI was significant, $\beta = .49$, $t(51) = 3.82$, $p < .01$, indicating that participants with a high eSCI tended to achieve higher scores on the intelligence test (Raven Matrices; supporting Hypothesis 1). As predicted, however, this effect was qualified by a significant interaction between iSCI and eSCI, $\beta = .27$, $t(51) = 2.16$, $p < .05$ (see Figure 2; supporting Hypothesis 2). Simple slope tests revealed that, among participants with a high eSCI (+1 *SD*), there was a significant positive relationship between iSCI and the Raven Matrices score, $\beta = .43$, $t(51) = 2.05$, $p < .05$. This confirmed Hypothesis 2a, as individuals with a consistently high SCI (high eSCI and high iSCI) performed significantly better on the Raven Matrices test than individuals with a fragile SCI (high eSCI and low iSCI). The relationship between iSCI and Raven Matrices scores among individuals with a low eSCI was negative, but not significant, $\beta = -.24$, $t(51) = 1.21$, $p = .23$, indicating a non-significant trend for participants with a consistently low SCI to perform better than participants with a modest SCI. Thus, Hypothesis 2b was not fully supported.

Table 4. Descriptive statistics and correlations for all variables in Study 2

	(1)	(2)	(3)
(1) iSCI (IAT, D measure)	—		
(2) eSCI	–0.06	—	
(3) Raven Matrices	0.05	0.41**	—
#	NA	8	48
α	0.83	0.84	0.79
M	0.54	51.88	99.97
SD	0.29	15.4	14.98
Min	–0.11	11	74
Max	1.41	100	125

Note: $n = 51$. #, number of items; α, internal consistency (Cronbach's alpha); eSCI, explicit self-concept of intelligence; IAT, Implicit Association Test; iSCI, implicit self-concept of intelligence.
**$p < .01$.

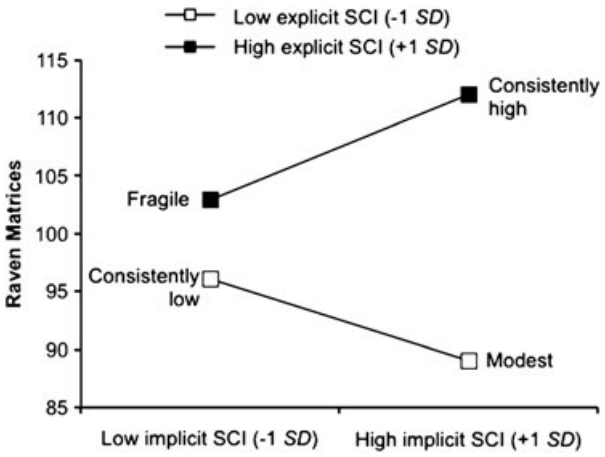

Figure 2. Predicted values for Raven Matrices (Study 2) as a function of explicit self-concept of intelligence and implicit self-concept of intelligence. SCI, self-concept of intelligence.

Discussion

The results of Study 2 corroborated the results of Study 1. Not only participants' performance on the test of fluid intelligence was predicted by their self-estimate (eSCI) but also the correspondence between the levels of iSCI and eSCI. Individuals with a consistently high SCI (high eSCI and high iSCI) scored higher on the intelligence test than participants with a fragile SCI (high eSCI and low iSCI). As in Study 1, among individuals who had a high eSCI, performance-based assessment of intelligence varied as a function of their level of iSCI. The finding that a discrepant SCI leads to worse performance also for those individuals with a low eSCI was found only descriptively in Study 2.

The first two studies provided consistent results fully in line with our predictions: intelligence test performance was systematically related to the configuration of eSCI and iSCI. These findings complement existing research that has shown effects of explicit–implicit discrepancy in the realm of self-esteem on a number of emotional outcome variables. Although the SCI may be related to self-esteem, we propose that it is not general (explicit and implicit) self-evaluation that predicts performance-based assessment of intelligence, but rather a person's (explicit and implicit) self-representation as intelligent (SCI). This hypothesis was tested in Study 3.

STUDY 3

Although in Studies 1 and 2, the idea of a moderating effect of iSCI on the relationship between eSCI and intelligence test scores was tested, the main goal of Study 3 was to test whether the relationship between eSCI and iSCI and performance-based assessments of intelligence was unique

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and independent of the more general constructs of implicit and explicit self-esteem (Hypothesis 3). This question is important for determining whether the effects found in Study 1 and Study 2 are due to people generally having a positive connotation of intelligence such that the results could be explained by general self-esteem. Therefore, one goal of Study 3 was to determine the discriminant validity of the SCI with respect to self-esteem. Furthermore, Hypotheses 1 and 2 from Study 1 were tested again.

Self-concept of intelligence versus self-esteem

We predicted that iSCI and eSCI would have unique and independent value over and above the value of implicit self-esteem and explicit self-esteem in predicting performance on intelligence tests (Hypothesis 3). In Study 3, intelligence was operationalized as and measured by participants' performance on a general intelligence structure test that includes both crystallized intelligence, examined in Study 1, and fluid intelligence, examined in Study 2.

Method

Participants

A total of 108 students (80 women, 28 men) studying different majors at the University of Koblenz-Landau participated in the present study in exchange for monetary compensation. Their average age was 22.1 years ($SD = 3.1$).

Constructs and measurement instruments

The measures of iSCI and eSCI were the same as those used in Studies 1 and 2.

Implicit self-esteem. As a measure of implicit self-esteem, a self-esteem IAT was used (Greenwald & Farnham, 2000; Schröder-Abé, Rudolph, & Schütz, 2007) with target concept discrimination among three self-relevant (I, me, my) and three non-self-relevant words (they, them, their), and attribute discrimination between six pleasant (e.g., rainbow, sunshine, joy) and six unpleasant words (e.g., pain, death, poison).

Explicit self-esteem. A German version of the Rosenberg (1965) Self-esteem Scale (RSES; von Collani & Herzberg, 2003) was used to assess explicit self-esteem. The RSES contains 10 items, an example of which is 'I feel I am a person of worth, at least on an equal basis with others'.

Performance-based assessment of intelligence. Intelligence was assessed using subtests of the German Intelligence Structure Test 2000 R (IST 2000 R; Liepmann, Beauducel, Brocke, & Amthauer, 2007). The test consists of 20 verbal analogy items, 20 math problems and 20 abstract reasoning tasks. Each verbal analogy item presented one target word along with a set of answer options from which participants were asked to choose the word most like the given target word. The 20 math problems required a variety of operations, such as adding two fractions and reducing to the lowest term. The most difficult problems required more than one operation. The abstract reasoning tasks each presented a figure with two rows and columns with the lower right-hand entry left out. The correct response for completing the figure had to be chosen from five possible alternative solutions.

Procedure

The procedure used in Study 3 was similar to the procedures used in Studies 1 and 2. Participants first completed the SCI-IAT and the self-esteem IAT, then the questionnaire measures of eSCI and explicit self-esteem, and finally, the intelligence test. Participants were then debriefed and thanked. All questionnaires, IATs and the intelligence test were computer administered.

Results

Descriptive statistics and internal consistencies (Cronbach's alpha) for all measures as well as intercorrelations between all measures used in Study 3 are presented in Table 5. The internal consistencies of the IATs were above .80. The SCI-IAT and the self-esteem IAT were moderately correlated, $r = .34$, $p < .01$. In addition, explicit self-esteem was also related to eSCI, but there were no cross-modal correlations

Table 5. Descriptive statistics and correlations for all variables in Study 3

	(1)	(2)	(3)	(4)	(5)
(1) iSCI (IAT, D measure)	—				
(2) iSE (IAT, D measure)	0.34**	—			
(3) eSCI	–0.09	–0.13	—		
(4) eSE	–0.13	0.00	0.24*	—	
(5) IST	0.05	0.13	0.55**	0.17	—
#	NA	NA	8	10	60
α	0.81	0.84	0.89	0.89	0.88
M	0.56	0.51	54.12	25.14	99.75
SD	0.31	0.29	14.8	8.23	15.22
Min	–0.14	–0.12	12	17	70
Max	1.21	1.43	100	40	128

Note: $n = 108$. #, number of items; α, internal consistency (Cronbach's alpha); eSCI, explicit self-concept of intelligence; eSE, explicit self-esteem; iSCI, implicit self-concept of intelligence; iSE, implicit self-esteem; IAT, Implicit Association Test; IST, Intelligence Structure Test.
*$p < .05$.
**$p < .01$.

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(i.e. between any IAT and any self-report measure). Gender differences were found only for explicit self-esteem but not for implicit self-esteem, eSCI and iSCI. Internal consistency of the subtests of the Intelligence Structure Test ($\alpha = .88$) did not differ from the internal consistencies reported by Liepmann et al. (2007; α's > .88).

To determine whether iSCI and eSCI predicted the participants' score on the intelligence test independently of implicit and explicit self-esteem, a moderated multiple regression analysis was conducted. First, intelligence scores were regressed on the centred implicit self-esteem score, the centred explicit self-esteem score and the interaction between them. No significant amount of variance in performance on the intelligence test was predicted by the self-esteem terms, $R^2 = .10$. Furthermore, the predictors (main effect and interaction) were not significant individually, p's > .31.

Next, the centred iSCI score, centred eSCI score and their interaction term were added to the same regression equation, which led to a significant increase in explained variance, $\Delta R^2 = .28$. The regression analysis ($R^2 = .38$) revealed a significant main effect of eSCI, $\beta = .58$, $t(104) = 6.68$, $p < .01$. That is, participants with high eSCI scores performed better on the intelligence test than participants with low eSCI scores (Hypothesis 1). Furthermore, a significant two-way interaction between iSCI and eSCI, $\beta = .28$, $t(104) = 3.74$, $p < .01$, was uncovered. The interaction was positive, indicating that individuals with a consistent SCI scored higher on the intelligence test than individuals with a discrepant SCI (Hypothesis 2; see Figure 3).

Additional simple slope analyses (Cohen & Cohen, 1983) revealed a significant positive relationship between iSCI and scores on the intelligence test for participants with a high eSCI, $\beta = .36$, $t(104) = 2.43$, $p < .05$ (Hypothesis 2a). Participants with a consistently high SCI (high eSCI and high iSCI) performed significantly better than fragile participants (high eSCI and low iSCI). Among individuals with a low eSCI, the relationship between iSCI and performance on the intelligence test was significantly negatively correlated, $\beta = -.31$, $t(104) = 2.14$, $p < .05$, indicating lower performance on the intelligence test for individuals with a modest versus a consistently low SCI (Hypothesis 2b).

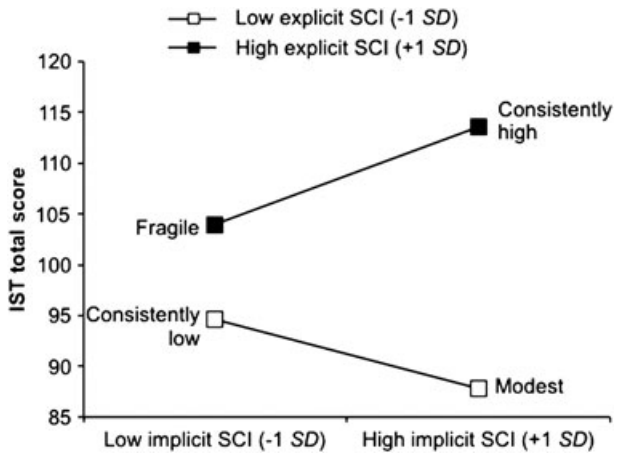

Figure 3. Predicted values for the aggregated intelligence total score (Study 3) as a function of explicit self-concept of intelligence and implicit self-concept of intelligence. IST, Intelligence Structure Test; SCI, self-concept of intelligence.

To rule out the possibility that the moderator effect of iSCI is unspecific and could also be observed for implicit self-esteem, a regression model was tested with eSCI as the predictor of intelligence test performance and implicit self-esteem as the moderator. Only the main effect of eSCI was significant. Implicit self-esteem had no significant main effect on test performance. More importantly, the interaction between eSCI × implicit self-esteem was also not significant. This result suggests that the implicit × explicit interaction effect that was observed in all three studies is a specific effect of the intelligence self-concept that cannot be explained with a self-esteem effect.

Discussion

In summary, Hypothesis 1, postulating that eSCI is a valid predictor of intelligence test performance was fully supported by the main effect of eSCI. Hypothesis 2, the stress hypothesis, was also supported by the worse performance of fragile and modest individuals compared with consistently high and consistently low individuals. Hypothesis 3, which stated that the relationship between iSCI and eSCI and performance-based assessment of intelligence is unique and independent of the more general construct of implicit and explicit self-esteem, was also fully supported.

GENERAL DISCUSSION

Across the three studies, we have provided remarkably consistent results for the relation between eSCI and iSCI with performance-based assessments of intelligence, above and beyond mere self-esteem. Results from the three studies, by using three different established measures of intelligence (tapping into crystallized as well as fluid intelligence), have provided strong convergent evidence that iSCI moderates the relationship between eSCI and performance on intelligence tests. Individuals with a consistently high or low SCI robustly performed better across intelligence tests than their respective counterparts with discrepant SCIs. Results from Study 3 indicated that this effect was independent of implicit and explicit self-esteem, indicating discriminant validity—and thus the unique, conceptual value—of the iSCI with respect to implicit self-esteem.

This research was the first to explore the effect of performance impairment for discrepant self-concepts of intelligence. We based our reasoning on the stress hypothesis that any kind of discrepancy between internal representations may result in adverse outcomes. Despite the fact that all three studies showed a noteworthy convergence in line with this hypothesis, the actual reasons or underlying mechanisms remain yet to be explored. Discrepancy may be related to cognitive as well as motivational factors that reduce performance. In fact, it may very well be that the reasons for performance impairment are not identical for the two types of discrepant configurations of the SCI.

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Individuals with a fragile SCI (i.e. a weak automatic association of the self with intelligence but a strong claim of being intelligent) had consistently lower intelligence test scores than participants whose explicit claim of intelligence was accompanied by a corresponding automatic association of the self with intelligence (consistently high SCI). Although highly speculative at this point, several routes of explanation seem plausible for this effect. In line with recent theories on the acquisition of implicit associations (Gawronski & Bodenhausen, 2006; Grumm et al., 2009), their low iSCI may reflect a repeated connection between 'self' and 'not intelligent'. By contrast, self-reports (eSCI) reflect explicit representations that can easily be adapted and changed by propositional mechanisms (Gawronski & Bodenhausen, 2006; Strack & Deutsch, 2004). Thus, individuals may associate themselves automatically with intellectual failure, but still claim to be smart, resulting in a highly fragile self-concept. Following this reasoning, it seems straight forward to suggest that their impaired performance is not the result of a lack of motivation but is due to cognitive factors instead. These could either relate to their actual abilities or take the form of a self-fulfilling prophecy of their low iSCI: in particular, their low iSCI may trigger anxious rumination and worrying that distract them from the actual task. In line with such a contention, participants with a fragile SCI were particularly vulnerable to a stereotype threat manipulation precisely because they showed a greater degree of worry after a stereotype threat manipulation (Dislich, Imhoff, & Schmitt, unpublished data). Future research will have to explore whether it is this kind of worry that also explains the robust effects reported here.

The case may be a little different for modest individuals, however. Their automatic association between the self and intelligence (iSCI) contradicts their claim of being less intelligent (eSCI), but it does not seem plausible that this would lead them to worry. First, it is not surprising that modest individuals do not perform very well. After all, they never claimed differently, and people can be assumed to have a (moderately) accurate knowledge of their intellectual abilities. However, the fact that they performed worse than individuals with a consistently low SCI (in two out of three studies, significantly worse; in one study, at least descriptively worse) deserves some attention. If it is true that their high iSCI is the result of repeated pairings of the 'self' and 'intelligent' (i.e. previous intellectual success), why would they claim a lack of intelligence explicitly and why would they not perform better? One direction for future research would be to look at motivational aspects. In line with the definition of modesty as the public understatement of one's favourable traits and abilities (Cialdini, Wosinski, Dabul, Whetstone-Dion, & Heszen, 1998), they may simply downplay their intellectual abilities in self-reports (eSCI) because they have no desire to stand out as intelligent. The same lack of desire may also be (at least in part) responsible for their weak performance on tests of intelligence. Preliminary evidence has suggested that it is indeed the case that modest SCI configurations are related to particularly low achievement motivation (Dislich, Imhoff, Altstötter-Gleich, Zinkernagel, & Schmitt, unpublished data). However, at present, these results remain preliminary, and future research will have to provide a clearer picture based on process analyses.

Limitations and future directions

A first limitation of the presented studies is their correlational design. Thus, the causal order could be the other way around (i.e. individuals who are more intelligent are better at resolving discrepancies in their self-concept; for example, by adapting implicit views to their explicit ones or vice versa). To address this hypothesis in future research, the causal order could be established by experimentally varying the discrepancies (i.e. reducing or enhancing eSCI and iSCI). One possible way to do this lies in the adaptation of procedures used by studies of self-esteem by Dijksterhuis (2004) and Grumm et al. (2009). Dijksterhuis as well as Grumm et al. was able to manipulate individuals' implicit self-esteem by using evaluative conditioning, and Grumm et al. were able to manipulate individuals' explicit self-esteem by using an imagination task. In these procedures, implicit and explicit self-esteem were manipulated independently so that the manipulation affected only the intended form of self-esteem (e.g., implicit, explicit) and did not affect the other form.

A second limitation of our studies results from the collection of all measures in a single session, with performance measured immediately after the measurement of eSCI and iSCI. This may have led to an increase in salience of the inconsistencies between eSCI and iSCI, and thus, the question arises as to whether individuals with inconsistent eSCI and iSCI would suffer a decrease in performance-based assessment of intelligence if their iSCI was not made salient immediately beforehand. In future research, this concern could be solved by separating the measurement of the self-concepts and the performance-based assessment of intelligence into two sessions.

Conclusion

In summary, the present work contributes to an understanding of the relationship between self-concept consistency and performance on intelligence tests by demonstrating that the association of discrepant and consistent self-associations with performance differs systematically. The current measurement approach, assessing individual differences in automatic and in controlled dispositions, provides new information for constructing a more complete depiction of intelligence-related self-associations than approaches that focus only on self-reported intelligence estimates or broader constructs such as self-esteem.

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