Bridging the gap between explicit and implicit measurement of personality: The questionnaire-based implicit association test

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ABSTRACT

This study presents the questionnaire-based implicit association test (qIAT), a method that resembles the assessment procedures of self-report scales and allows an implicit assessment of constructs measured by such instruments. The qIAT measures the speed of association between ordinary questionnaires' items (i.e., short statements rather than single words) and true versus false self-related sentences. Participants completed self-report measures of all Big-Five domains and the qIAT that measured extraversion. The qIAT implicit extraversion score showed good levels of internal consistency and it correlated with explicit extraversion but not with other explicit scales, thus supporting the convergent and discriminant validity of this measure. It also predicted a criterion behavior, and this prediction was incremental to self-report assessment of the same set of items. The qIAT opens the door for the indirect assessment of numerous psychological phenomena measured by existing self-report scales.

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1. Introduction

Personality and psychopathology assessment is based to a large degree on explicit measures (e.g., self-report questionnaires, structured interviews), which assess introspectively available aspects of the self that are deliberately revealed. Unfortunately, however, people do not always provide accurate information about themselves. Inaccurate information is sometimes provided intentionally, as explicit assessment methods are susceptible to a variety of self-report strategies (Nunnally & Bernstein, 1994). This is a major concern in settings where people may be particularly motivated to appear in positive or negative light when trying, for example, to obtain benefits or please other individuals such as experimenters or treatment providers. Inaccurate information about the self may also be provided unintentionally. Much evidence suggests that consciously available self-knowledge is inherently biased and incomplete because a great deal of mental processing occurs outside of awareness (Wilson, 2009).

Researchers have long been interested in indirect assessment methods that do not rely on explicit self-report procedures (e.g., projective tests). This issue has received much attention since

the development of paradigms such as the implicit association test (IAT; Greenwald, McGhee, & Schwartz, 1998), which are designed to tap information that may be less accessible to controlled processes. The IAT is a double categorization reaction-time task that can measure, for example, the extent to which individuals associate certain attributes with themselves (e.g., "me" versus "others" and "anxious" versus "calm"). Despite existing controversies about the nature of implicit assessment (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009) and concerns that have been raised regarding its reliability (LeBel & Paunonen, 2011), a rapidly growing body of literature demonstrates the added value of this type of measurement (Greenwald, Poehlman, Uhlmann, & Banaji, 2009; Roefs et al., 2011).

Accumulating findings suggest that implicit measures often provide information that is incremental to other forms of assessment in a wide variety of contexts, ranging from therapy outcome studies in which clients may feel pressured to show improvement as treatment progresses (Teachman, Marker, & Smith-Janik, 2008), to evaluations of pedophiles who disguise their sexual attraction towards children (Gray, Brown, MacCulloch, Smith, & Snowden, 2005). For example, in a recent study that demonstrated the utility of the IAT, Nock et al. (2010) used this task to measure the strength of automatic associations between the self and death-related words (e.g., *dead*, *suicide*) among individuals seeking emergency psychiatric treatment. This implicit measure predicted future suicidal attempts over and above other predictors and known risk factors, including self-reported suicidal ideation, clinician and patient

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predictions, history of suicide attempts and a diagnosis of a depressive disorder.

Notwithstanding their limitations, self-report instruments provide access to numerous unique constructs associated with many different emotional, cognitive, behavioral, and social aspects of the self. Compared to that, the scope of implicit assessment of self-knowledge has been much narrower (Wilson, 2009), and the type of verbal stimuli implicit tasks used (i.e., single words) enable the measurement of a relatively limited range of psychological phenomena. As evidenced by the nature of the items of most personality questionnaires (typically short statements), the operationalization of many constructs requires semantic specificity, complexity and flexibility that cannot be provided by single words.

Attempting to expand the limits of implicit assessment, we developed the questionnaire-based IAT (qIAT), a reaction-time task that was designed to enable an indirect measurement of standard self-report questionnaires. Particularly, the qIAT allows an implicit assessment that is based on responses to the original items of such questionnaires, and compared to other versions of the IAT, the categorization task it uses resembles more closely the instructions of most self-reports. A method that enables an implicit assessment of existing questionnaires, which measure numerous different constructs, holds a potential pragmatic value (e.g., improved prediction of behavior; see Back, Schmukle, & Egloff, 2009). Such a method may also lead to a fuller understanding of the constructs measured by these scales, as the information provided by implicit measures is often incremental to other types of assessment (Greenwald et al., 2009). Moreover, although implicit and explicit measures are frequently compared in the literature, in many cases each measurement is based on responses to a different set of items. Indeed, Payne and colleagues (Payne, Burkley, & Stokes, 2008) found that implicit-explicit correspondence increased as the stimuli in the two measures became more similar, and a meta analytic review showed that methodological fit between IAT and explicit measures was a significant moderator of explicit-implicit correlations (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). A greater methodological similarity between explicit and implicit modes of assessment is likely to facilitate research on the accuracy of different aspects of self-knowledge (Wilson, 2009).

The methodology of the qIAT is based on the autobiographical IAT (aIAT; Sartori, Agosta, Zogmaister, Ferrara, & Castiello, 2008), which is a recently developed lie-detection tool designed to be used in forensic settings (e.g., crime investigations). The qIAT enables the implicit assessment of standard questionnaires' original items based on the speed of association between such items and true versus false self-related sentences. Specifically, this task measures the classification speed of items (e.g., "*I don't talk a lot*", "*I start conversations*") to relevant categories (e.g., *introvert person* versus *extravert person*), when they need to be categorized interchangeably with self-related statements (e.g., *I'm in a psychology laboratory*, *I'm playing soccer outside*) that need to be classified to logical (i.e., *true* versus *false*) categories.

The qIAT was specifically designed to resemble standard self-report assessment procedures, and the methodology it uses differs from earlier IAT-based measures of personality in two major ways. First, compared to the "me versus others" categorization used in many IAT studies, double classification of items with true versus false self-related statements is conceptually closer to the instructions of most self-reports, in which respondents are asked to rate the extent to which certain statements are true for them. In addition, while the target stimuli in earlier versions of the IAT that were used for personality assessment were single words, similarly to most self-report instruments measurement in the qIAT is based on responses to sentences of variable length.

The aim of this study was to test the methodology of the qIAT and examine the validity of the measurement it provides. To do that, we followed many earlier implicit assessment studies (e.g., Back et al., 2009) and used an instrument that measures the domains of the Big-Five model of personality. Importantly, however, assessment here was based on a standard questionnaire (Goldberg, 2005), which contains short statements rather than single words. Implicit assessment focused on extraversion, and we expected that the implicit measure of extraversion of the qIAT would correlate with the explicit measure of this scale and not with the other Big-Five scales.

2. Methods

2.1. Participants

Participants were 88 consented undergraduates (63 females; mean age = 23.87, SD = 2.35), who received course credit. One participant was excluded due to technical reasons. Analyses were based on the remaining 87 participants.

2.2. Personality measurement

2.2.1. Explicit measures

Standard self-report assessment included the 50-item International Personality Item Pool questionnaire (Goldberg, 2005), which measures the personality domains of the Big-Five factor structure (Agreeableness, Conscientiousness, Extraversion, Emotional Stability, Intellect; McCrae & Costa, 1987). Each dimension was measured by a 10-item subscale. Items were rated on a 1–5 Likert scale. Internal consistencies (Cronbach's Alphas) in the current study were 0.91 for Extraversion, 0.91 for Emotional Stability, 0.82 for Agreeableness, 0.82 for Conscientiousness, and 0.79 for Intellect.

2.2.2. Implicit measure

Implicit measurement was based on the qIAT, a brief classification task in which the general methodology of the aIAT (Sartori et al., 2008) was followed. The qIAT included seven blocks. On each trial a sentence was presented at the center of the computer monitor, and participants needed to classify it as quickly and as accurately as possible using one of two designated response keys. In Block 1 (40 trials), participants were introduced to the classification of the personality categories, labeled *extravert person* (the five non-reversed extraversion items) versus *introvert person* (the five reversed extraversion items; all stimuli are presented in Table 1). In Block 2 (20 trials), they were introduced to the classification of the self-related logical categories, labeled *true* (e.g., "*I'm participating in an experiment in psychology*") versus *false* (e.g., "*I'm shopping at the local grocery store*"). In Block 3 (20 trials) and Block 4 (40 trials), participants performed these tasks interchangeably (first double categorization; e.g., *extravert person* and *true* versus *introvert person* and *false*). In Block 5 (40 trials), they practiced the reversed classification of the personality category, and in Blocks 6 and 7 (second double categorization), they again classified the sentences based on both categories, this time using the reversed trait classification (e.g., *introvert person* and *true* versus *extravert person* and *false*). In all trials, the labels of the categories remained on the computer screen as a reminder, and an error signal appeared after an incorrect response (i.e., erroneous classification) was made. Personality items and true versus false sentences were presented in alteration in the double-categorization blocs. The order of the double-categorization blocks was counterbalanced across participants.

Reaction-times and error responses for all trials were recorded. For each participant we calculated a D score, following Greenwald, Nosek, and Banaji (2003) improved scoring algorithm. Larger positive D's represent a stronger association between the non-reversed

Table 1
Stimuli used in the qIAT.

Category	Stimuli
True	I'm in a building in Mount Scopus campus
	I'm in a small room with a computer
	I'm participating in an experiment in psychology
	I'm in a psychology laboratory
	I'm sitting in front of the computer
False	I'm climbing a steep mountain
	I'm sitting on the sand at the beach
	I'm playing my electric guitar
	I'm playing soccer outside
	I'm shopping at the local grocery store
Extravert person	I am the life of the party
	I feel comfortable around people
	I start conversations
	I talk to a lot of different people at parties
	I don't mind being the center of attention
Introvert person	I don't talk a lot
	I keep in the background
	I have little to say
	I don't like to draw attention to myself
	I am quiet around strangers

Note: qIAT = questionnaire-based implicit association test.

extraversion items and the self-related true category (i.e., faster responses on the *extravert person/true* versus *introvert person/false* blocks relative to the *introvert person/true* versus *extravert person/false* blocks). Thus, similarly to the total score of the self-report instrument, individuals higher on extraversion are expected to have larger D's.

2.3. Procedure

Participants completed the experiment individually on a computer. Earlier versions of the IAT have shown to be fairly robust against explicit–implicit order effects (Hofmann et al., 2005). However, in the present study, a carryover effect from the implicit measurement (in which each extraversion item was presented many times) to the explicit measurement (in which extraversion items were presented only once along with the items of the other Big-Five scales) seemed particularly likely, because both measurements used the same complex verbal stimuli. Therefore, to avoid inflated explicit–implicit correlations, the self-report scales were administered first. In the qIAT, participants viewed the display from a distance of 45 cm, which was controlled by a chin rest. In addition to the qIAT, participants completed another version of the IAT designed to test a different hypothesis.[1]

3. Results and discussion

3.1. Reliability of the qIAT

Across all seven blocks of the qIAT, response latencies ($M = 1143.08$, $SD = 227.42$) were comparable to those reported for the aIAT (Sartori et al., 2008), and RT correlated with sentence length (number of characters), $r (23) = 0.69$, $p < .001$, $d = 1.91$. A univariate ANOVA indicated that gender did not affect the D score of the qIAT ($F < 1$).

We computed two different estimates of internal consistency for the qIAT. We first calculated the correlation between a D score

that was based on the practice blocks (Blocks 3 and 6) and another D that was based on the critical blocks (Blocks 4 and 7; see Greenwald et al., 2003). The obtained correlation was $r = 0.68$ ($p < .001$, df's = 85, unless otherwise specified), which is comparable or superior to those reported by Greenwald et al. (2003) for standard versions of the IAT that were based on single-word stimuli. We also computed the split-half reliability for the qIAT (correlation between odd and even critical trials, Spearman-Brown corrected), which was $r_{tt} = 0.87$. Thus, despite the expected relationship between RT and sentence length, the internal consistency of the qIAT was in par with those demonstrated by earlier versions of the IAT, in which assessment was based on responses to single words.

3.2. Convergent and discriminant validity

The use of Greenwald et al.'s (2003) improved scoring algorithm is expected to reduce the method-specific variance in IAT tasks (see Back, Schmukle, & Egloff, 2005). Indeed, the correlation between the qIAT and the additional IAT task that was administered here was not significant ($r = 0.16$, $p > 0.1$), suggesting that the extent to which method-specific variance contaminated the D score of the qIAT was small.

Supporting the convergent validity of the qIAT, it correlated with explicit extraversion ($r = 0.36$, $p < 0.001$, $d = 0.77$). In contrast, none of the correlations between the implicit qIAT extraversion measure and all other explicit Big-Five measures was significant, r's ranged between -0.05 (for conscientiousness) and 0.09 (for emotional stability, all p's > 0.35). These four correlations were all significantly smaller than the obtained correlation between the qIAT D and the parallel explicit extraversion measure (z's > 2.63, p's < 0.01).

A more detailed examination of the convergent and discriminant validity of the qIAT D score showed that it correlated with eight of the ten explicitly measured extraversion items (see Table 2). Interestingly, the two explicit extraversion items that did not correlate significantly with this implicit measure were the ones that were least related to the total explicit extraversion score (based on corrected item-total correlations). In contrast, only one of the 40 items that measured other Big-Five domains (the Emotional Stability item "*Get upset easily*") correlated significantly with the qIAT D score ($r = 0.25$, $p < 0.05$). For the remaining 39 items, r's ranged between -0.14 and 0.17, all p's > 0.10. Taken together, the pattern of relationships of the qIAT D with the explicit measures supports the convergent and discriminant validity of this implicit assessment method.

Table 2
Correlations between the explicitly measured extraversion items and the explicit and implicit measures of extraversion.

Extraversion items (explicit measure)	Explicit scale (total score)	qIAT (D score)
I am the life of the party	0.68***	0.37**
I don't talk a lot (r)	0.70***	0.27*
I feel comfortable around people	0.55***	0.03
I keep in the background (r)	0.80***	0.26*
I start conversations	0.66***	0.25*
I have little to say (r)	0.65***	0.40**
I talk to a lot of different people at parties	0.77***	0.28**
I don't like to draw attention to myself (r)	0.68***	0.27*
I don't mind being the center of attention	0.53***	0.17
I am quiet around strangers (r)	0.76***	0.34**

Note: Correlations with the explicit scale are corrected item-total correlations. qIAT = questionnaire-based implicit association test; r = reversed.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

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[1] Target items in this task were classified to the categories *trait/behavior* (non-reversed extraversion items) versus *external description* (e.g., "*I have green eyes*"). The reliability of this task was $r_{tt} = 0.78$, and it did not correlate with explicit extraversion ($r = 0.03$).

3.3. Prediction of behavior

Extraversion has long been linked to impulsivity and to proneness to errors in reaction-time paradigms (e.g., Dickman, 1990; Eysenck & Eysenck, 1977; Kirkcaldy, 1984). Therefore, we examined whether the two measures of extraversion correlated with errors in the additional version of the IAT task administered here. In line with earlier studies (e.g., Kirkcaldy, 1984), the number of errors in that task ($M = 11.37$, $SD = 10.27$) correlated with explicit extraversion ($r = 0.30$, $d = 0.63$, $p = 0.004$). None of the other Big-Five explicit measures correlated with errors (r's ranged between -0.08 and -0.01, all p's > 0.40). More importantly, the implicit qIAT D score also correlated with errors ($r = 0.33$, $d = 0.70$, $p = 0.002$), thus further supporting the validity of this assessment method.

To examine whether the qIAT added incrementally to the prediction of errors beyond the explicit extraversion measure, we performed a hierarchical regression analysis in which explicit extraversion was entered in the first step and the implicit qIAT D was added in the second step. As Table 3 shows, Step 2 in this analysis predicted a significant increment of the variance ($p < 0.05$), thus revealing that the relative contribution of the implicit assessment of the qIAT to the prediction was significant over and above the self-report extraversion measure. This pattern is consistent with findings of earlier studies (e.g., Asendorpf, Banse, & Mucke, 2002; Steffens & Konig, 2006), in which implicit measures of personality were useful in predicting behaviors that are not deliberately controlled. The betas in Step 2 also indicate that both the qIAT and the self-report measure uniquely predicted the number of errors participants made. Thus, the implicit qIAT and the explicit self-report measurement were based on the same set of items, but each type of extraversion assessment independently accounted for a different aspect the variance of the criterion behavior. More research is needed to further elucidate the nature of the connections between extraversion and impulsivity, which goes beyond the scope of this report (see DeYoung, 2011; Eysenck & Eysenck, 1977). In terms of the aims of the present study, these findings suggest that the implicit assessment of self-report instruments by the qIAT may improve prediction of behavior and provide a better insight into the constructs these instruments measure.

3.4. Conclusions

Assessment in many self-report questionnaires is based on respondents' ratings of the extent to which each of a set of short statements is true for them. The qIAT was designed to closely resemble these procedures. Compared to other implicit assessment paradigms, this task uses more complex and elaborated semantic stimuli, and it therefore enables the measurement of a broader range of psychological phenomena. Most importantly, it provides the means for the indirect assessment of constructs tapped by existing self-report questionnaires related to nearly all fields of psychological enquiry.

Table 3
Hierarchical regression analysis predicting number of errors in the additional task.

Steps	Predictors	R	ΔR^2	β	t
Step 1		0.30**	0.09**		
	Explicit (self-report)			0.30	2.93**
Step 2		0.39***	0.06*		
	Explicit (self-report)			0.21	1.96*
	Implicit (qIAT D score)			0.26	2.41*

Note: Explicit and implicit measures were based on the same extraversion items. qIAT = questionnaire-based implicit association test.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

The present results indicate that an implicit assessment that is based on the original items of standard self-reports is feasible. These results are consistent with the basic findings that emerge across the numerous studies in which implicit assessment was based on single-word stimuli (cf. Hofmann et al., 2005). In terms of convergent and discriminant validity, the implicit measure of the scale on which we focused (extraversion) obtained by the qIAT was related to the explicit self-report assessment of the same scale but not to any of the other explicitly measured scales (i.e., other Big-Five domains). Moreover, the explicitly measured extraversion items showed a similar pattern of relationships with the explicit and implicit measures of this construct. As to predictive validity (cf. Greenwald et al., 2009), both the explicit and implicit measures of extraversion predicted a criterion behavior. However, despite the relationship between these two measures, the qIAT yielded unique information that was not provided by ordinary self-report measurement of the exact same set of items. Taken together, results indicate that an implicit assessment that is based on the original items of standard questionnaires is feasible, and they support the validity and potential utility of this indirect measurement.

The present findings were obtained despite the expected strong correlation between sentence length and RT in the qIAT. As Nosek and Greenwald (2009) noted, all measures involve automatic and non-automatic processes, and an implicit measure does not need to be composed entirely of automatic or unconscious components. The implicitness of a measurement refers to the respondent's lack of awareness of certain aspects of the response, the construct being measured, or the link between them (see also De Houwer et al., 2009). Thus, the measurement the qIAT yields is considered implicit mainly because it is based on facilitation and inhibition processes stemming from the different pairing combinations (e.g., *introvert person* and *true* versus *extravert person* and *false*), and not on direct ratings (e.g., on a Likert scale) or categorizations (e.g., to true versus false categories) of personality items.

3.5. Future directions

Several methodological aspects of this task (e.g., robustness to explicit–implicit order effects) require further examination (cf. Nosek, 2005). Also, the qIAT was internally consistent (see LeBel & Paunonen, 2011), but other aspects of reliability (e.g., test–retest) need to be verified. The accuracy of the aIAT (on which the qIAT is based) as a lie detection tool has been confirmed at the individual level (Sartori et al., 2008), but the extent to which it is resistant to faking is unclear (Agosta, Ghirardi, Zogmaister, Castiello, & Sartori, 2011; Verschuere, Prati, & De Houwer, 2009). It should be noted that in general the IAT effect is susceptible to extraneous factors, and several studies have shown that people are able to influence both the direction and the magnitude of the score this task yields (e.g., Czellar, 2006; De Houwer, Beckers, & Moors, 2007; Steffens, 2004). The convergence of the qIAT with other implicit tasks should also be examined. Indeed, the low correlations among implicit measures has long been a thorny issue in this field (Fazio & Olson, 2003), to the extent that the construct validity of these measures has been questioned (e.g., Ziegler, Schmukle, Egloff, & Bühner, 2010). The present study provided initial support for the validity of the qIAT, but this assessment procedure should be tested in additional personality domains and against different behavioral criteria. It will be particularly useful to examine the performance of the qIAT in areas in which implicit and explicit measures have been shown to provide different predictions (e.g., Asendorpf et al., 2002). Finally, questionnaires that do not include reversed items cannot be measured by the qIAT. Hopefully, future methodological developments (e.g., modifications of tasks that measure absolute rather than relative strength of association;

Karpinski & Steinman, 2006) will complement the qIAT and further expand the limits of implicit assessment.

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