



Increasing the Flexibility of Implicit Personality Assessment: An Examination of a Universal Assessment Procedure of the Self

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ABSTRACT

The current studies systematically examined a new version of the Questionnaire-Based Implicit Association Test (qIAT), which minimizes the differences between direct and indirect modes of assessment. Studies 1a ($N = 276$) and 1b ($N = 238$) tested a method that enables an indirect assessment of questionnaires that include only non-reversed items. Studies 2a ($N = 255$) and 2b ($N = 284$) tested a task that substitutes the problematic construct-related category labels with generic, universal categories. These studies, which focused on extraversion, supported the feasibility, reliability and validity of this procedure. Studies 3a-3c ($N = 159$, 154 and 151, respectively) supported the internal consistency, test-retest reliability and convergent validity of these methods, assessing three well-researched, semantically complex personality scales: Aggressive Humor Style, Need for Closure and Anxiety Sensitivity. Studies 4a ($N = 195$) and 4b ($N = 283$) supported the implicitness of the qIAT, as most respondents were not aware of this task's purpose. In Study 4c ($N = 598$), participants who reported using antidepressants had lower self-esteem qIAT scores compared to a control group, thus supporting the criterion validity of this task. Taken together, findings suggest that the new qIAT substantially increases the scope of indirect personality assessment.

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Implicit or indirect assessment methods do not require conscious awareness of the measured construct, nor the ability to report about it verbally (Greenwald & Banaji, 1995, 2017). Thus, in contrast to standard self-report measures, implicit measures do not rely on the ability of respondents to introspect, and they may be less vulnerable to self-presentation strategies and social desirability of the assessed construct (Nosek et al., 2011). In the past decades, much research has been devoted to the development and investigation of such indirect measures (De Houwer et al., 2009). Still, compared to the nearly infinite number of self-related psychological constructs that can be measured by ordinary questionnaires, the scope of implicit assessment has been much narrower (Wilson, 2009). In the present series of studies, we tested indirect measurement procedures aimed at removing key extraneous factors that affect implicit but not explicit measures (Gawronski, 2019; Nosek et al., 2011), thus increasing the flexibility and potential scope of indirect assessment of the self.

The implicit association test (Greenwald et al., 1998), which measures the strength of association between concepts, had become the most popular and widely used indirect measure (Bar-Anan & Nosek, 2014). In this task, participants are presented with stimuli, typically single words, that belong to two target categories (e.g., “flowers” and “insects”) and two attribute categories (for example, “good” and “bad”), and they need to quickly classify them

using two response keys. In the critical trials of the IAT, the target and attribute categories share response keys. This categorization task is expected to be faster when the two concepts sharing the same response key are more strongly associated (e.g., “insects” and “bad” versus “insects” and “good”). The IAT has been used extensively, and it was found to have good levels of reliability and validity, compared to other implicit assessment methods (e.g., average implicit-explicit correlation $r = .35$; Bar-Anan & Nosek, 2014). The IAT has also been adapted to assess personality (i.e., attitudes toward the self). This is typically done using the target categories “me” (or “self”) versus “others”, along with attributes that represent the measured personality construct (Asendorpf et al., 2002). However, compared to IATs that measure other types of attitudes (e.g., racial, political), the self-concept IAT has generally been less reliable and valid (Bar-Anan & Nosek, 2014; De Cuyper et al., 2017).

The Questionnaire-based Implicit Association Test (qIAT; Friedman et al., 2021; Yovel & Friedman, 2013), which follows earlier versions of the IAT (Greenwald et al., 1998; Sartori et al., 2008), was specifically designed to measure the self-concept. The stimuli in the task are propositions, instead of single words, typically questionnaire items taken from existing self-reports (e.g., “I feel comfortable around people”, “I keep in the background”), that need to be classified to relevant target categories (e.g., “extravert” versus “introvert”, respectively). These target personality items are classified

along with true and false self-related statements (e.g., “*I am looking at a computer screen*”, “*I am sunbathing at the beach*”, respectively), that need to be classified to the logical attribute categories “*true*” versus “*false*”. As in other variants of the IAT, the qIAT contains two critical, double categorization tasks, each combining different pairs of categories (e.g., “*extravert*” with “*true*” versus “*introvert*” and “*false*”), and the outcome is based on the response time difference between these tasks (Greenwald et al., 2003). Thus, the stimuli in the qIAT are propositional, but the assessment it yields is based on inhibition and facilitation processes that stem from the different pairings in the different blocks of the task. In contrast to explicit self-reports, it does not require any deliberation or reflection of the connections between the self and the assessed construct.

The design of the qIAT addresses the limitations of the self-concept IAT in two major ways. First, the stimuli in the qIAT are whole sentences containing propositional information (de Houwer, 2014), rather than single words. This enables a broader and more refined scope of implicit personality assessment, that can include the indirect measurement of specific, semantically complex constructs. Moreover, this task typically uses items taken from validated instruments, rather than stimuli created ad-hoc for a specific research (Costantini et al., 2015). Compared to earlier implicit paradigms, the stimuli in the qIAT therefore better represent the measured construct, reduce irrelevant influences (Gawronski, 2019), and increase consistency across studies (De Cuyper et al., 2017).

Second, the conventional self-related IAT measures the general association between the self (versus others) and the measured construct (e.g., self-esteem). As Karpinski (2004) noted, it may not be clear who these “others” are. More importantly, the broad and vague association between the self and the measured construct may reflect different relationships between these concepts (e.g., “I have high self-esteem” or “I wish I had high self-esteem”; see Remue et al., 2013). In the qIAT, the target is the measured construct (i.e., not the self), and the attribute logical categories represent self-related truth (Sartori et al., 2008). Thus, in contrast to the self-concept IAT, the score in the qIAT is designed to reflect the degree to which people associate the to-be-measured construct with self-related truth. This assessment method closely resembles self-report questionnaires, that commonly require respondents to rate the degree to which statements are true as they relate to them. In sum, the qIAT is based on the simple and reliable measurement procedure of the IAT, but it enables the use of well-validated propositional stimuli. In contrast to the self-concept IAT, the outcome it provides reflects a clear, unambiguous association between concepts.

The qIAT has been used for the assessment of various personality traits, including extraversion (Yovel & Friedman, 2013), conscientiousness (Friedman et al., 2021), shame aversion (Currie et al., 2017), and general self-esteem (Yovel et al., 2020). These studies provided support for the internal consistency, test-retest reliability and convergent and predictive validity of this task. However, two core features of

this task greatly restrict its potential utilization: the requirement for a sufficient number of personality stimuli that represent both target categories, and the necessity to create classification labels for these categories.

As in the IAT, the design of the qIAT requires an equal number of reversed versus non-reversed items to serve as stimuli that need to be classified into the two opposing target categories (e.g., five questionnaire items for each of the extraversion and introversion categories). But despite some notable exceptions (e.g., Rosenberg, 1965), most personality questionnaires do not include an equal number of reversed and non-reversed items. In fact, many self-reports are comprised of items that can be classified to only one of the target categories (typically only non-reversed items).

The other, more problematic feature of the qIAT is the necessity to create meaningful labels or titles for the target categories. As in the IAT, participants are asked in the qIAT to classify each target item into one of two relevant categories. It is therefore necessary to create for each specific task two opposing category labels that would clearly and accurately reflect the to-be-measured construct. Sometimes, the choice of such labels is relatively straightforward (e.g., “*extravert*” vs. “*introvert*”). For most personality constructs, however, creating such labels is far less trivial. In some cases, there may be several different optional labels that would reasonably reflect the inverse category of the measured trait. For example, the opposite of anger has ranged from “*self-control*” (Schnabel et al., 2006) to “*peacefulness*” (Lobbstaël et al., 2009) or “*calmness*” (Kunzmann & Thomas, 2014). Importantly, it has been shown that the use of different labels in the IAT, even with the same set of items, may result in different outcomes (Mitchell et al., 2003; Nosek et al., 2007). Moreover, in many cases it may be difficult to create meaningful labels for *both* categories. The selected category titles must be clear for laypeople, but many potential labels may be based on research jargon, at least to some extent. Indeed, a recent study (Hall et al., 2019) showed that even the labels of the Big-5 traits are understood differently by laypeople, compared to the ways they are conceptualized by researchers.

The use of category labels in the qIAT (and in general in the IAT) may be problematic even when the selection process is relatively straightforward and the selected labels are reasonably clear. For example, in many cases one of the chosen labels is likely to be perceived as negative and judgmental, particularly compared to the other label (Back et al., 2009). This, again, may bias the outcome. It is important to bear in mind that self-report questionnaires do not include *any* labels – people respond directly to the items, without any intervening labels intended to describe the measured construct. Because both the categories and the response stimuli affect the outcome in the IAT (Mitchell et al., 2003), any chosen set of category labels may add construct-irrelevant variance to the assessment, and for example artificially reduce explicit-implicit relationships (Gawronski, 2019; Nosek et al., 2011).

In the present line of studies, we attempted to address these limitations, thus enabling the implicit assessment of a

much greater variety of distinct personality constructs, currently measured only by self-reports.¹ In Studies 1a and 1b, we focused on the first problem, the lack of reversed or non-reversed scale items. To do that, we tested a straightforward strategy – we created such items, which were directly based on the existing scale items. To deal with the more challenging problems associated with the need to create category labels, we made substantial modifications in the assessment methodology of the task. In Studies 2a and 2b we tested this novel variant of the qIAT, which eliminates the need to create meaningful category labels for the measurement of each specific personality construct. Different constructs have different basic psychometric properties because, for example, they are affected differently by response biases (Hofmann et al., 2005). Therefore, to compare variants of the task against each other, we focused in all these four studies on the same target construct, extraversion of the Big-5. Based on the findings of these studies, we then examined in Studies 3a-3c whether the newly developed methods indeed expand the scope of implicit assessment of the self. In these studies, we tested the indirect measurement of three well-researched, semantically complex personality constructs, currently measured only by self-report scales – aggressive humor (Martin et al., 2003), need for closure (Webster & Kruglanski, 1994), and anxiety sensitivity (i.e., fear of sensations related to anxiety; Taylor et al., 2007). In Studies 4a and 4b we examined whether the personality assessment procedure of the qIAT is indeed implicit. Finally, in Study 4c we examined the criterion validity of the new variant of this task.

Study 1

In the standard self-concept IAT, implicit measurement is typically based on ad-hoc stimuli (De Cuyper et al., 2017). In order to deal with the problem of lack of reversed (or non-reversed) original scale items, we also created ad-hoc stimuli specifically for the purpose of the indirect assessment. Here, however, only half of the qIAT stimuli (e.g., the reversed items) were not original scale items, and they were all created based on the existing items of the target scale. Specifically, each of these ad-hoc items was created to reflect the opposite meaning of one of the existing non-reversed items of the target questionnaire (e.g., “*I feel uncomfortable around people*” was created based on the original item “*I feel comfortable around people*”). We therefore expected that the validity of the task’s output (e.g., explicit-implicit correlation) would only be minimally affected, even though the explicit and implicit assessments would not be based on the exact same set of items.

Study 1a

In the present study, we focused only on the non-reversed items of the Extraversion Big-5 scale, ignoring this scale’s

original reversed items. That is, we created for each of the non-reversed extraversion items a new “non-extraversion” item, and the qIAT included the original non-reversed extraversion items and these “non-extraversion” ad-hoc items (see Table 1). We examined the split-half internal consistency and the convergent and discriminant validity of this task. We expected that this implicit measure would correlate with the standard explicit extraversion scale, (i.e., that includes the original reversed items), and that this correlation would be larger than the correlation of this score with the other Big-5 subscales.

Method

Participants. Participants in all studies agreed to an informed consent form, approved by the departmental ethical committee. To prevent an overlap between the samples of the different studies, participation in any previous study that included the qIAT was a recruitment exclusion criterion in all present studies. In the present study participants were recruited via Amazon’s Mechanical Turk platform (AMT). They all identified themselves as American residents, and had completed more than 100 Human Intelligence Tasks (HITs) with an approval rate of at least 95%. They received \$1 for their participation in the study. In order to encourage truthful responses, participants were allowed to complete the tasks regardless of their reported native language, but only native English speakers were included in the analyses. Participants were excluded from the analyses based on the following criteria: error rate higher than 20% or high rate of extremely short response time (at least 10% with RT < 300 msec) in the qIAT (see below), or taking a break while completing the task (based on RT > 30 seconds in any trial). Based on an *a priori* power analysis, in order to detect Pearson correlation coefficients that represent a medium effect size ($r = .24$), with alpha levels set at .05 and a power of .80, we needed a sample of at least 134 participants. However, because we tested new or modified assessment methodologies, and in agreement with Schönbrodt and Perugini (2013) suggestion, here and in the following studies we recruited larger samples. Of the 276 AMT “workers” recruited for the present study, 36 participants (13.04%) were excluded using the above criteria, and analyses were based on the remaining 240 participants (mean age = 37.39, $SD = 13.22$; 56.70% females).

Materials

Explicit measure. Personality was assessed explicitly using the 50-item International Personality Item Pool (IPIP; Goldberg et al., 2006) representation of the Goldberg markers (Goldberg, 1992) for the Big-Five factor model of personality (Agreeableness, Conscientiousness, Extraversion, Emotional Stability, Intellect). Each of the five personality domains was measured by a 10-item subscale, rated on a 1 (very inaccurate) –5 (very accurate) Likert scale. Internal consistencies (Cronbach’s alphas) in the current study ranged between .83 for Intellect and .93 for Extraversion.

¹Measures, raw data, data processing code, processed data and analysis syntax of all present studies are openly available at <https://osf.io/xz5wp/>

Table 1. Stimuli used in the implicit tasks in all studies.

Self-related logical categories (used in all studies)	True	False	Average number of characters per item (<i>SD</i>)
Personality Categories Study 1a	I am looking at a computer screen I am participating in an experiment on the internet I am doing a psychology experiment I am putting my fingers on the keyboard I am in front of the computer Extravert	I am sunbathing at the beach I am climbing a steep mountain I am currently playing an electric guitar I am buying groceries in the local grocery store I am playing football on the grass Not extravert	36.70 (7.92)
	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 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 Person A	I am hardly the life of the party I feel uncomfortable around people I rarely start conversations I don't talk to a lot of people at parties I don't like being the center of attention Not introvert I talk a lot I don't keep in the background I have a lot to say I like to draw attention to myself I am not quiet around strangers Person B	34.60 (8.21)
Study 1b	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 Type 1	I talk a lot I don't keep in the background I have a lot to say I like to draw attention to myself I am not quiet around strangers Type 2	25.50 (8.49)
Study 2a*	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 Type 1	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 Type 2	29.60 (9.94)
Studies 2b, 4b*	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 Type 1	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 Type 2	29.60 (9.94)
Study 3a*	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 Type 1 If someone makes a mistake, I will often tease them about it When telling jokes or saying funny things, I am usually not very concerned about how other people are taking it Sometimes I think of something that is so funny that I can't stop myself from saying it, even if it is not appropriate for the situation If I don't like someone, I often use humor or teasing to put them down	People are never offended or hurt by my sense of humor I do not like it when people use humor as a way of criticizing or putting someone down I never participate in laughing at others even if all my friends are doing it Even if something is really funny to me, I will not laugh or joke about it if someone will be offended	87.00 (27.80)
Study 3b*	Type 1 I enjoy having a clear and structured mode of life I dislike unpredictable situations I don't like to go into a situation without knowing what I can expect from it I find that a well-ordered life with regular hours suits my temperament I find that establishing a consistent routine enables me to enjoy life more	Type 2 I do not enjoy having a clear and structured mode of life I like unpredictable situations I like to go into a situation without knowing what I can expect from it I find that a well-ordered life with regular hours does not suit my temperament I find that living without a consistent routine enables me to enjoy life more	63.70 (18.58)
Study 3c*	Type 1 I worry that other people will notice my anxiety When I tremble in the presence of others, I fear what people might think of me It scares me when I blush in front of people When I begin to sweat in a social situation, I fear people will think negatively of me It is important for me not to appear nervous	Type 2 I do not worry about people noticing my anxiety When I tremble in the presence of others, I am not so concerned about it I do not mind blushing in front of people When I begin to sweat in a social situation, I let it pass I do not mind appearing nervous	55.50 (17.87)
Study 4a, 4c*	Type 1 On the whole, I am satisfied with myself I feel that I have a number of good qualities I am able to do things as well as most other people I feel that I'm a person of worth, at least on an equal plane with others I take a positive attitude toward myself	Type 2 At times I think I am no good at all I feel I do not have much to be proud of I certainly feel useless at times I wish I could have more respect for myself All in all, I am inclined to think that I am a failure	45.50 (11.56)

*The allocation of reversed and non-reversed items to category labels were counterbalanced across participants.

Table 2. Descriptive statistics for qIAT tasks in all studies.

Study	RT	qIAT <i>D</i> score	Error rate
1a	1332.56 (295.93)	.41 (.49)	.06 (.05)
1 b	1396.74 (306.71)	-.89 (.50)	.06 (.05)
2a	1280.50 (268.51)	-.03 (.65)	.06 (.05)
2 b	1311.05 (257.26)	.06 (.75)	.07 (.05)
3a	1811.52 (347.09)	-.26 (.51)	.08 (.06)
3a retest	1694.27 (407.79)	-.24 (.50)	.07 (.05)
3 b	1936.41 (443.64)	.38 (.40)	.07 (.05)
3 b retest	1889.00 (339.71)	.41 (.33)	.06 (.05)
3c	1701.55 (342.83)	.09 (.57)	.07 (.05)
3c retest	1610.00 (338.22)	.03 (.50)	.07 (.05)
4a	1529.40 (421.54)	.84 (.55)	.09 (.07)
4 b	1468.86 (337.97)	.11 (.75)	.06 (.05)
4c	1501.01 (371.28)	.60 (.63)	.07 (.05)

Note: qIAT = Questionnaire-Based Implicit Association Test.

Implicit measure. The Questionnaire-Based Implicit Association Test (Yovel & Friedman, 2013), which follows earlier versions of the IAT (Greenwald et al., 1998; Sartori et al., 2008), is a brief classification task that includes seven blocks. On each trial, a sentence was presented at the center of the computer screen, along with category labels at the top right and top left corners of the screen. Participants were instructed to classify the sentences to the correct category labels as quickly and as accurately as possible by pressing either the “D” key or the “L” key on the keyboard. The first two blocks were practice blocks. In Block 1 (40 trials), participants categorized items representing the two personality category labels, which in the current study were *Extravert* vs. *Not extravert*. The *Extravert* category items were the five positively coded items of the Extraversion subscale of the explicit measure (e.g., “I am the life of the party”). The five items that needed to be classified to the *Not extravert* category were developed specifically for the purpose of the present study (see Table 1). This was done by reversing the meaning of each of the five original positively coded extraversion items with minimal syntactic change (e.g., “I am hardly the life of the party”). In Block 2 (20 trials), participants categorized as *True* (e.g., “I am sitting in front of the computer”) vs. *False* (e.g., “I am playing football on the grass”) self-related sentences. Blocks 3 and 4 (20 and 40 trials, respectively) were critical blocks that included double categorization trials, in which participants performed these tasks interchangeably. For example, participants categorized *Extravert* and *True* sentences using one key and *Not extravert* and *False* sentences using the other key. In Block 5 (40 trials) the personality categories switched sides, and participants practiced the reversed classification of the personality items. Blocks 6 and 7 (20 and 40 trials, respectively) were double categorization blocks with the reversed personality classification (e.g., *Extravert* with *False* vs. *Not extravert* with *True*). The order of the double-categorization blocks was counterbalanced across participants. In all trials, an error signal (i.e., a red “X”) appeared if an incorrect response (i.e., erroneous classification) was made, and the next trial appeared immediately following the correct response. Reaction-times and error responses for all trials were recorded. The qIAT was scored based on the *D* measure developed by Greenwald and colleagues (Greenwald et al., 2003). Paralleling the explicit extraversion scores, larger

Table 3. Descriptive statistics for the explicit Big-5 IPIP scales in studies 1a-b, 2a-b and 4b.

Study	Intellect	Conscientiousness	Extraversion	Agreeableness	Emotional Stability
1a	39.60 (5.98)	38.01 (7.18)	28.86 (9.55)	40.03 (7.06)	34.05 (9.61)
1 b	39.19 (6.29)	37.46 (7.29)	28.29 (9.27)	40.17 (6.54)	34.76 (9.01)
2a	38.49 (6.24)	38.04 (7.51)	27.33 (9.30)	39.20 (7.81)	33.90 (9.40)
2 b	38.38 (7.03)	36.94 (7.33)	29.26 (9.53)	39.97 (6.27)	33.84 (9.31)
4 b	37.01 (5.71)	35.62 (6.65)	29.46 (9.01)	39.32 (6.35)	33.95 (8.52)

positive *D*s represented a stronger association between *Extraversion* and the self-related *True* items.

Procedure. To prevent potential carryover effects from the implicit assessment (in which each extraversion item was presented many times) to the explicit assessment (in which each extraversion item was presented only once; Yovel & Friedman, 2013), participants completed the self-report scale first, which was followed by the qIAT.

Results and discussion. Table 2 presents the Descriptive statistics for the RTs, *D* scores and error rates of qIAT tasks in all studies, and Table 3 presents the descriptive statistics for all explicit Big-5 IPIP scales. The split-half reliability of the qIAT in the present study, based on the correlation between *D* scores calculated separately for odd and even trials of the task (Spearman-Brown corrected), was $r_{tt} = .86$. The split-half reliability of the explicit Extraversion scale was $r_{tt} = .90$. The implicit-explicit correlation of the qIAT with the self-report Extraversion scale (i.e., that included all ten original items) was $r = .47$, $p < .001$. This correlation was virtually identical to the correlation of the qIAT with the explicit extraversion score that was based only on the five non-reversed items of the explicit Extraversion scale ($r = .47$, $p < .001$). Supporting the task’s discriminant validity, the correlations between the implicit qIAT extraversion measure and the other four explicit Big-Five measures were all significantly smaller (Steiger’s Z ’s > 4.36 ; p ’s $< .001$), ranging between $r = .11$ ($p = .091$, for Intellect) and $r = .18$ ($p = .005$, for Agreeableness). Taken together, these results provide initial support for the reliability and validity of the implicit assessment of qIAT, which was partially based on ad hoc reversed items. Particularly, the magnitude of the explicit-implicit correlation of the qIAT score with the original extraversion scale strongly supports the convergent validity of this task. In the next study we attempted to replicate these findings, this time focusing on the opposite “pole” of this same construct.

Study 1b

The goals of the present study were twofold: to replicate the findings obtained in Study 1a, and to verify that this method can be applied successfully to both reversed and non-reversed original items of the existing scale. Thus, in the present study we focused only on the reversed items of the Extraversion subscale (i.e., that measure introversion), this time ignoring this scale’s *non-reversed* items. As in Study 1a, we created for each of the remaining original items a new “non-introversion” item (see Table 1). We examined the reliability and validity of the qIAT, which used the original reversed items and these ad-hoc “non-introversion” items.

Method

Participants. Of the 238 AMT “workers” who were recruited to the study and received \$1 for their participation, 40 participants (16.81%) were excluded based on their performance in the qIAT, following the criteria detailed above. Analyses were based on the remaining 198 participants (mean age = 35.42, $SD = 11.08$; 54.00% females).

Materials

Explicit measure. As in Study 1a, personality was assessed explicitly using the same 50-item IPIP scale (Goldberg et al., 2006). Internal consistencies (Cronbach’s alphas) in the current study ranged between .83 for Intellect and .94 for Extraversion.

Implicit measure. The implicit task was similar to the qIAT used in Study 1a, but here the target trait was introversion rather than extraversion. Thus, the five items that needed to be classified to the *Introvert* category were the five original reversed items of the Extraversion self-report subscale (e.g., “I keep in the background”). The items that needed to be classified to the *Not introvert* category were created specifically for the purpose of this study, by reversing the meaning of each of these original items (e.g., “I don’t keep in the background”; see Table 1).

Procedure. As in Study 1a, participants completed the self-report scale and then the qIAT.

Results and discussion. The split half reliability of the qIAT (Spearman-Brown corrected) was $r_{tt} = .88$ for the qIAT, and $r_{tt} = .87$ for the explicit Extraversion scale. Implicit-explicit correlation of the qIAT (that measured introversion) with the self-report Extraversion scale was $r = -.51$, $p < .001$. This correlation was very similar to the correlation of the qIAT with the explicit score that was based only on the five reversed items of the explicit Extraversion scale ($r = -.49$, $p < .001$). The correlations between the implicit qIAT score and the other four explicit Big-Five scales were all significantly smaller (Steiger’s Z ’s > -3.26 ; p ’s $< .002$), ranging between $r = -.07$ ($p = .329$ for Conscientiousness) and $r = -.29$ ($p < .001$ for Emotional stability).

The structure of the qIAT requires a balanced number of reversed and non-reversed items to measure the target construct, but most existing personality scales do not meet this requirement. The findings of Studies 1a and 1b suggest that the straightforward method employed to deal with this problem was effective. Here, however, both “poles” of the target construct (i.e., extraversion and introversion) were easily defined. Before examining more complicated scales, we first needed to address the other basic limitation of the qIAT – the need to provide semantically meaningful labels for such scales.

Study 2

In the following two studies, we aimed to address the problems and difficulties associated with the necessity to create labels for the personality categories. To do that, we developed and examined a new, modified version of the qIAT.

The primary novel feature in this task, the Generic Categories qIAT (GC-qIAT), is that the titles of the target categories are nonspecific (e.g., *Person A* vs. *Person B*). We reasoned that such universal and neutral category titles are not likely to affect the assessment outcome (Perkins & Forehand, 2006). Neither title is expected to be perceived as more negative or judgmental than the other, and in any case, the arbitrary ad hoc “meaning” of these labels (e.g., whether extraversion or introversion items should be classified to the category titled “*Person A*”) can be randomly allocated. Moreover, such universal labels can be used for the assessment of any given personality construct, and they therefore eliminate the necessity to create meaningful labels for each target trait.

The use of universal personality labels, however, may also cause unwanted effects. Classifying stimuli (e.g., “*I start conversations*”) to such generic category labels (e.g., *Person A*) rather than to meaningful labels (e.g., *Extravert person*) is non-intuitive, because the nonspecific titles and the items are unrelated to each other. This additional difficulty may result in higher response times and larger error rates, thus increasing the proportion of error variance and decreasing the task’s reliability and validity. Attempting to prevent such undesirable outcomes, in this new version of the task we also augmented and extended the initial practice phase. We expected that this extended practice would help familiarize respondents with the arbitrarily assigned “meaning” of the category labels (i.e., which items need to be classified to which category; see below). As in the previous studies, we tested here the reliability and validity of this new version of the qIAT, measuring extraversion.

Study 2a

In this study we examined the new GC-qIAT, using the generic category labels “*Person A*” versus “*Person B*” (see below).

Method

Participants. Participants were recruited via AMT, following the same recruitment criteria used in Study 1a, and received \$1 for their participation. Of the 255 recruited “workers”, 19 participants (7.45%) were excluded based on their performance in the qIAT, following the criteria detailed above. Analyses were based on the remaining 236 participants (mean age = 35.22, $SD = 11.73$; 56.80% females).

Materials

Explicit measure. Personality was assessed using the same 50-item IPIP scale that was used in the previous studies (Goldberg et al., 2006). Cronbach’s alphas in the current study ranged between .84 for Intellect and .93 for Extraversion.

Implicit measure. The new Generic Categories qIAT (GC-qIAT) measured extraversion. This version of the task was similar to the qIAT described in Study 1, except for the following modifications: First, the personality stimuli in this task were comprised of the whole set of the original ten items of the explicit Extraversion scale, five non-reversed

(e.g., “*I am the life of the party*”) and five reversed (e.g., “*I keep in the background*”; see Table 1). Most importantly, the classification labels for the personality items in this task were the generic categories “*Person A*” and “*Person B*”. In order to familiarize participants with the classification process of the personality items, which was based on these generic (i.e., not self-explanatory) categories, the practice phase of this task was modified and extended. In Block 1 (20 trials), participants sorted the self-related *True* versus *False* statements. They were then introduced to the personality items they needed to classify into the generic *Person A* and *Person B* categories. The allocation of the reversed versus the non-reversed personality items to these generic categories was randomly allocated, and it was counterbalanced across participants. Participants then completed two practice single-categorization blocks, in which they classified the personality items into these arbitrarily assigned categories. In Block 2a (20 trials), a relevant hint (*A* or *B*) appeared at the end of each item (e.g., “*I don’t talk a lot – A*”, an item that in this case needed to be classified to the category “*Person A*”). In the next block (2b; 40 trials), they classified these items again into the same two categories, but this time without any categorization hint. As in the original task, a feedback (i.e., a red “X”) was presented following an erroneous response, and the subsequent trial appeared after the correct response was made. In the remaining Blocks (3-7), the new *Person A/Person B* categories were used for the classification of the personality items, but other than that these blocks were similar to Blocks 3-7 of the original qIAT.

Procedure. Participants completed the self-report scale, which was followed by the GC-qIAT.

Results and discussion. The split half reliability (Spearman-Brown corrected) was $r_{tt} = .88$ for the GC-qIAT and $r_{tt} = .90$ for the parallel Extraversion scale. The implicit-explicit correlation of the GC-qIAT with the Extraversion scale was $r = .55$, $p < .001$. The correlations between the implicit qIAT score and the other four explicit Big-Five scales were all significantly smaller (all Steiger’s Z ’s > 5.36 , p ’s $< .001$), ranging between $r = .15$, $p = .014$ (conscientiousness) and $r = .20$, $p = .002$ (agreeableness).

We tested here a modified variant of the qIAT, which eliminates the necessity to create meaningful category labels that reflect the target personality construct. The internal consistency estimate and the explicit-implicit correlation observed here support for the reliability and convergent validity of the implicit extraversion assessment this task provides. Taken together, the present results provide initial support for this methodology.

Study 2b

The findings obtained in Study 2a, in which we tested the GC-qIAT for the first time, supported the feasibility of an IAT-based assessment procedure that relies on nonspecific target categories. In the present study we attempted to replicate these findings, this time using a different set of generic categories, “*Type 1*” and “*Type 2*”.

Method

Participants. Participants were 284 AMT “workers”, who received \$1 for their participation. Of these, 66 participants (23.24%) were excluded, following the criteria detailed above. Analyses were based on the remaining 218 participants (mean age = 36.50, $SD = 11.45$; 54.60% females).

Materials

Explicit measure. Personality was assessed explicitly using the same 50-item IPIP scale used in the previous studies. Internal consistencies (Cronbach’s alphas) in the current study ranged between .87 for Agreeableness and .94 for Extraversion.

Implicit measure. In the present study, the generic category titles used for the classification of the personality items in the GC-qIAT were “*Type 1*” versus “*Type 2*”. Other than that, this task was identical to the task used in Study 2a.

Procedure. Participants completed the self-report scale, which was followed by the GC-qIAT.

Results and discussion. The split half reliability was $r_{tt} = .94$ for the GC-qIAT, and $r_{tt} = .92$ for the parallel self-report scale. Implicit-explicit correlation of the GC-qIAT with the explicit Extraversion scale was $r = .64$ ($p < .001$). The correlations between the implicit score and the other four explicit Big-Five scales were all significantly smaller (all Steiger’s Z ’s > 6.31 , p ’s $< .001$), ranging between $r = .06$ ($p = .35$ for Conscientiousness) and $r = .25$ ($p < .001$ for Emotional stability).

In the version of the task tested in Studies 2a and 2b (i.e., the GC-qIAT), classification of the target personality stimuli was not intuitive. These items needed to be classified to generic or nonspecific categories to which they were not semantically related, and the practice phase in this task was therefore extended. In order to examine whether these changes affected participants’ performance, we compared the response times and error rates in the present two studies to those observed in the first two studies, in which the same construct (i.e., extraversion) was assessed using standard, meaningful target labels. A between-group t -test showed that response times (msec.) in the GC-qIAT (i.e., Studies 2a and 2b combined; $M = 1381.17$, $SD = 297.27$) were actually slightly faster than in the previous version of the task (i.e., Studies 1a and 1b combined; $M = 1427.57$, $SD = 298.82$), $t(884) = 2.32$, $p = .021$, $d = .16$. The difference in error rates (percent) between the two versions of the task was small and not significant, $M = 6.29$, $SD = 5.19$ versus $M = 5.94$, $SD = 4.59$ (respectively), $t(884) = 1.06$, $p = .29$, $d = .07$. The slight decrease in response latencies in the present two studies was possibly due to the extended practice in the new version of the task. In any case, these results indicate that performance in the GC-qIAT was comparable to the previous version of the task, in which the target labels and the items were semantically related. It thus appears that after performing the extended practice, participants became adequately familiar with the assigned arbitrary “meaning” of the generic categories (e.g., *Type 1/Type 2*). Taken together, the present findings support the assessment method tested

here, which eliminates the need to create construct-related category titles in the qIAT, and may remove certain potential extraneous effects of the classification labels on the outcome.

Study 3

Our broad objective was to improve the assessment methodology of the qIAT, in order to increase the correspondence between implicit and explicit assessment of the self, thus expanding the potential scope of implicit personality measurement. However, the previous four studies focused exclusively on a single construct (extraversion), for which the process of creating a pair of clear labels was relatively straightforward. Is it possible to apply the same procedures to other, more challenging constructs, currently measured only by self-reports? To address this question, we examined in the following three studies the implicit assessment of three well-researched scales related to different dimensions of the Big-5 model of personality. Importantly, these scales are comprised of longer items that are far more semantically complex, compared to the items of the extraversion questionnaire on which we focused in the previous four studies (see Table 1). Also, we specifically selected scales that measure personality constructs, for which it would have been particularly challenging to create a pair of meaningful, jargon-free and non-judgmental classification labels (i.e., rather than using the GC-qIAT universal labels).

In Study 3a we tested the implicit assessment of the Aggressive Humor subscale (Martin et al., 2003), which measures people's inclination to use sarcasm and teasing as means of enhancing the self, at the expense of their relationships with others. Unlike the other two scales on which we focused here, this scale originally includes reversed items. However, the items in this scale are exceptionally complex and long, and were nearly triple the length of the average item of the Extraversion scale (mean number of characters = 87.00 versus 29.60, respectively; see Table 1). Research has shown that this scale is negatively related to agreeableness (Martin et al., 2003). In Study 3b, we examined the implicit assessment of the Need for Closure scale (Webster & Kruglanski, 1994), which measures the individual's desire for predictability, order and structure. Studies showed that this scale is negatively related to openness to experience, and positively to conscientiousness (Roets & Van Hiel, 2011). In Study 3c, the GC-qIAT measured the social subscale of the Anxiety Sensitivity Inventory (Taylor et al., 2007). This scale, which is strongly associated with neuroticism, assesses fear of anxiety-related sensations, based on beliefs about their harmful social consequences. In each of the studies, the implicit assessment focused on one of these scales, but all three scales were assessed explicitly. As in the previous studies, we tested the internal consistency of the implicit measure, and predicted that it would correlate with the parallel self-report, and that this correlation would be stronger than its correlation with the other two explicit scales. In addition, in each of the following studies we also

examined the temporal stability of the respective implicit measure in two separate sessions.

Study 3a

In the present study, the target scale assessed by the GC-qIAT measured aggressive humor style (Martin et al., 2003). The two sessions of the study were completed five weeks apart.

Method

Participants. Participants were recruited via Prolific Academic platform. They all completed more than 50 previous submitted tasks with an approval rate of at least 95%. Participants received GBP 1.25 for their participation in the first session of the study and GBP 2.50 for their participation in the second session (see below). Of the 159 English-speaking participants recruited to the study, 48 participants (30.19%) were excluded using the criteria described above. Analyses were based on the remaining 111 participants (mean age = 34.41, $SD = 9.26$; 68.50% females). Of these, 108 participants (97.30%) returned to participate in the second session five weeks later (average time between sessions in days = 38.51, $SD = 1.69$), and 22 participants (20.37%) were excluded based on their performance in the second GC-qIAT task. Thus, analyses in the second session were based on 86 participants (mean age = 35.34, $SD = 9.46$, 64.00% females).

Materials

Explicit measures.

Aggressive Humor (AH) is an eight-item subscale (four reversed) taken from the 32-item Humor Styles Questionnaire (Martin et al., 2003). The subscale assesses a tendency to use humor on the expense of other people, disregarding the detrimental effect it might have on them (e.g., "If someone makes a mistake, I will often tease them about it"). Participants rated each of the eight items of subscale on a 7-point Likert scale (1 = totally disagree; 7 = totally agree). Cronbach's alphas for the scale in the current study were .79 in the first session and .90 in the second session.

Need for Closure (Roets & Van Hiel, 2011). The 15-item brief version of the Need for Closure Scale (Webster & Kruglanski, 1994) assesses the inclination for decisiveness and discomfort with ambiguity (e.g., "I enjoy having a clear and structured mode of life."). Participants rated each of the items on a 6-point Likert scale (1 = Strongly disagree; 6 = Strongly agree). Cronbach's alphas for the scale in the current study were .89 in the first session, and .88 in the second session.

Social Concerns subscale of the Anxiety Sensitivity Index-3 (Taylor et al., 2007). This six-item subscale assesses sensitivity to observable physical anxiety reactions, based on the belief about their adverse social implications (e.g., "I worry that other people will notice my anxiety"). Participants rated each of the six items on a 5-point Likert scale (0 = very little to 4 = very much). The ASI-3-SC subscale has demonstrated good reliability and convergent, discriminant and criterion

Table 4. Descriptive statistics for explicit scales in studies 3a-3c.

Study	Aggressive Humor	Need for Closure	Anxiety Sensitivity Index-3 Social Concerns
3a	26.60 (8.11)	62.76 (10.6)	11.57 (6.15)
3a retest	25.27 (9.95)	60.45 (10.43)	11.35 (6.15)
3b	24.60 (6.96)	62.43 (9.86)	11.70 (5.97)
3b retest	24.70 (7.12)	62.28 (10.66)	11.07 (6.02)
3c	25.35 (7.32)	62.23 (10.85)	11.81 (6.26)
3c retest	61.09 (11.27)	61.09 (11.27)	12.36 (6.64)

validity (Taylor et al., 2007). Cronbach's alphas for the scale in the current study were .89 in the first session, and .87 in second session.

Implicit measure.

The GC-qIAT task used here was similar to the task used in Study 2b, with the generic category titles *Type 1* versus *Type 2*. The personality items were the eight AH subscale items (four reversed; see Table 1).

Procedure. On both sessions of the study, participants first completed the three explicit scales, and then the GC-qIAT that measured AH. To avoid primacy and recency effects, the explicit scale that paralleled the implicit measure (i.e., the AH scale) was always completed second, and the order of the two other scales was randomized. Five weeks after the first session, participants received a message asking them to return and complete the second session.

Results and discussion. Table 4 presents the descriptive statistics for the explicit scales in Studies 3a-3c. The split-half reliability of the GC-qIAT that measured AH was $r_{tt} = .88$ in the first session, and $r_{tt} = .90$ in the second session, and it was $r_{tt} = .72$ and $r_{tt} = .86$, respectively, for the parallel AH subscale. As to test-retest reliability, the correlation between the two GC-qIAT tasks completed five weeks apart was $r_{tt} = .49$ ($p < .001$), and it was $r_{tt} = .81$ ($p < .001$) for the explicit AH subscale.

Supporting the convergent validity of the implicit AH assessment, the implicit-explicit correlation of the GC-qIAT score with the parallel explicit AH scale was $r = .53$ in the first session and $r = .48$ in the second session (p 's $< .001$). The correlations with the two other explicit measures in the first session were both significantly smaller, $r = -.14$ with explicit ASI-3-SC ($p = .156$, Steiger's $Z = 5.02$, $p < .001$) and $r = -.13$ with NFC ($p = .163$, Steiger's $Z = 4.79$; $p < .001$). Taken together, these findings provide initial support for the feasibility of an implicit personality assessment that is based on long and semantically complex questionnaire items. In the next two studies, we focused on scales that do not include reversed items.

Study 3b

The target scale in the present study was Need for Closure (Webster & Kruglanski, 1994). The two sessions of the study were completed three months apart.

Method

Participants. Of the 154 participants recruited to the study, 46 participants (29.87%) were excluded using the criteria described above. Analyses were based on the remaining 108

participants (mean age = 36.60, $SD = 10.15$; 73.10% females). Of these, 83 participants (76.85%) returned to participate in the second session of the study three months later (average time between sessions in days = 90.87, $SD = 2.21$), and 14 participants (16.87%) were excluded based on their performance in the second GC-qIAT task. Thus, analyses in the second session were based on 69 participants (mean age = 39.59, $SD = 10.07$, 68.40% females).

Materials

Explicit measures. Explicit assessment in this study included the same three scales used in Study 3a. Cronbach's alphas in the first and second session of the current study were .71 and .79 for the AH subscale, .86 and .88 for the NFC scale, and .87 and .84 for the ASI-3-SC subscale (all respectively).

Implicit measure. The target non-reversed personality items used in the GC-qIAT (which was similar to the task used in Study 3a) were five items of the NFC scale (see Table 1). These particular items were selected because they had the highest loadings on the single factor extracted in a principal component analysis performed on the 15-item short version of the brief NFC scale (Roets & Van Hiel, 2011). Following the methods used in Study 1, for each of these five original non-reversed items we created reversed items specifically for the purpose of this study (see Table 1).

Procedure. In each of the two sessions, participants completed the three explicit scales and then the qIAT. As in Study 3a, the self-report scale that paralleled the implicit measure (i.e., the NFC scale), was always completed second, and the order of the two other scales was random. Three months following the first session, participants received a message asking them to complete the second session.

Results and discussion. The split half reliability of the GC-qIAT (Spearman-Brown corrected) was $r_{tt} = .84$ in the first session, and $r_{tt} = .78$ in the second session, and it was $r_{tt} = .91$ in both sessions for the parallel NFC scale. The correlation between the GC-qIAT tasks completed three months apart was $r_{tt} = .48$ ($p < .001$), and it was $r_{tt} = .75$ ($p < .001$) for the explicit NFC scale.

Supporting the convergent validity of the indirect NFC measure, the implicit-explicit correlation between the GC-qIAT and the explicit NFC scale in the first session was $r = .25$ ($p = .009$) and $r = .29$ in the second session ($p = .010$). This correlation was larger than the correlations with the two other explicit measures in the first session, $r = -.16$ with the explicit AH subscale ($p = .098$, Steiger's $Z > 2.77$, $p = .005$), and $r = -.07$ with the explicit ASI-3-SC ($p = .46$, Steiger's $Z = 2.96$, $p = .003$). The correlation of the GC-qIAT score with the explicit NFC score that was based only on the five original non-reversed items used in the GC-

qIAT was $r = .30$ ($p = .001$) in the first session and $r = .37$ ($p = .001$) in the second session. In sum, these results support the implicit personality assessment performed here, in which the methods tested in Study 1 (i.e., the use of ad-hoc reversed items) and in Study 2 (generic personality labels) were both applied.

Study 3c

The target personality scale in the present study measured socially-related anxiety sensitivity (Taylor et al., 2007), and the test-retest period was five months.

Method

Participants. Of the 151 participants recruited to the study, 24 participants (15.89%) were excluded using the criteria described above. Analyses were based on the remaining 127 participants (mean age = 32.39, $SD = 8.04$; 75.60% females). Of these, 87 participants (68.50%) returned to complete the second session five months later (average time between sessions in days = 148.93, $SD = 3.39$), and 6 participants (6.90%) were excluded based on their performance in the second GC-qIAT task. Analyses in the second session were based on the remaining 81 participants (mean age = 32.19, $SD = 7.90$, 73.90% females).

Materials

Explicit measures. Explicit assessment in this study included the same three scales used in Study 3a. Cronbach's alphas in the first and second session of the current study were .74 and .80 for the AH subscale, .88 and .90 in for the NFC scale, and .88 and .91 for the ASI-3-SC subscale (all respectively).

Implicit measure. As in Study 3b, the original non-reversed personality items used in the GC-qIAT were the five ASI-3 items that had the highest loadings on the social concerns factor in the exploratory factor analysis performed on all the ASI-3 items (Osman et al., 2010). For each of these original non-reversed ASI-3-SC items we created a reversed ad-hoc item specifically for the purpose of this study (see Table 1).

Procedure. As in the previous two studies, participants completed in both sessions the explicit target scale (i.e., the ASI-3-SC) second. They received a reminder to complete the second session five months following the first session.

Results and discussion. The split half reliability of the GC-qIAT (Spearman-Brown corrected) was $r_{tt} = .89$ in both sessions, and it was $r_{tt} = .91$ in the first session and $r_{tt} = .93$ in the second session for the parallel ASI-3-SC subscale. The correlation between the GC-qIAT tasks completed five months apart was $r_{tt} = .58$, $p < .001$, and it was $r_{tt} = .78$, $p < .001$, for the explicit ASI-3-SC scale.

Implicit-explicit correlation of the GC-qIAT with the explicit ASI-3-SC subscale was $r = .41$ in the first session, and $r = .50$ in the second session (p 's $< .001$). This correlation was significantly larger than the correlations with the other two self-reports ($r = .18$, $p = .040$, for the explicit

NFC scale, Steiger's $Z = 2.43$, $p = .015$, and $r = .07$, $p = .417$, for the AH scale, Steiger's $Z = 2.75$, $p = .006$). Thus, as was the case with the other two personality scales on which we focused, the present findings support the internal consistency, temporal stability and convergent and discriminant validity of the implicit assessment of the ASI-3-SC.

Study 4

The following set of studies tested additional aspects related to the validity of the GC-qIAT as an implicit assessment procedure. In Studies 4a and 4b, we focused on a central aspect of the definition of automatic or implicit assessment (e.g., Greenwald & Banaji, 2017), namely the extent to which respondents are conscious of the purpose of the task. The qIAT is an indirect assessment procedure. In contrast to parallel self-report scales, which may include the same set of personality items, the assessment in the qIAT is not based on respondents' reflection on the connections between the content of these items and themselves. Instead, as in other IAT variants, the outcome in the qIAT is based on the speed of categorization in the different parts of the task (e.g., Nosek et al., 2011). However, as Gawronski (2019) suggested, even if the assessment procedure is clearly indirect, actual unawareness to its purpose should be treated as a hypothesis and tested empirically. This holds particularly for the qIAT, which compared to most indirect assessment procedures it is based on the relatively long and complex stimuli, and consequently is associated with larger response latencies.

Critically, we did not aim to examine respondents' awareness to the *specific* objective of the task (e.g., measuring extraversion). Indeed, awareness of the nature of the assessed construct may often be limited in any mode of assessment, including explicit self-reports. Rather, our goal was to examine whether respondents are at all conscious of the *general* purpose of the procedure (i.e., assessing one's perceptions of the self). In most self-report measures, this broad objective is stated clearly and directly as part of the instruments' instructions (e.g. "Describe yourself as you generally are ..."; Goldberg et al., 2006).

Study 4a

Self-esteem has been assessed by implicit procedures in numerous studies (for reviews, see Buhrmester et al., 2011; Falk & Heine, 2015). In the present study, we examined the extent to which participants were aware of the purpose of the GC-qIAT, which was based on the items of the Rosenberg Self-Esteem scale (RSES; Rosenberg, 1965), the most widely used measure of general self-esteem.

Method

Participants. A total of 195 native English speakers were recruited via Prolific Academic platform and received GBP 1.25 for their participation. Of these, 15 participants were excluded based on their performance in the implicit tasks, following the criteria detailed above. The final sample

Table 5. Frequencies (percent) of answers selected in the multiple-choice question about the purpose of the qIAT in Studies 4a and 4b.

Answer choice	Study 4a	Study 4b
The task assesses people's ability to adapt to changing rules, based on categorization speed in the different parts	37.80	40.50
The task assesses differences between the left and right hemispheres, based on categorization speed in the different parts	19.40	17.70
The task assesses people's ability to memorize confusing directions, based on error rate in the different parts	6.70	4.50
The task assesses whether different font colors cause more mistakes, based on the error rate in the different parts	4.40	1.80
The task assesses people's ability to complete dull tasks quickly but accurately, based on speed versus error rate in the different parts	1.70	3.20
The task measures the connections between sentence length and categorization speed	1.70	0.50
Total incorrect answers	71.70	68.20
The task assesses people's levels of self-esteem/extraversion, based on categorization speed in the different parts*	28.30	31.80

Note: Answer options were presented in random order.

*Correct answer (self-esteem in Study 4a, extraversion in Study 4b).

included 180 participants (96 females, Mean age = 37.48, $SD = 13.48$).

Materials

Explicit measure: Rosenberg Self-Esteem scale (RSES; Rosenberg, 1965). The RSES is composed of ten items (five reversed) designed to measure self-esteem. Internal consistency for this scale in the current study was $\alpha = .92$.

Implicit measure. The GC-qIAT (as in Study 2b), in which the target personality stimuli were the five reversed and five non-reversed original RSES items (see Table 1).

Procedure. Participants completed the self-report scale, which was followed by the GC-qIAT. They then answered two open questions. First, they were asked about the purpose of the categorization task they had just performed, and then whether they had been aware of this purpose while completing the task. They then responded to the following seven-choice multiple choice question: "Regardless of what your answer was to the previous questions, which of the following options you think best represents the actual purpose of this task?". The six wrong answer choices were based on responses to the above first open question in an earlier pilot work. Most importantly, they were all completely unrelated to the task's purpose (e.g., *The task assesses differences between the left and right hemispheres, based on categorization speed in the different parts*; see Table 5). That is, the correct answer (*The task assesses people's levels of self-esteem, based on categorization speed in the different parts*) was the only one that reflected the general purpose of the qIAT (i.e., measuring self-perceptions). The order of the seven answer choices was randomized. To increase participants' motivation and seriousness, they were informed that correct answers would enter a draw to win two prizes of GBP 15 each (=12 times their participation compensation).

Results and discussion. The Spearman-Brown corrected split half reliability was $r_{tt} = .80$ for the GC-qIAT, and $r_{tt} = .93$ for the explicit RSES ($M = 34.36$, $SD = 8.38$). Implicit-explicit correlation of the GC-qIAT with the explicit RSES was $r = .34$ ($p < .001$). Two independent raters (90% agreement between them) coded the responses for the main open question, and inconsistencies between them were decided by a third rater. Answers were coded as correct as long as they generally indicated, an understanding that the task assessed one's perceptions of the self (e.g., "To identify what you truly think about yourself"; "See how you perceive positive/negative thoughts in relation to lies/truth"). Critically, identification of the assessed construct (i.e., self-esteem) was not a criterion.

Results showed that only 31 (17.2%) participants provided an answer that reflected, even remotely, the general purpose of the task. The vast majority of the participants (82.8%) either provided an answer that was clearly erroneous (e.g., "Assessing one's ability to multitask"; "To test co-ordination under pressure"), or simply wrote that they had no idea (answering was mandatory; all responses are included in the [supplementary materials](#)). Most importantly, despite the fact that the correct answer was one of the options in the multiple-choice question, a large majority of the participants (129, 71.7%) chose one of the clearly wrong choices, that had nothing to do with personality assessment (see Table 5 for the complete distribution of the responses). Only 21 (11.7%) participants answered the open question correctly based on the above criteria and chose the correct answer. Sixty one (33.9%) participants reported that they thought about the purpose of the task while completing it, but of those, only 9 participants (5.0% of the whole sample) answered both questions about the purpose of the task correctly. Finally, follow-up between-group t-tests did not reveal any differences between those who did and those who did not answer correctly the multiple-choice question on any of the implicit task's parameters (RT, error rate, D-score; all $ps > .1$). Taken together, the present results indicate that the large majority of the respondents were not aware of the actual purpose of the qIAT.

Study 4b

In the present study, we replicated the initial findings obtained in Study 4a, this time focusing on the construct of extraversion.

Method

Participants. A total of 283 native English speakers were recruited via Prolific Academic platform, and received GBP 1.25 for their participation. Of these, 63 participants were excluded based on their performance in the implicit tasks, following the criteria detailed above. The final sample included 220 participants (128 females, Mean age = 36.85, $SD = 13.35$).

Materials

Explicit measure. Personality was assessed using the same 50-item IPIP scale that was used in Studies 1 and 2 (Goldberg et al., 2006). Cronbach's alphas in the current study ranged between .83 for Intellect and .93 for Extraversion.

Implicit measure. The GC-qIAT, in which the target personality items were the five reversed and five non-reversed original IPIP extraversion items.

Procedure. Procedure was identical to that of Study 4a, but here participants were informed that they could also win one of two GBP 15 prizes for answering correctly in the open question about the purpose of the task (i.e., and not only in multiple-choice question).

Results and discussion. The Spearman-Brown corrected split half reliability was $r_{tt} = .92$ for the GC-qIAT and $r_{tt} = .94$ for the parallel explicit Extraversion scale. Implicit-explicit correlation of the GC-qIAT with the explicit Extraversion scale was $r = .52$ ($p < .001$). Two independent raters (91.8% agreement between them) coded the open question's responses, and inconsistencies between them were decided by a third rater. As in Study 4a, identifying the assessed construct (i.e., extraversion) was not a criterion. Results showed that even though in the current study participants could also win a prize for answering the open question correctly, again a large majority (156, 70.9%) did not provide an answer that reflected the general purpose of the task, even in a broad sense (all responses are included in the [supplementary materials](#)). More importantly, a large majority of the participants (150, 68.2%) again chose one of the clearly wrong answers to the multiple choice question, in which the correct answer was presented (see [Table 5](#) for the complete distribution of all responses). Only 47 (21.4%) participants answered the open question correctly *and* chose the correct answer. Only 45 (20.5%) participants reported that they were aware of the purpose of the task while completing it, and of those, only 6 (2.7% of the whole sample) answered both questions about the purpose of the task correctly. As in the previous study, exploratory follow-up analyses showed that the error rate and D-score of the GC-qIAT did not differ between those who answered correctly vs. incorrectly the multiple-choice question ($ps > .1$). However, here the task's overall RT did differ between these two groups, $M = 1334.57$ ($SD = 270.33$) vs. $M = 1505.34$ ($SD = 345.87$), respectively, $t = 3.13$, $p = .002$, $d = .55$, 95% CI [63.34, 278.20].

Thus, replicating the findings of the previous study, the present results again indicate that a large majority of the respondents were unaware that the qIAT was related to personality assessment. Notably, Prolific online samples are comprised of "expert participants", who often preform many studies on a daily basis. It is therefore likely that the present results actually underestimate that extent to which people may not be aware of this task's objective in most other settings. Regardless, the findings of both studies, in which the qIAT measured two different constructs, suggest that for the most part respondents are not conscious of the actual purpose of this indirect assessment procedure (see Gawronski, 2019).

Study 4c

In this pre-registered study (<https://aspredicted.org/mz72w.pdf>), we examined the criterion validity of the GC-qIAT, which again measured self-esteem. Numerous studies that used standard self-report measures showed that depression

and dysphoria are clearly associated with low self-esteem (e.g., $r = .57$; Sowislo & Orth, 2013). Contrary to expectations, however, this was not the case for studies in which self-esteem has been measured implicitly (e.g., Franck et al., 2008). Here, we examined whether the self-esteem GC-qIAT would differentiate between individuals who reported using antidepressants, and those who did not report using such medications.

Method

Participants. A total of 598 native English speakers were recruited via Prolific Academic platform, and received GBP 1.75 for their participation. The Antidepressants (AD) Group included 297 participants who reported using such medications when registered to Prolific, and the Non-Antidepressants (NAD) Group included 301 participants who reported that they do not use any type of psychiatric medications. Of these, 65 participants (34 and 31 in each group, respectively) were excluded based on their performance in the implicit tasks, following the criteria detailed above. The final sample included a total of $N = 533$ participants (305 females, Mean age = 37.14, $SD = 13.32$).

Materials. As in Study 4a, the RSES and the GC-qIAT measured self-esteem.

Procedure. Participants completed the explicit RSES, which was followed by the GC-qIAT.

Results and discussion. The split-half reliability (Spearman-Brown corrected) was $r_{tt} = .88$ for the GC-qIAT and $r_{tt} = .94$ for the explicit RSES. The implicit-explicit correlation between this task and the parallel self-report RSES was $r = .53$, $p < .001$, in the AD group and $r = .41$, $p < .001$ in the NAD group, and $r = .49$, $p < .001$, across the whole sample. The difference between these two groups on the self-report RSES was significant, $M = 29.94$ ($SD = 9.12$) for the AD Group, and $M = 35.03$ ($SD = 8.52$) for the NAD Group, $t = 6.66$, $p < .001$, $d = .58$, 95% CI [3.59, 6.59]. More importantly, supporting the criterion validity of the implicit self-esteem GC-qIAT, it also differentiated between the AD and the NAD groups: $M = .51$ ($SD = .65$) versus $M = .69$ ($SD = .59$), $t = 3.29$, $p = .001$, $d = .29$, 95% CI [.07, .28], respectively. To examine the incremental validity of the implicit self-esteem scores over the standard explicit assessment, we conducted a univariate ANCOVA, in which the group (AD, NAD) was the independent variable, the GC-qIAT score was the dependent variable, and the RSES was the covariate. Results showed that after controlling for the explicit RSES, the difference between the two groups on the GC-qIAT was not significant, $F(1, 530) = .02$, $p = .879$, $\eta_p^2 < .001$. Thus, supporting criterion validity of the implicit self-esteem assessment of the GC-qIAT, it differentiated between participants who use antidepressants and those who do not use such medications. However, this effect was not incremental over the explicit self-esteem measure.

General discussion

Implicit-explicit dissociations may be the result of factors related to the lack of conceptual correspondence between

the two modes of assessment (e.g., the use of different type of stimuli; Gawronski, 2019; Nosek et al., 2011). Here we tested implicit assessment procedures of the self that minimize the influence of such extraneous factors, while retaining the simplicity and flexibility of the assessment technology of the IAT. The present findings provide initial support for the feasibility, reliability and validity of these methods, and suggest that they may be utilized for the indirect assessment of a broad range of personality constructs, which so far have been assessed exclusively by self-report instruments.

The GC-qIAT is based on the IAT (Greenwald et al., 1998) and the qIAT (Yovel & Friedman, 2013), but the personality stimuli in this task are classified into universal and neutral categories (e.g., *Type 1* vs. *Type 2*), which are not semantically related to the measured construct. The error rates and RTs observed in Studies 2a and 2b suggest that despite the arbitrary, non-intuitive connection between the category labels and the personality stimuli in this task, participants' performance was not impaired. Accordingly, in both studies the reliability and validity of the assessment provided by the GC-qIAT was at least comparable to the outcome of the earlier version of this task (measuring the same construct) in Studies 1a and 1b, in which the classification process was based on meaningful and construct-specific labels (e.g., *Extravert* vs. *Not extravert*). In addition, the implicit assessment of the self in the qIAT is based on the items of standard, validated self-report questionnaires. However, most questionnaires do not include an equal number of reversed and non-reversed items, which is required for the classification procedure of the IAT. The results of Studies 1a and 1b support the adequacy of a task that includes ad-hoc items (reversed or non-reversed), which are directly based on the original items of the target scale.

Studies 1a, 1b, 2a and 2b focused on extraversion, a construct that has been previously measured implicitly by the qIAT (Friedman et al., 2021; Yovel & Friedman, 2013), as well as by earlier versions of the IAT (De Cuyper et al., 2017). In Studies 3a-3c, we examined the implicit assessment of three frequently used personality scales, which include items that are far more semantically complex (see Table 1). To the best of our knowledge, the personality constructs measured by these scales have never been assessed indirectly. All three studies provided support for the internal consistency, test-retest reliability and implicit-explicit convergent validity of the indirect assessment procedure of the GC-qIAT. The results of Studies 4a and 4b supported the implicitness of this indirect assessment procedure (Gawronski, 2019). In both these studies, in which two different constructs were assessed (i.e., general self-esteem and extraversion, respectively), a large majority of the task's respondents were clearly unaware of its general purpose of measuring perceptions of the self. Finally, Study 4c provided initial support for the criterion validity of this new version of the qIAT. In this study, the GC-qIAT that measured general self-esteem differentiated between respondents who reported taking antidepressant medications, and those who did not report the use of any psychiatric medications. Taken together, the present findings suggest that this new version

of the qIAT, which uses generic nonspecific target categories and may be partially based on ad-hoc reversed items, can substantially expand the scope of implicit assessment of the self.

In most standard self-reports, respondents need to indicate the extent to which each of several propositions is true about themselves. In the same vein, and in contrast to the conventional self-IAT, the outcome in the qIAT reflects the association between the measured construct and self-related truth, rather than the general and vague association between the self and the measured construct (Remue et al., 2013). Also, the stimuli in the qIAT are typically the same validated, propositional items that comprise the parallel explicit questionnaire.

The version of the qIAT tested here takes a further significant step toward a conceptual correspondence between implicit and explicit assessment of the self. The category labels are an essential aspect of the IAT, but they are totally extraneous to the parallel explicit assessment, where such labels simply do not exist. Research has shown that these labels create a context that can affect the interpretation of the target stimuli, and that this may lead to unwanted and unpredictable effects on the task's outcome (Gawronski, 2019; Mitchell et al., 2003; Nosek et al., 2007). Also, short labels may not fully capture the entire trait domain portrayed by the scale's items, and respondents may have their own interpretations of any selected labels (Hall et al., 2019). The assessment in the GC-qIAT is based on speeded classification into nonspecific categories, and it therefore eliminates the need to create ad hoc, construct-specific labels. Most importantly, it removes potential unwanted effects that may be caused by the task's labels. Thus, it substantially facilitates the ease of interpretation of implicit-explicit discrepancies (Gawronski, 2019; Nosek et al., 2011), as any obtained differences between these two modes of assessment cannot be attributed to the quality or the content of the target stimuli or to the nature of the category labels.

Dual process perspectives suggest that implicit measures assess associative information that is activated automatically by the impulsive system, while explicit measures tap into propositional information that is activated deliberately via the controlled processes of the reflective system (Asendorpf et al., 2002; Gawronski & Bodenhausen, 2006). Clarifying this distinction with regard to the explicit versus implicit self-concept, Schnabel and Asendorpf (2010) argued that unlike associations, propositions that describe the self are comprised of concepts that are connected by relations, and that such propositions may be regarded by individuals as either true or false as they imply to themselves. Intriguingly, this description of the explicit (compared to the implicit) self-concept closely resembles the assessment method in the qIAT, which assesses the associations between personality and logical true-false self-related propositions. However, as is the case with other variants of the IAT, the qIAT measurement is clearly indirect – it is based on comparing behavior between the two conditions of the task, and not on intentional, deliberate reflection of the assessed material (see Nosek et al., 2011).

The present findings are therefore in line with the propositional model of implicit evaluation (Cummins & De Houwer, 2019; de Houwer, 2014), which suggests that all information is processed through the formation and retrieval of propositions that include relational information between concepts. Based on this perspective, many indirect measures such as the conventional, single-word IAT assess only part of the propositional information. These tasks only measure the strength of the association between the concepts (e.g., “I” + “good”) that comprise the propositional information, and omit the relational part, or the specific way in which the concepts relate to each other (e.g., “I want to be a good person” versus “I am a good person”; de Houwer, 2014). The findings of the present studies, which show that complex self-related propositional information can be activated and measured indirectly, strongly support this perspective.

Unlike other proposition-based implicit tasks (Cummins & De Houwer, 2019), the qIAT assesses the association between propositions that reflect the target personality construct and self-related truth. This task therefore poses an additional challenge to the dual process model, because the association it taps reflects a validation process, which based on this model is assumed to be reflective (Gawronski & Bodenhausen, 2006). It has been suggested, however, that validity affirmation of activated information, which characterizes propositional processes, does not necessarily require either awareness nor intention, nor the deployment of substantial cognitive resources (Wyer & Radvansky, 1999). Shidlovski et al. (2014) suggested that such automatically perceived veracity represents the *implicit truth value* of the information, which differs from the *explicit truth value* that relies on intentional processes. The explicit truth value may represent the verification process that underlies self-report assessment, which involves complex syllogistic inferences and requires deliberation. According to this perspective, the qIAT assesses the implicit truth value of propositional information concerning the self-concept.

The reliability estimates of the qIAT tasks in the present studies were in line with the general pattern observed in earlier investigations that used the conventional self-IAT – good internal consistency, but only moderate levels of temporal stability (e.g., .74 versus .41; De Cuyper et al., 2017; see Gawronski, 2019). Possibly, implicit tasks (including the qIAT) tend to be less temporally stable than explicit measures because they capture situational-specific patterns of behavior, while explicit self-reports reflect the narratives that individuals have about their personalities. According to Mischel’s social-cognitive perspective on personality (Mischel, 2004), people’s self-conceptions, or the ways they perceive their own personality traits, tend to be stable over time and across contexts. However, as Enkavi et al. (2019) have recently demonstrated for measures of self-regulation, observable behavioral patterns are much less stable, and they are more affected by contextual factors (Mischel, 2004; Mischel & Shoda, 1995). Based on such perspectives, explicit assessment typically shows good test-retest reliability because it reflects individuals’ constructions of their own personality traits, which tends to be stable. In contrast, the assessment

of implicit tasks is based on distinctive patterns of situation-behavior relationships, and not on reflective processes. This mode of assessment is therefore more prone to be affected by contextual cues. The present findings suggest that this holds also for the proposition-based qIAT.

The self-esteem implicit assessment of the GC-qIAT predicted the criterion in Study 4c (the use of antidepressants), but it did not provide information that was incremental to the explicit RSES. Additionally, the implicit-explicit relationships observed in most present studies, across several different constructs, were fairly substantial, compared to the conventional self-IAT (e.g., $r = .24$ for extraversion; De Cuyper et al., 2017). In a recent qIAT study (Friedman et al., 2021), the correlation between the qIAT that measured conscientiousness and the parallel self-report ($r = .30$) was smaller than the implicit-explicit correlations observed in most present studies. More importantly, in Friedman and colleagues’ study (2021), the conscientiousness qIAT predicted a criterion behavior in two different samples (i.e., returning to complete a second session of the study, after being paid to do so in advance), and the information it provided was incremental to the parallel self-report.

It appears that in contrast to dual process perspectives (e.g., Gawronski & Bodenhausen, 2006), in the present studies, the outcome of the indirect qIAT tasks and the parallel self-reports were not fundamentally different from each other. Indeed, as Kurdi et al. (2020) recently suggested, it is far from clear that direct and indirect measures tap different constructs, and therefore strong relationships between these two modes of assessment procedures should not be unexpected (see also Greenwald & Lai, 2020). This holds particularly true for the GC-qIAT, given the methodological resemblance between this task and the parallel self-reports (e.g., identical target stimuli, the lack of conceptual classification labels). Importantly, however, the pattern of findings observed in Studies 4a and 4b suggest that for the most part respondents are not conscious of the general objective of the qIAT (i.e., assessing self-perceptions), thus supporting the implicitness of this indirect assessment procedure. Taken together, the current results indicate that a substantial convergence was observed between the qIAT and the parallel self-reports, despite the fact that in the latter mode of assessment respondents needed to reflect about the relevance of the items to themselves, while most of them had no idea that their personality was being assessed by the qIAT. In sum, it appears that in the current studies the implicit GC-qIAT and the parallel explicit questionnaires tapped similar constructs, albeit in very different ways.

Future studies will hopefully explore the conditions under which the implicit assessment of the qIAT may provide information that is incremental to measurement of conventional self-reports (see Friedman et al., 2021). These factors may include the nature of the assessed construct, the criterion behavior, or the context of the assessment. For example, conscientiousness has been found to be associated with social desirability (Ones et al., 1996), and the findings of Studies 4a and 4b suggest that the qIAT is likely to be less prone to such response biases. Future research may also

take a further step, and focus on causal validation by testing the sensitivity of the qIAT to experimental manipulations that affect the constructs measured by this task (see Borsboom et al., 2004).

To conclude, the qIAT combines the flexibility and simplicity of the IAT, with the propositional quality and established validity of the items of standard self-report scales. In the present series of studies, we tested a novel variant of the qIAT, which relies on nonspecific target categories and may use specifically constructed reversed items. Compared to the conventional self-IAT, it substantially increases the correspondence between implicit and explicit measures, and therefore reduces the impact of extraneous variables on the interpretability of its outcome. The current findings suggest that the new version of the qIAT can be readily used for the indirect assessment of a wide range of complex personality constructs, currently tapped only by self-reports. Future research will hopefully use the procedures tested here to further expand the limits of implicit assessment of the self.

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Conflicts of interests

The authors have no conflicts of interest to report.

Data availability

Measures, raw data, data processing code, processed data and analysis syntax of all present studies are openly available at <https://osf.io/xz5wp/>

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