

Multifactor implicit measures to assess enterprising personality dimensions

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Abstract

Background: Several implicit measures have been proposed to overcome limitations of self-reports. The present study aimed to develop a new implicit association test (MFT-IAT) to assess enterprising-related traits, exploring its reliability and validity evidence. **Method:** A total of 1,142 individuals (Mean age 42.36 years, SD = 13.17) from the general population were assessed. Participants were asked about sociodemographic data, employment status, and personality traits using the Battery for the Assessment of the Enterprising Personality (BEPE). They completed an MFT-IAT designed to assess the BEPE's traits (achievement motivation, autonomy, innovativeness, self-efficacy, locus of control, optimism, stress tolerance and risk taking). Reliability was estimated using Cronbach's alpha. Exploratory Factor Analyses (EFAs) were performed to assess the internal structure of the MFT-IAT. Correlations and a Multiple Analysis of Variance were used to estimate validity evidence based on the relationship toward participants' employment status. **Results:** EFAs provided validity evidence for all dimensions with high internal consistency ($\alpha = .92-.93$). Correlations between implicit and explicit measures were non-significant. Non-implicit measures yielded significant differences between employment statuses. **Discussion:** This is a pioneering study in this field and more research is needed to improve the feasibility and practicality of implicit measures in applied assessment settings.

Keywords: Implicit Association Test, entrepreneurship, personality, assessment.

Resumen

Medidas implícitas multifactoriales para evaluar dimensiones de la personalidad emprendedora. Antecedentes: se han propuesto múltiples medidas implícitas para superar las limitaciones de los autoinformes. El presente estudio tiene por objetivo desarrollar un nuevo test de asociación implícita (MFT-IAT) para evaluar rasgos asociados a la emprendeduría, explorar su fiabilidad y evidencias de validez. **Método:** se evaluaron 1.142 personas (edad media 42,36, DT = 13,17) sobre información demográfica, de empleo y personalidad usando la Batería para la Evaluación de la Personalidad Emprendedora (BEPE). Completaron una tarea MFT-IAT para evaluar los rasgos del BEPE (motivación de logro, autonomía, innovación, auto-eficacia, locus de control, optimismo, tolerancia al estrés y asunción de riesgos). Se estimó la fiabilidad mediante el alfa de Cronbach. Se realizaron Análisis Factoriales Exploratorios (AFEs) para evaluar la estructura interna del MFT-IAT y correlaciones y análisis de varianza para estimar las evidencias de validez en la relación con el empleo. **Resultados:** los AFEs ofrecieron evidencias de validez con alta consistencia interna ($\alpha = .92-.93$). Las correlaciones entre las medidas explícitas e implícitas fueron no significativas. Ninguna medida implícita mostró diferencias significativas entre los distintos estados laborales. **Discusión:** este es un estudio pionero en el cambio y se necesita más investigación para mejorar la viabilidad de las medidas implícitas en evaluaciones aplicadas.

Palabras clave: Test de Asociación Implícita, emprendeduría, personalidad, evaluación.

Self-reports are the most widely used tools in psychology, given their ease of use and reduced administration time. However, they also have some limitations such as being influenced by social desirability, self-biases or individuals' insight (Navarro-González, Lorenzo-Seva, & Vigil-Colet, 2016). One way of overcoming some of these limitations is assessing automatically activated cognitive associations by means of implicit measures (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009; Fazio & Olson, 2003). The most commonly used instrument is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; Lane, Banaji,

Nosek, & Greenwald, 2007). The IAT is based on interference effects produced by the association between a target (e.g., 'guitar' vs. 'piano') and an attribute (e.g., 'positive' vs. 'negative' adjectives) pair. In the example, the basic assumption of the IAT is that an individual having an implicit positive attitude to guitars should present shorter the reaction times (RT) for the association 'guitar-positive' than for 'piano-positive'. IAT is useful in several fields such as social cognition (Nosek, Graham, & Hawkins, 2010), clinical psychology (Teachman, Cody, & Clerkin, 2010) and personality research in clinical (Suslow, Lindner, Kugel, Egloff, & Schmukle, 2014) and non-clinical populations (Grumm & Collani, 2007).

Despite these promising findings, several concerns regarding its theoretical foundations and measure interpretations exist. For example, individuals can accurately predict their IAT score; despite its supposed implicit nature and even if it does not match their explicit response (Hahn, Judd, Hirsh, & Blair, 2014). The Associative-Propositional Evaluation (APE) model tries to explain

this apparent contradiction regarding the awareness of implicit measures by accounting for different processes underlying implicit and explicit attitudes (Gawronski & Bodenhausen, 2006). While implicit measures reflect automatic reactions to cues, explicit measures result from a reflective process in which several propositions regarding the attitudinal object are weighted and validated. This fact implies that implicit measurement procedures target automatic cues-triggered responses rather than unconscious processes that cannot be introspected.

Much controversy still exists over their test-retest reliability or their incremental predictive validity above their explicit counterparts (Falk, Heine, Takemura, Zhang, & Hsu, 2013; but see Cuyper et al., 2017). These concerns partially derive from limitations identified in the implicit measurement paradigm. The IAT assesses the relative preference of one category in relation to its comparison pair, rather than an absolute preference. Also, it needs a comparison pole, which limits its application in studies where there is no specific contrasting concept. Different variations of the classical IAT have been developed with the aim of overcoming those limitations, such as the brief-IAT (Sriram & Greenwald, 2009), the Single Category IAT (Karpinski & Steinman, 2006), and the Multifactor trait IAT (MFT-IAT, Greenwald, 2005).

The MFT-IAT was proposed as an assessment alternative for personality (Greenwald, 2005). In the classical IAT participants are asked to associate ‘self’ vs. ‘others’ items with opposite poles of the same trait (e.g., ‘extraversion’ vs. ‘introversion’). The IAT score can be distorted by self-concept, as these items represent to some extent positive/negative biased words (Schnabel, Asendorpf, & Greenwald, 2008; Steffens & Schulze-König, 2006). In the MFT-IAT items belonging to the target trait (e.g., extraversion) are compared with a pool of items belonging to either of the comparison traits (e.g., openness, agreeableness and/or conscientiousness), which overcomes two of the major limitations of the classical IAT (i.e., self-concept confounding and the need for a comparison category).

The so-called enterprising personality comprises traits which facilitate the personal development towards the resolution and maintenance of new projects (Muñiz, Pedrosa, García-Cueto, & Suárez-Álvarez, 2016). Previous research has explored broad (Brandstätter, 2011; Obschonka, Schmitt-Rodermund, Silbereisen, Gosling, & Potter, 2013) and narrow ‘enterprising’ traits (Almeida, Ahmetoglu, & Chamorro-Premuzic, 2014; Suárez-Álvarez, Pedrosa, García-Cueto, & Muñiz, 2014), with the latter exhibiting the strongest predictive power (Leutner, Ahmetoglu, Akhtar, & Chamorro-Premuzic, 2014). Traits like achievement motivation, autonomy, innovativeness, self-efficacy, internal locus of control and risk taking have been found to have the highest predictive power in the enterprising field (Pedrosa, Suárez-Álvarez, García-Cueto, & Muñiz, 2016; Rauch & Frese, 2007a, 2007b; Suárez-Álvarez et al., 2014). A meta-analysis reported that external assessments of personality show incremental predictive validity of job performance over self-reported measures (Connelly & Ones, 2010), what suggests the potential utility of implicit measures in this field. However, the existing evidence on this topic is mixed and some studies found significant predictive validity for implicit measures (Slabbinck et al., 2018; Steffens & König, 2006) while others did not support its use for applied purposes in work settings (Asendorpf, Banse, & Mücke, 2002; Siers & Christiansen, 2013). The assessment of broad traits or motives through classical versions of the IAT procedure may explain these mixed results. To our

knowledge no previous research has developed an MFT-IAT for the assessment of narrow ‘enterprising’ traits.

Giving the potential benefits of using a specific IAT procedure to assess personality dimensions, the present study sought to overcome previous gaps in the literature by exploring the feasibility of an MFT-IAT for the assessment of eight narrow dimensions of the enterprising personality. The objective was threefold: a) to develop an MFT-IAT to assess the aforementioned traits, and explore its psychometric properties, b) to explore the relationship between implicit and explicit measures of enterprising personality traits, and c) to analyse the ability of the MFT-IAT to discriminate between groups of entrepreneurs and non-entrepreneurs.

Method

Participants

A total of 1,142 individuals (58.6 % female) were recruited from January to May 2017 mainly through online advertisements on public, enterprising-related and University websites. Participants, sampled following an incidental, snowball procedure, were asked to complete an online survey and an MFT-AIT task. The mean age was 42.36 years ($SD = 13.17$) and most participants were employees (70%), followed by self-employed (13.5%), civil servants (6%), unemployed (4.1%), retired (3.3%), and students (3.2%). Most self-employed participants were established entrepreneurs (44.23%), followed by potential (35.58%), new (16.83%) and nascent (3.36%). A total of 118 participants (10.3%) were excluded due to either random answers (85 participants, 7.4%) or low RT in more than 10% of trials (33 participants, 2.9%) (See *Data analysis* section). Characteristics of the final sample ($n = 1,024$, 59.9% female) are shown in Table 1. There were no sex differences in either age ($p = .393$) or profession ($p = .222$).

Instruments

Sociodemographic information. Participants provided information about sex, age and employment status. Those who reported being self-employed were asked about how long they had owned their business. The self-employed were then classified into four categories following the Global Entrepreneurship Monitor report (GEM, 2015): potential (thinking about setting up a business in the next three years), nascent (involved in setting

Table 1
Sample characteristics

	Total sample	Male	Female	t / χ^2
	n (%)	n (%)	n (%)	
Age ^a	42.51 (13.05)	42.08 (13.19)	42.79 (12.95)	.854
Profession				6.82
Employed	725 (70.8)	274 (36.4)	451 (63.6)	
Potential entrepreneur	74 (7.2)	36 (48.6)	38 (51.4)	
Nascent entrepreneur	7 (0.7)	2 (28.6)	5 (71.4)	
New entrepreneur	35 (3.4)	17 (48.6)	18 (51.4)	
Established entrepreneur	92 (9)	41 (44.6)	51 (55.4)	
Other	91 (8.9)	41 (38.6)	50 (61.4)	

^a Mean age (Standard deviation)

up less than three months), new (owning a business for up to 3.5 years), and established (owning a business for more than 3.5 years) entrepreneur. To detect random or careless responses 10 items stating the correct option (e.g. ‘please, select option three’) were interspersed throughout the questionnaires. Participants with three or more incorrect answers were removed.

Explicit measures. The Battery for the Assessment of the Enterprising Personality (BEPE; Cuesta, Suárez-Álvarez, Lozano, García-Cueto, & Muñiz, in press) was used. It comprises eight traits (15 items per trait): achievement motivation, autonomy, innovativeness, self-efficacy, internal locus of control, optimism, stress tolerance and risk taking. Participants were asked about their agreement (1 *completely disagree*, 5 *completely agree*) with each statement. In this study, BEPE’s internal consistency was good ($\alpha = .82-.90$).

Implicit measures. The structure of the Multifactor-Trait Implicit Association Test (MFT-IAT) proposed by Greenwald (2005) was followed. Each of the eight subtasks comprised six blocks including practice and critical blocks (see Table 2 for an example for Self-efficacy). As the first block was common to all subtasks it was only presented once. Remaining tasks started in the second block (attribute discrimination). To prevent order effects, each subtask was randomly presented. Participants were prompted to correct wrong answers before continuing, recording the RT up to the correct classification. Each category (‘me’, ‘others’ and the eight personality traits) consisted of two items which were randomly presented within each task.

Two items per category instead of five were used to reduce task demand without losing validity (Nosek, Greenwald, & Banaji, 2005). Item selection followed a four-step procedure: 1) several words for each trait were proposed based on items from the BEPE, 2) words were reworded into adjectives if possible and removed if present in more than one trait, 3) the four words best suited to each trait were selected by expert judges, and 4) using Thurstone’s pairwise comparison procedure with qualified psychologists, two final words were selected for each trait based on the two highest scalar values (see Table 3 and 4).

Two different scores were used. Firstly, the D score proposed by Greenwald, Nosek and Banaji (2003) was calculated. RT means and inclusive standard deviations for trials in blocks 3-5, and 4-6 were calculated. As participants were prompted to correct wrong answers, no penalty was included. Each difference score ($Mean_{B5.3}$ and $Mean_{B6.4}$) was divided by its associated SD. The IAT_D resulted from the average of the two previous divisions. Secondly, to prevent

possible bias produced by the inclusion of a weighting factor based on SD (see Blanton, Jaccard, & Burrows, 2015) a raw IAT score was calculated by simply subtracting the mean RT of blocks 3-4 from the mean RT of blocks 5-6. In both measures a higher score suggests a stronger implicit attribution.

Procedure

The online advertisements asked individuals interested in the study to provide their e-mail. Potential participants received an e-mail explaining the aims of the study, the procedure and guarantees of confidentiality and anonymity. Before performing the MFT-IAT, participants completed a questionnaire including sociodemographic and employment data, and the BEPE.

Data analysis

In order to avoid extreme RT values, RT greater than 10,000 ms were replaced with the blocks’ average RTs. Data from participants with more than 10% of trials showing latencies lower than 300 ms were removed (Greenwald et al., 2003). Eight Exploratory Factor Analyses (EFA) were performed to assess the internal structure

Table 2
Structure of the Self-efficacy task blocks

Block	No. of trials	Task	Left-key category	right-key category
1	20	Target discrimination	Me	Others
2	20	Attribute discrimination	Self-efficacy	Other traits
3	20	Combined task	Me, Self-efficacy	Others, other traits
4	40	Combined task	Me, Self-efficacy	Others, other traits
5	20	Combined task	Others, Self-efficacy	Me, other traits
6	40	Combined task	Others, Self-efficacy	Me, other traits

Table 3
MFT-IAT stimulus words

Category	Stimulus words
Me	Me, my (yo, mí)
Others	They, others (ellos, otros)
Achievement motivation	Overcoming, Persistent (superación, persistente)
Autonomy	Independent, Initiative (independiente, iniciativa)
Innovativeness	Innovative, Creative (innovador, creativo)
Self-efficacy	Competent, Effective (competente, eficaz)
Internal locus of control	Responsible, Assume (responsable, asumir)
Optimism	Optimistic, Positive (optimista, positivo)
Stress tolerance	Stable, Calm (estable, sereno)
Risk taking	Courageous, Daring (valiente, atrevido)

Note: English words (Spanish words)

Table 4
Scalar values of stimulus words according to traits

Stimulus words	Scalar value	Stimulus words	Scalar value
Achievement motivation		Locus of control	
Overcoming	.855	Responsible	1.117
Persistent	.417	Assume	.892
Next word	.147	Next word	.200
Autonomy		Optimism	
Independent	.615	Optimistic	1.530
Initiative	.462	Positive	1.177
Next word	.302	Next word	.392
Innovativeness		Stress tolerance	
Innovative	.997	Stable	.540
Creative	.815	Calm	.315
Next word	.447	Next word	.115
Self-efficacy		Risk taking	
Competent	.897	Courageous	.740
Effective	.887	Daring	.605
Next word	.835	Next word	.555

of the MFT-IAT for each personality trait. The extraction method used was Unweighted Least Squares (ULS) and the number of factors was determined by Optimal Implementation of Parallel Analyses (Timmerman & Lorenzo-Seva, 2011) with 1,000 resampling operations. The root mean-squared residual (RMSR) and the comparative fit index (CFI) were used to test goodness of fit. A RMSR equal to or lower than .08, and a CFI equal to or greater than .90 are indicative of good fit. Internal consistency was calculated by means of Cronbach's alpha.

Pearson and canonical correlation coefficients between the BEPE and the MFT-IAT were calculated. A Multiple Analyses of Variance was used to analyse differences in MFT-IAT D scores according to participants' employment status. Analyses were performed using SPSS 24 (SPSS Inc., Chicago IL, USA) and Factor 10.5 (Lorenzo-Seva & Ferrando, 2006).

Results

Exploratory factor analysis of the implicit measures

The goodness of fit criteria for unidimensionality were adequate for all dimensions (see Table 5), with percentages of explained variance by the first factor ranging from 29.8% to 34.1% (Factor loadings ranged from .35 to .69). Reliability was consistently high for the eight assessed traits.

Pearson product-moment and canonical correlations between implicit and explicit measures

Correlations between implicit and explicit measures were non-significant (see Table 6). The canonical correlation between the two blocks of variables (eight BEPE subscales and the correspondent implicit measures) was .20 ($p = .15$) for the D and .19 for the Raw scores ($p = .25$). The redundancy coefficient in both cases was .002 (explained variance < 1%).

Table 5
Psychometric properties of the Implicit Association Tests

Traits	Model fit indexes		Explained variance	Internal consistency
	CFI	RMSR	%	α
Achievement motivation	.987	.042	31.7	.92
Autonomy	.990	.038	29.8	.92
Innovativeness	.989	.040	31.5	.92
Self-efficacy	.983	.047	34.1	.92
Locus of control	.985	.047	32.8	.93
Optimism	.990	.039	29.8	.92
Stress tolerance	.989	.042	33.3	.92
Risk taking	.988	.042	33.1	.92

Note: CFI = comparative fit index; RMSR = root mean-squared residual; α = Cronbach's coefficient.

Table 6
Correlations between explicit and implicit measures

	MFT-IAT	
	D	Raw scores
Achievement motivation	-.055	.004
Autonomy	.008	.003
Innovativeness	.037	-.018
Self-efficacy	-.005	.032
Locus of control	-.051	.004
Optimism	-.039	.011
Stress tolerance	.006	-.059
Risk taking	.026	.011

* $p < .05$

Table 7
Differences in MFT-IAT scores between non-self-employed, potential entrepreneurs and self-employed participants

	Total sample	Non-self-employed	Potential entrepreneurs	Self-employed	F
Achievement motivation ^a	.093 (.436)	.092 (.433)	0.088 (.394)	.104 (.470)	.064
Autonomy ^a	.184 (.410)	.188 (.404)	.199 (.380)	.154 (.463)	.331
Innovativeness ^a	.161 (.414)	.161 (.414)	.141 (.380)	.171 (.431)	.595
Self-efficacy ^a	.141 (.419)	.154 (.414)	.074 (.469)	.093 (.419)	1.01
Internal locus of control ^a	.116 (.424)	.121 (.422)	.046 (.426)	.123 (.434)	.978
Optimism ^a	.235 (.437)	.220 (.439)	.260 (.417)	.321 (.425)	1.88
Stress tolerance ^a	.095 (.430)	.096 (.429)	.069 (.400)	.099 (.454)	.257
Risk taking ^a	.142 (.418)	.146 (.423)	.144 (.394)	.112 (.406)	.326

^a Mean (Standard deviation) D scores
* $p < .05$, ** $p < .001$

Differences in implicit enterprising traits between employment status

No implicit measure yielded significant differences between the groups with different employment status (Table 7).

Discussion

This study aimed to explore the feasibility of using a Multifactor Trait Implicit Association Test (MFT-IAT) for the assessment of enterprising personality traits. Three main findings are highlighted: a) The MFT-IAT demonstrates adequate psychometric characteristics, reliability and validity evidence of internal structure, b) low correlations were found between explicit and implicit measures of enterprising personality traits, and c) implicit measures did not differ significantly between groups with different employment status.

To date, no previous study has used the Multifactor-trait variation of the classical IAT to assess narrow enterprising personality traits. The hypothesis guiding our research is that the explicit dimensions of enterprising personality assessed with the BEPE battery are also present when assessing these traits through implicit measures. This parallel latent structure between explicit and implicit measures has also been replicated in studies assessing general personality traits such as the Big Five through the classical IAT (Grumm & Collani, 2007; Schmukle & Egloff, 2008). The MFT-IAT has been shown to be a reliable instrument which overcomes several shortcomings of the IAT version proposed by Greenwald et al. (1998) when used in personality research. The internal consistency of the MFT-IAT ($\alpha = .92 - .93$) was higher than that of the BEPE in young people (Suárez-Álvarez et al., 2014) and adults (Cuesta et al., in press).

Implicit measures were not related with their explicit counterparts. Conflicting evidence exists in previous research, with some studies finding significant results (Banse, Seise, & Zerbes, 2001; Gawronski, 2002; Grumm & Collani, 2007), and others finding non-significant or limited associations (Brunstein & Schmitt, 2004; de Cuyper et al., 2017; Siers & Christiansen, 2013; Wiers, Houben, & de Kraker, 2007), especially when exploring personality dimensions such as self-concept (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). There are several explanations that might account for this result such as motivational biases, lack of insight, factors affecting memory retrieval or method-related characteristics (see Hofmann et al., 2005 for a more in-depth review). This non-significant result may also be related to different pathways of information processing, as proposed by several dual-processes models (Strack & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000). In general, these dual-processes models state that self-reports demand a reflective evaluation of past behaviours to be self-classified, while behavioural tasks involve the performance of specific behaviours in normative situations without requiring any reflective processing. Measures of the same construct obtained through different pathways are not necessarily related (Strack &

Deutsch, 2004). Several criticisms have also been made about the diagnostic use of the IAT (Fiedler, Messner, & Blumke, 2006), specifically using IAT scores in order to classify individuals or predict behaviours based on individual differences in said scores. This fact forces us to be very cautious about the interpretation of the relationship between explicit and implicit measures until more data are collected.

Contrastingly with the differences between employees, potential entrepreneurs and self-employed in BEPE scores found recently (Cuesta et al., in press), the implicit measures did not differ significantly between groups. The APE model integrates these conflicting findings by considering alternative but complementary processes underlying implicit and explicit measures. So, individuals may present greater bias toward some specific personality characteristic associated with the entrepreneurial activity. However, they may not consider this bias as valid in their life but just cultural associations (Hahn et al., 2014), hence their life decisions (e.g., potential or actual entrepreneurial activity) depending on other variables such as past experiences and ruled-governed behaviors. This fact raises some important implications since most individuals consider implicit or automatic-based responses as more 'real' or truthful than their actual explicit reports (Hahn et al., 2014). The present findings suggest that even in case that implicit association concepts exist, individuals behave considering much broader information than mere automatic cues-triggered responses what may vanishes the influence of such implicit associations.

Some limitations merit consideration. As this was a cross-sectional study, the direction of the relationship between personality and entrepreneurship remains unclear. The low percentage of self-employed prevented us from exploring differences between enterprising profiles. Negative results may be due to the current definition of enterprising activity as self-employment (Hurst & Pugsley, 2011). Participants' socioeconomic status (SES) and other contextual variables which may be relevant were not included. However, some previous research has shown that personality is a more important predictor of important life outcomes (e.g. to become self-employed) than SES (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

In conclusion, although the MFT-IAT showed good internal consistency, present findings do not support the use of implicit measures for applied purposes in work settings.

Acknowledgements

The present study was funded by the Ministry of Economy and Competitiveness (Refs: PSI2014-56114-P and PSI2017-85724-P) and a predoctoral grant (Ref: BES- 2015-073327). Both funding sources played no role in the study design, data collection, analysis or interpretation of the results.

Conflict of interest

The authors declare that there is no conflict of interest.

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