Development and Validation of Implicit Measures of Emotional Intelligence

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Implicit Measures of Emotional Intelligence

ABSTRACT
We developed non-bipolar IATs that are balanced with respect to an evaluative dimension (good—bad) using semantically distinct descriptors of behavioral tendencies related to emotional intelligence. Confirmatory factor analysis of nested models provided evidence of convergent and discriminant validity, which suggests the measures warrant further development and study.

PRESS PARAGRAPH
Emotional intelligence has attracted much attention in the decades since Goleman’s (1995) claim that EI is important for success in a wide range of social and professional roles. With this interest has come much debate about whether EI should be defined and measured as a set of abilities or as a set of dispositional self-perceptions. The latter is typically assessed with self-report measures that are susceptible to contamination related to inaccurate self-knowledge and impression management artifacts – problems that may be mitigated by implicit measures. This research developed implicit measures of EI using IAT methods and investigated their construct validity.

WORD COUNT
2855
Emotional Intelligence (EI) has received considerable interest and attention from both researchers and practitioners (Lievens & Chan, 2010). Along with this interest has come much criticism and controversy regarding its measurement (Cherniss, 2010), and much of this controversy relates to whether EI is conceptualized as a set of cognitive abilities (Mayer, Salovey & Caruso, 2003) or as a set of dispositional self-perceptions (Petrides, 2011). Regarding the latter, Petrides and Furnham (2001) define trait-EI as a “constellation of behavioral dispositions and self-perceptions concerning one’s ability to recognize, process, and utilize emotion-laden information” (p. 278) – a constellation which is located at the lower levels of personality hierarchies. As such, trait-EI represents the emotional self-efficacy component of the self-concept.

Self-report measures of self-concept can be described as explicit measures in that they ask one to describe how one consciously thinks of one’s self (Wilson & Dunn, 2004). This self-descriptive task typically allows time for the person to thoughtfully deliberate before responding. Kahneman (2011) describes the cognitive processes that underlie these tasks as “thinking slow” (System 2), which he contrasts with “thinking fast” (System 1). The latter involves automatic associations and implicit cognitive processes which operate outside our conscious awareness. Implicit cognition is defined by Greenwald and Banaji (1995) as cognitions, feelings and evaluations that are not necessarily available to conscious awareness, conscious control, conscious intention, or self-reflection. They say the “signature of implicit cognition is that traces of past experiences affect some performance – even though the influential earlier experience is not remembered in the usual sense – that is, it is unavailable to self-report or introspection” (p. 4-5).
Much discussion and debate has occurred on the topic of the relationship between implicit and explicit measures of social cognitive knowledge structures, particularly those involving attitudes, personality traits and self-concepts (Greenwald, Banaji, Rudman, Farnham, Nosek & Mellott, 2002; Wilson & Dunn, 2004). Researchers have offered several hypotheses as to why dissociation and association between implicit and explicit measures of these constructs are observed. One reason dissociation may occur is that the implicit measure reflects associations about which the individual lacks introspective insight and accurate self-knowledge (Wilson & Dunn, 2004). Wilson’s model of dual attitudes (Wilson, Lindsey & Schooler, 2000) proposes different systems of evaluation and argues that neither implicit nor explicit attitudes are “bona fide” or “true,” but rather each co-exists and directs behavior. Research also suggests discordance can be due to the fact that individuals are reluctant to admit, explicitly, to the tendency revealed by the implicit measure. In other words, individuals can be motivated to distort or disguise when asked to report how they feel and what they think (Fazio & Olsen, 2003). Thus, implicit measures are seen as a way to mitigate the lack of insightful self-knowledge and impression management artifacts that can contaminate explicit (self-report) measures (Greenwald et al., 2002).

The purpose of this research was to develop implicit measures of attributes related to trait-EI and to explore how these implicit measures of self-concept are related to one’s self-awareness as reflected by explicit measures of these attributes. This effort involved usingImplicit Association Test (IAT) procedures to develop non-bipolar, valence-balanced measures of semantically distinct behavioral tendencies, and examining how these are related to explicit (self-report) measures of these behavioral tendencies. Campbell and Fiske’s (1959) multitrait-multimethod (MTMM) strategy was followed, using Widaman’s (1985) confirmatory factor
analytic (CFA) procedure to evaluate a set of nested latent trait models that target the convergent and discriminant validity hypotheses framed by Campbell and Fiske’s MTMM\(^1\).

**METHOD**

*Participants*

Participants (N = 180) were recruited from psychology courses at a public university.

*Explicit Measures*

The NEO-PI-R (Costa & McCrae, 1992) provided scores on eight facet scales that theory and research (Petrides, Pita & Kokkinaki, 2007) suggest are related to the four components of Goleman’s (2001) model of EI (see Figure 1). Two facet scales were selected for each of Goleman’s four EI competencies: O3-Feelings and E6-Positive Emotions (Self-awareness); N4-Self Conscious and N6-Vulnerable (Self-management); A3-Altruism and A6-Tenderminded (Social Awareness); E2-Gregarious and E3-Assertive (Relationship Management). These relationships are displayed in the CFA model labeled Model 1 in Figure 2.

The TEIQue (v1.50; Petrides, 2001) provided four factor scales related to EI: Emotionality, Sociability, Self-control and Well Being. The factor scales are composites of 15 more basic scales which, in turn, are composed of responses to the measure’s 150 items. Although the four TEIQue factors do not map onto the four components of Goleman’s model in an isomorphic manner, each of Goleman’s competencies is theoretically related to one or more of the TEIQue factors. These relationships are displayed in the CFA model labeled Model 1 in Figure 2.

*Implicit Measures*

Schnabel, Asendorpf, and Greenwald (2008) describe a problem involving the confounding influence of valence with semantic value when an IAT includes a self-referent
category. They suggest that individuals may more strongly identify with words associated with a positive valence (e.g. delicate) than words associated with a negative valence (e.g. weak). When controlling for a word’s valence, they found that self-descriptive attributes were more strongly associated with one’s self-concept than non-self-descriptive words with a similar valence. This finding underscores the importance of the semantic meaning of the word, in addition to its valence. As an alternative to traditional bipolar IATs, the authors suggest using semantic contrasts that are non-bipolar by pairing concepts and stimuli that are balanced with respect to an evaluative dimension, in much the same way that forced-choice self-report measures match items according to their social desirability. For example, “sensitive” and “calloused” represent a bipolar pair of EI concepts that are confounded with a value dimension (sensitive—good, calloused—bad). Greenwald and his colleagues used pairs of non-bipolar categories – like conscientiousness and agreeableness – with semantically distinct descriptors of corresponding behavioral tendencies which were matched according to their valence. One of these balanced IATs paired positive aspects of conscientiousness (determined, dutiful and orderly) with positive aspects of agreeableness (bighearted, amicable and warmhearted). Correlations among their measures provided support for the convergent and discriminant validity of the IATs – the IATs measured implicit associations among semantically distinct self-constructs that were independent of self-esteem, and they did so in a way that reflected relationships among explicit measures of corresponding constructs.

In accord with Schnabel et al. (2008), semantically distinct descriptors of EI behavioral tendencies were used to develop non-bipolar valence-balanced IATs using the seven block procedure and D-scoring method described by Greenwald, Nosek and Banaji (2003). More specifically, we developed four IATs by pairing attributes that are strongly associated with
components of Goleman’s model (e.g., emotional self-awareness) with attributes that are weakly associated with EI (e.g., physical strength). These attributes were combined with a self-referent dichotomy (me, not-me) in order to assess the strength of these associations in one’s implicit self-concept. Table 1 and Table 2 display the attribute labels and stimuli for the four IATs, which were labeled EK for the Self-awareness component (paired with physical strength), EA for the Social Awareness component (also paired with physical strength), EC for the Self-management component (paired with mental strength) and ES for the Relationship Management component (paired with integrity). According to Schnabel et al. (2008), larger IAT effects reflect stronger self—EI attribute associations in one’s implicit self-concept.

In accord with Campbell and Fiske’s (1959) MTMM procedure for investigating the construct validity of measures, we predicted that the IATs and corresponding self-report measures for the same EI attribute would be more strongly associated (convergent validity) than each of these would be with the IATs and self-report measures of different EI attributes (discriminant validity).

Procedure

The explicit and implicit measures were administered to groups of subjects in a computer lab over the course of three sessions. The order in which the scales were administered was as follows: two of the IATs and half of the NEO items (session 1); the remaining two IATs and second half of the NEO items (session 2); several demographic items and the TEIQue items (session 3).

RESULTS

The use of a multiple session design resulted in many subjects with missing data. Although 180 subjects completed the first session, only 95 completed the second session and
only 55 completed all three. Of those who completed all three sessions, 60% were female, their mean age was 20.3 years, and 87% identified themselves as non-Hispanic whites. Table 3 and Table 4\(^3\) contain descriptive statistics for study variables based upon those who completed at least the first two sessions (N = 95). An a priori power analysis (MacCallum, Browne & Sugawara, 1996) determined that a sample this size exceeds that required to provide adequate power (.80), given an appropriate null hypothesis of close fit (H\(_0\): RMSEA = .05) and alternative hypothesis of poor fit (H\(_A\): RMSEA = .10).

According to Widaman (1985), convergent and discriminant validity can be investigated by comparing the model fit statistics for a sequence of nested CFA models. The first of these models (see Figure 2) is least restrictive in that it contains two measurement method factors (labeled Explicit and Implicit) and four EI trait factors (labeled Self-awareness, Self-management, Social Awareness and Relationship Management), where both the method factors and the EI traits are allowed to be freely correlated. Model 2 (see Figure 3) is more restrictive than Model 1 in that it contains no EI trait factors – the only latent constructs are the two measurement method factors. Model 3 (see Figure 4) is more restrictive than Model 1 in that it requires the four EI trait factors to be perfectly correlated (i.e., it allows for only a single EI trait factor in addition to the two method factors). Model 4 (see Figure 5) is more restrictive than Model 1 in that it allows the four EI trait factors to be freely correlated while the two method factors are required to be uncorrelated.

The Model 1 – Model 2 comparison reveals evidence of convergent validity to the extent that Model 2 has poorer fit statistics, due to the lack of the specified trait factors contained in Model 1. The Model 1 – Model 3 comparison reveals discriminant validity by comparing a model in which the four EI traits are allowed to be freely correlated (Model 1) to a model in
which the traits are required to be perfectly correlated (Model 3) – the greater the difference in model fit, the stronger the evidence for discriminant validity. The Model 1 – Model 4 comparison uses the same logic as the Model 1 – Model 3 comparison but in reverse (Model 4 eliminates the free correlation between methods). However, it should be noted that since the measurement methods are expected to be uncorrelated, a null finding in this comparison is predicted.

Table 5 displays model fit statistics for the four CFA models. These results indicate that the hypothesized latent trait model described by Model 1 fits the variance-covariance structure of the MTMM data very well. The CFI value is greater than .90 in accord with Bentler’s (1990) recommendation and the RMSEA value is less than .08 in accord with the guidelines that Byrne (2010) and others provide. Furthermore, in accord with MacCallum et al., (1996), the 90% confidence interval for the RMSEA statistic is fairly narrow and the upper bound falls below the threshold (.10) for a poor fit (i.e., we can conclude the model is a close fit).

The results displayed in Table 6 indicate substantial support for both the convergent and discriminant validity of the hypothesized model in that there are substantial and significant decrements in the fit indices when Model 1 is compared with Model 2 and Model 3. More specifically, the change in the CFI and RMSEA values from Model 1 to Model 2 constitute substantial support for the convergent validity hypothesis – the relationships among the observed measures cannot be explained by method variance alone. The CFI value falls from .90 (Model 1) to .42 (Model 2) and the RSMEA value rises from .07 (Model 1) to .13 (Model 2). While the CFI and RSMEA values for Model 1 match the “good fit” standards that Bentler (1990) and others prescribe, the corresponding values for Model 2 fall well outside these boundaries.

Similarly, the results displayed in Table 6 provide empirical support for the discriminant validity hypothesis when Model 1 is compared with Model 3 – a single EI factor does a poor job
of describing the relationships among the observed variables. More specifically, the CFI value drops from .90 (Model 1) to .65 (Model 3) and the RMSEA value rises from .07 (Model 1) to .12 (Model 3). As with Model 2, the statistics for Model 3 fall well outside the accepted thresholds for a good fit. Finally, the comparison of Model 1 with Model 4 reveals that the fit statistics are virtually identical, which suggests that the two method factors are unrelated and that there is no method bias across the two sets of measures. However, the substantial loadings of the individual measures on their respective methods (see Table 7) suggest considerable method bias within each set.

Table 7 displays the loadings for each observed measure on the four EI trait factors and the two method factors of Model 1. These results indicate that most of the indicator variables for each factor had significant loadings (28 out of 36) and, as such, these findings represent further support for the construct validity of the measures. An important exception to this conclusion is the fact that only two of the four IATs (EK-IAT and EA-IAT) had significant loadings on the corresponding EI traits (Self-awareness and Social Awareness), although all four of the IATs had substantial and significant loadings on the corresponding (implicit) method factor.

DISCUSSION

The purpose of this research was to investigate the construct validity of implicit measures that target attributes related to trait-EI. While the effort produced much evidence supporting the construct validity of the entire set of observed measures, there was less evidence supporting the construct validity of the implicit measures for some of the targeted attributes. The hypothesized model did a good job of describing the variance-covariance structure of the 16 observed variables according to fit statistics, and comparisons of this model with more restricted models
(e.g., no EI traits and only one EI trait) produced substantial detrimental changes in the fit statistics.

However, two of the four implicit measures had significant loadings on the targeted EI attributes and two did not. With respect to the targeted EI attributes, the two IATs with significant loadings involved the emotional recognition factors (Self-awareness and Social Awareness) and the two IATs with non-significant loadings targeted the emotional regulation factors (Self-management and Relationship Management). These results suggest that our implicit and explicit identities are *more* concordant when it comes to the way we view ourselves sensing emotions (both our own and others’), while our implicit and explicit identities are *less* concordant when it comes to the way we view ourselves expressing emotions. The dissociation of the latter may indicate a potential for implicit measures to have incremental validity (relative to explicit measures) for the prediction of overt behavior related to these constructs (e.g., effectively managing one’s emotions at work). The relatively weak relationships between implicit and explicit measures of the emotional recognition factors suggest there may be a similar potential for incremental predictive validity regarding overt behavior related to these constructs as well. Furthermore, to the extent there is evidence of incremental predictive validity for the implicit measures, there may be a potential for these to be used in selection and development interventions that target risk management and competitive advantage interests of employers.

However, before these potential applications can be explored there are some psychometric issues with the implicit measures that need to be addressed. In particular, the reliability coefficients for the IATs indicate that measurement error is a problem, especially if the IATs are going to be used to make decisions about individuals (Nunnally, 1978). The reliability estimates reported in Table 3 indicate that the IATs related to the EI competencies involving
others (Social Awareness and Relationship Management) are especially problematic in this regard (EA-IAT = .58 and ES-IAT = .45). According to Lane, Banaji, Nosek and Greenwald (2007), error variance in IAT effects will be less when the stimuli to be classified are quickly and easily associated with their categories. Slow responding and classification errors can distort the IAT effect, especially if stimulus classification ease is confounded with the classification categories (i.e., the stimuli are more quickly and easily classified for one category than another). The percentage of classification errors that subjects make is an index of the potential for this source of measurement error and the average error rates for our four IATs ranged from 9% to 13%. These compare poorly with the average error rates for IATs targeting racial attitudes (obtained from the Project Implicit web site), which ranged from 4% to 6%. This indicates that stimulus ambiguity and classification ease are likely contributing to the unreliability of these IATs. In accord with Lane et al. (2007), future work should focus upon developing (1) IAT attribute labels that are more easily identified, (2) stimuli that are more easily and accurately associated with each attribute, and (3) comparison attributes with stimuli that are semantically more distinctive and different from EI.
Notes

1. The many hypotheses which the MTMM incorporates are not listed here because of size constraints. However, these are addressed in the Method and Results sections of this paper.

2. The authors acknowledge the contributions of research team members Tony Crowder, Michaela Fisher, Erica Golliday, Chelsey McBride, Jacob Tipton and Jazzera Yarborough in making this research possible and express our gratitude for their help.

3. All of the results reported in this paper were based upon analyses using IBM SPSS (v22) and AMOS (v18) software.
References


Figure 1. Goleman’s (2001) Two-by-Two Model of Emotional Competencies

<table>
<thead>
<tr>
<th></th>
<th>Self (Personal Competence)</th>
<th>Other (Social Competence)</th>
</tr>
</thead>
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<tr>
<td><strong>Emotional Recognition</strong></td>
<td>Self-awareness • Emotional self-awareness • Accurate self-assessment • Self-confidence</td>
<td>Social Awareness • Empathy • Service orientation</td>
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<tr>
<td></td>
<td></td>
<td>• Organizational awareness</td>
</tr>
<tr>
<td><strong>Emotional Regulation</strong></td>
<td>Self-management • Self-control • Trustworthiness • Conscientiousness</td>
<td>Relationship Management • Communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conflict management • Teamwork and Collaboration</td>
</tr>
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</table>

16
Figure 2. CFA Model 1.
Figure 3. CFA Model 2.
Figure 4. CFA Model 3.
Figure 5. CFA Model 4.
Table 1. *Category Labels and Word Stimuli for Goleman’s Four EI Attributes*

<table>
<thead>
<tr>
<th>Emotional Self-Management (EC)</th>
<th>Social Awareness (EA)</th>
<th>Relationship Management (ES)</th>
<th>Emotional Self-Awareness (EK)</th>
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<tr>
<td>Poised</td>
<td>Perceptive</td>
<td>Sympathy</td>
<td>Introspective</td>
</tr>
<tr>
<td>Steady</td>
<td>Thoughtful</td>
<td>Caring</td>
<td>Self-Aware</td>
</tr>
<tr>
<td>Composed</td>
<td>Insightful</td>
<td>Sensitive</td>
<td>Mindful</td>
</tr>
<tr>
<td>Controlled</td>
<td>Aware</td>
<td>Helpful</td>
<td>Intuitive</td>
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</table>

Note: EC was paired with MS; EA & EK were paired with PS; ES was paired with I.

Table 2. *Category Labels and Word Stimuli for Three Non-EI Attributes*

<table>
<thead>
<tr>
<th>Physical Strength (PS)</th>
<th>Mental Strength (MS)</th>
<th>Integrity (I)</th>
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<tr>
<td>Athletic</td>
<td>Smart</td>
<td>Honest</td>
</tr>
<tr>
<td>Strong</td>
<td>Bright</td>
<td>Truth</td>
</tr>
<tr>
<td>Powerful</td>
<td>Clever</td>
<td>Fair</td>
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<tr>
<td>Tough</td>
<td>Wise</td>
<td>Ethical</td>
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Table 3. *Descriptive Statistics for Study Variables*

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<th>Max</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
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<tr>
<td>EA-IAT</td>
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<td>.97</td>
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<td>A6-TenderMinded</td>
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<td>37</td>
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<td>E2-Gregarious</td>
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<td>40</td>
<td>25.37</td>
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<td>E3-Assertive</td>
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<td>13</td>
<td>33</td>
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<td>14</td>
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1 The different N values are the result of missing data.
Table 4. Zero-Order Correlations for Study Variables

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<td>1. EK-IAT</td>
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* p < .05; ** p < .01
Table 5. Summary of Goodness-of-Fit Statistics for CFA Models

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<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>CFI</th>
<th>RMSEA</th>
<th>90% C.I.</th>
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<td>1. Freely correlated traits; freely correlated methods</td>
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<td>2. No traits; freely correlated methods</td>
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<td>3. Perfectly correlated traits; freely correlated methods</td>
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<td>4. Freely correlated traits; uncorrelated methods</td>
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Table 6. Differential Goodness-of-Fit Statistics for Nested Model Comparisons

<table>
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<th>$\Delta\chi^2$</th>
<th>df</th>
<th>$\Delta$CFI</th>
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<tr>
<td>Test of Convergent Validity</td>
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<td>Model 1 vs. Model 2</td>
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<td>Model 1 vs. Model 3</td>
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<td>Model 1 vs. Model 4</td>
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* $p < .01$
Table 7. Trait and Method Loadings for CFA Model 1

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<th>Self-Aware</th>
<th>Self-Mgt</th>
<th>Reltn Mgt</th>
<th>Social Aware</th>
<th>Implicit</th>
<th>Explicit</th>
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*p < .05; **p < .01