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The Development and Validation of Implicit Measures of Emotional Intelligence

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THE DEVELOPMENT AND VALIDATION OF IMPLICIT MEASURES OF EMOTIONAL INTELLIGENCE

A Masters Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Psychology

By

Louis Leo Oberdiear

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ABSTRACT

Emotional intelligence (EI) 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 used Implicit Association Test (IAT) procedures to develop implicit measures of EI and investigated relationships with theoretically related explicit (self-report) measures. The results of confirmatory factor analyses of nested latent trait models provided some evidence of convergent and discriminant validity. However, internal consistency reliability estimates indicated that some of the IATs are contaminated with excessive measurement error. Problems with these basic psychometric properties suggest directions for future work in order to realize the full potential of these measures.

KEYWORDS: emotional intelligence, implicit measures, Implicit Association Test, construct validity, confirmatory factor analysis, nested latent trait models.

This abstract is approved as to form and content

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Donald L. Fischer, PhD
Chairperson, Advisory Committee
Missouri State University

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I also would like to dedicate this thesis to the most important person in my life, my grandmother. Her love and care guided my path to where I am now and I can never be thankful enough for it. I love you, Grandma.

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INTRODUCTION

Emotional Intelligence (EI) has received considerable interest and attention by both researchers and practitioners (Lievens & Chan, 2010). EI became popular around the time Daniel Goleman (1995) published his book claiming that EI can be more important than cognitive ability (IQ) with regard to success in social and professional roles. Since then there have been numerous attempts to measure the elusive construct (Tett, Fox, & Wang, 2005). Much of the criticism and controversy that surrounds EI is due to the vast difference in measurement approaches related to problems in defining and operationalizing EI (Mayer, Salovey, & Caruso, 2004).

Along with the debate of dimensionality and definition of EI, the role of it in everyday living is often discussed and celebrated (Tett et al, 2005). EI is often connected to both professional and personal success (Matthews, Zeidner, & Roberts, 2002). Just as Goleman (1995) claimed early on, many still argue EI is a better predictor of many important outcomes than cognitive ability. Some of those outcomes include emotional adjustment, emotional health, and work satisfaction (Elias, Zins, Weissberg, Frey, Greenberg, Haynes et al, 1997). Furthermore, when one controls for cognitive ability, differences in EI are what distinguish those who are more effective and successful from those who are less (Goleman, 1995).

Emotional Intelligence

Ability versus Trait Debate. In most of the EI literature and research, EI is conceptualized as either an ability or trait. Mayer, Caruso, and Salovey (2000) use the

ability model to define EI as a true intelligence meaning it should be a set of abilities and behave in the same way as other intelligences have been shown to behave. Their latest measure, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT V2.0), defines EI as containing four skillsets or branches: perceiving emotion accurately, using emotion to facilitate thought, understanding emotion, and managing emotion (Mayer, Caruso, Salovey & Sitarenios, 2003). The "perceiving emotion accurately" branch describes the individual's aptitude at identifying the emotion in faces, pictures, and other non-verbal expressions. The "using emotion to facilitate thought" branch is the extent to which one can use or harness emotions to assist or enhance thinking that will guide future effective behavior. The "understanding emotion" branch is the ability to comprehend, examine, reflect, and recognize emotional information. The last branch, "managing emotion," is the ability to control emotions for personal and interpersonal growth and to achieve one's goals (Mayer et al, 2004; Mayer, Caruso, Salovey, & Sitarenios, 2003).

The trait EI model views EI as dispositional. Petrides and Furnham (2003) argue that EI is a "constellation of behavioral dispositions and self-perceptions concerning one's ability to recognize, process, and utilize emotion-laden information" (p. 278). This constellation is comprised of personality traits that relate to EI. Examples given are empathy, optimism, self-efficacy, etc. Petrides and Furnham's Trait Emotional Intelligence Questionnaire V1.5 (TEIQue) defines trait EI as a hierarchical construct involving four factors and 15 facets. The four factors they identify are emotionality (being emotionally capable), self-control (possessing willpower), sociability (being socially capable), and well-being (being overall well-adapted). In turn, emotionality is comprised of four facets: trait empathy, emotion perception, emotion expression, and

relationships. Self-control is made up of three facets: stress management, low impulsiveness, and emotion regulation. Sociability is comprised of emotion management, assertiveness, and social awareness. The last factor, Well-being, is made up of self-esteem, trait happiness, and trait optimism.

Measuring Emotional Intelligence. While many researchers disagree on whether EI is best construed as a trait or an ability, they agree that trait EI and ability EI do not measure the same construct (Lievens & Chan, 2010). This can be clearly seen in the type of measurement methods employed. Trait EI uses self-report questionnaires while ability EI utilizes performance-based tests (Petrides, 2011). Meta-analysis has shown that ability EI and trait EI measures are minimally correlated with each other (Van Rooy, Viswesvaran, & Pluta, 2005). With this weak relationship it can been seen why these two different types of measures have been shown to have different correlates. As would be expected, ability EI is more highly correlated with cognitive ability than personality and trait EI is more highly correlated with personality than cognitive ability (Lievens & Chan, 2010).

Both types of measures have been criticized. Researchers' biggest criticism with performance-based measures is the fact the ability model defines EI as a true intelligence. Petrides (2011) states that defining EI as an intelligence makes it just one of many "faux intelligences." He argues that for EI to be properly defined as a true intelligence it would have to be measured with an "IQ-type" procedure – meaning there are objectively true answers to test items. The MSCEIT V2.0, for example, relies on a scoring procedure that involves comparing participant answers to a panel of experts' answers. This leads to the question of whether these experts' judgments are really correct answers in interpreting

emotions and emotional situations, especially when it comes to introspective self-awareness. Without the presence of an "IQ-type measurement" with objectively true answers, ability EI cannot be properly defined as a true intelligence.

Self-report measures are not without criticism, however. Self-report measures face serious validity problems due to the possibility of impression management artifacts and "inflation of correlations because of common method variance" (Lievens & Chan, 2010). Impression management or faking can be especially problematic when measuring socially sensitive variables (like EI) in situations where the outcome of the measurement can influence employment opportunities. In addition to problems related to impression management, self-report measures can suffer from insightful self-knowledge artifacts or inaccurate self-awareness – i.e., one's conscious self-awareness may not accurately reflect others' perceptions and experiences. In particular, Goleman advocates the use of multi-source ratings from significant others (subordinates, peers and superiors) to assess EI as a way of addressing these problems.

Given the heavy criticism of the two primary types of measures currently being employed, it can be argued that alternative approaches might be useful. Both types of measures can be defined as explicit measures in that they provide opportunities for one to consciously reflect upon how to respond. Zeidner, Matthews, and Roberts (2009) argue that emotional intelligence may be better measured by an implicit method. They argue that emotional intelligence involves unconscious or implicit psychological processes. Greenwald and Banaji (1995) define implicit cognitive processes 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).

While explicit processes can be described verbally, implicit processes are difficult to verbalize. It can be argued that dealing with an emotional situation is like riding a bike – it is hard to describe the physical movements and coordination the activity involves but it is easy task to do in the moment. The same could be said for an emotional situation. It would be difficult to go through a step by step process describing all that needs to be done to comprehend and effectively respond but, in the moment, taking in all of the environmental cues and acting, seems to be a fairly natural and effortless process.

Implicit Measures

One of the most prominent and widely used implicit measures is the Implicit Association Test (IAT) developed by Greenwald, McGhee, and Schwartz (1998). By 2007, the IAT was reported to have been used in more than 200 published papers and in hundreds more conference papers (Lane, Banaji, Nosek, & Greenwald, 2007). It can be reasonably assumed that this number has risen considerably since then.

The IAT aims to measure the "strength of association between concepts and attributes" (Lane et al., 2007). The key to the IAT are implicit associations, which are often referred to as automatic associations and automatic thoughts. These automatic associations and thoughts can shed light on individual's underlying attitudes and beliefs. Many of these implicit associations would be described as System 1 processes by Daniel Kahneman. In his book *Thinking, Fast and Slow*, Kahneman (2011) explains the idea

behind the two systems the mind uses to process information. System 1 is automatic and requires no effort when processing information. System 2 is a much slower. System 2 processes information when situations or "mental activities demand it." System 1 is implicit thoughts that mostly go unnoticed while System 2 is explicit thoughts of which we are consciously aware.

The interesting part of the two system theory is the amount of influence each system has on behavior. Intuitively it would be assumed that System 2 would dictate most of the behavior, but this is not what the theory purports. The theory suggests that System 1 is actually the "hero of the book" where thoughts, feelings, impressions are effortlessly produced in ways that fuel explicit beliefs and the choices we make. System 1 contains all of the innate behaviors humans are born with. Kahneman also states "System 1 has learned associations between ideas" and "it has also learned skills such as reading and understanding nuances of social situations."

Can the processes of System 1 be measured? And if so, how? The IAT measures the strengths of associations between concepts through reaction times when sorting word or picture stimuli into paired categories. In the prototypic IAT that Greenwald et al. (1998) use to illustrate their procedure, preference for either "flowers" or "insects" is measured by pairing exemplars of these categories with an attribute – "good" or "bad." The structure of the IAT can be seen in Table 1. Individuals sit at a computer with the left index finger on one key (usually the "E") and the right index finger on another key (usually the "I"), and they press these keys to sort the stimuli, which are presented one at a time on the screen. Practice trials of sorting various "flower" stimuli (daffodil, lily, tulip, etc.) by hitting the left hand key and various "insect" stimuli (spider, ant, roach,

etc.) by hitting the right hand key are performed in Block 1. In Block 2 the person practices sorting "good" stimuli (marvelous, great, wonderful, etc.) by hitting the left hand key and "bad" stimuli (horrible, terrible, awful, etc.) by hitting the right hand key. In the next blocks "flowers" and "good" are paired (i.e., assigned to the same key for sorting) while "insects" and "bad" are paired (i.e., assigned to the same key for sorting). The concepts and attributes are then switched. "Flowers" is paired with "bad" and "insects" with "good," and the individual again sorts presentations of the stimuli. Mean latency times are then compared between the test blocks of 4 and 7. Sorting the stimuli quicker and with fewer errors when "flowers" is paired with "good" and slower when "flowers" is paired with "bad," reveals an automatic (implicit) preference for "flowers." The larger the difference between mean latency times, the stronger the association or IAT effect (Lane et al., 2007).

Table 1. Structure of the IAT.

Block	Number of Trials	Left key response	Right key response
1*	20	Flower	Insect
2*	20	Good	Bad
3*	20	Flower + Good	Insect + Bad
4**	40	Flower + Good	Insect + Bad
5*	40	Insect	Flower
6*	20	Insect + Good	Flower + Bad
7**	40	Insect + Good	Flower + Bad

*Practice blocks; **Test blocks

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. 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, not just 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, one of their balanced IATs paired positive aspects of conscientiousness (determined, dutiful and orderly) with positive aspects of agreeableness (bighearted, amicable and warmhearted). Another IAT paired negative aspects of these traits (absentminded, neglectful and chaotic versus egoistic, greedy and quarrelsome). 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, Asendorpf and Greenwald (2008), trait descriptors related to EI attributes were used to develop IATs that are balanced with respect to an evaluative dimension, in order to not confound self-esteem with semantically distinct descriptors of EI behavioral tendencies. More specifically, four IATs were developed by

pairing attributes that are strongly associated with Goleman's (1995) four EI competencies (see Table) and attributes that are weakly associated with EI (e.g., physical strength and integrity) with a self-referent dichotomy (me, not-me). Table 2 and Table 3 display the attributes and stimuli of the four EI IATs. According to this procedure, larger IAT effects should reflect stronger self—EI associations in one's

Table 2. Goleman's (2001) Two-by-Two Model of Emotional Competencies

	Self(Personal Competence)	**Other(Social Competence)**
Emotional Recognition	Self-awareness • Emotional self-awareness • Accurate self-assessment • Self-confidence	Social Awareness • Empathy • Service orientation • Organizational awareness
Emotional Regulation	Self- management • Self-control • Trustworthiness • Conscientiousness	Relationship Management • Communication • Conflict management • Teamwork and Collaboration

implicit self-concept. We predicted that the IATs associated with EI would be more strongly related to the corresponding self-report measures of EI than measures related to other, less relevant attributes.

Hypothesis*: IAT measures of four EI attributes (Emotional Composure, Emotional Awareness, Emotional Support and Emotional Self-knowledge) will be related to corresponding explicit (self-report) measures of these attributes, and these*

relationships will be stronger than the relationships with both explicit (self-report) and implicit (IAT) measures of non-corresponding attributes.

This general hypothesis can be broken into more specific convergent and discriminant validity hypotheses. Furthermore, these more specific hypotheses can be evaluated by testing hierarchically nested latent trait models using confirmatory factor analytic (CFA) procedures in a manner described by Widaman (1985). These more specific hypotheses and procedures will be described below in the next section.

METHOD

Participants

The Missouri State University Institutional Review Board's Protection of Human Subjects Committee approved this research on November 19, 2014 (Study Number 15-0212). Student volunteers ($N = 180$) were recruited from undergraduate introductory psychology courses at Missouri State University. Students received credit for their participation, which went toward satisfying a course requirement.

Implicit Measures

When developing the IATs, guidelines from Lane et al. (2007) were used. In addition, the standard seven block procedure and D-scoring method described by Greenwald, Nosek and Banaji (2003) was used. The structure of the IAT was slightly modified from the original version described by Greenwald et al. (1998) in that a self-referent dichotomy (me versus not-me) was used as the target categories (instead of flowers versus insects). This self-referent dichotomy was then paired with an EI and non-EI attribute in order to assess the degree to which one's implicit self-concept is associated with the EI attributes. The D-scoring method used in this study is different from the scoring procedure which the original method used (Greenwald, McGhee, & Schwartz, 1998). The original method used the difference between the mean latencies from Test Blocks 4 and 7 (i.e., the mean for Block 7 minus the mean for Block 4). The D-scoring method that is used in this study uses an algorithm that incorporates practice trials and uses respondent latency variability to develop a standardized mean difference score.

More specifically, the mean difference between Practice Blocks 3 and 6 is divided by the pooled standard deviation of the response latencies for these blocks. Similarly, the mean difference between the Test Blocks 4 and 7 is divided by the pooled standard deviation of the response latencies for these blocks. Finally, the two standardized mean differences are averaged. Among other benefits, Greenwald, Nosek and Banaji (2003) provide evidence that the revised scoring procedure is resistant to artifacts related to subjects' overall speed of responding and is more internally consistent than the original metric.

In selecting a model of trait EI to use in constructing the IATs, a team of research assistants agreed that, after a thorough literature review, most EI models contain both an ability to recognize and regulate emotions in oneself and in others, as described by Goleman (1995). This two-by-two model (see Table 2) was used to construct four IATs, where one IAT represented each of Goleman's four EI competencies: Emotional Composure (regulation of one's own emotions), Emotional Self-Knowledge (recognition of one's own emotions), Emotional Awareness (recognition of others' emotions) and Emotional Support (regulation of others' emotions).

As with Schnabel et al. (2008), each EI attribute needed a comparison attribute (a non-EI category). In deciding upon the non-EI attributes, the researchers wanted to use concepts that were completely unrelated to EI and would be easy to understand. The three non-EI attributes chosen were: Physical Strength, Mental Strength, and Integrity.

The next step was developing word stimuli to represent both the EI categories and non-EI categories. Nosek, Greenwald, and Banaji (2005) advise using a minimum of four stimulus items per category and Schnabel et al. (2008) advise using valance-balanced stimuli. Valence can be described as the emotion evoked by a stimulus, which can be

positive or negative. Steffens, Kischbaum, and Glados (2008) suggest that using synonyms of the target categories is the most effective strategy to choosing stimuli. Following this advice, six word stimuli were chosen for each category using synonyms found at Thesaurus.com and other sources (Gough & Heilbrun, 1980). After stimuli were chosen, research team members ($N = 10$) rated the valence of each word independently on a Likert-type scale (1 = very negative, 5 = very positive). Mean valences were then compared and satisfactory matches were composed. The lists below display the attribute labels and stimuli for the four IATs, which were labeled EK for the Self-knowledge component of EI (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). These relationships are displayed in the CFA model labeled Model 1 in Figure 1. According to Schnabel et al. (2008), larger IAT effects reflect stronger self—EI attribute associations in one's implicit self-concept.

Word Stimuli for the Four Emotional Intelligence Competencies

Emotional Composure	Emotional Awareness	Emotional Support	Emotional Self-Knowledge
Poised	Perceptive	Sympathy	Introspective
Steady	Thoughtful	Caring	Self-Aware
Composed	Insightful	Sensitive	Mindful
Controlled	Aware	Helpful	Intuitive

Word Stimuli for the Three Non-EI Competencies

Physical Strength	Mental Strength	Integrity
Athletic	Smart	Honest
Strong	Bright	Truth
Powerful	Clever	Fair
Tough	Wise	Ethical

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 Table 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 1.

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 1.

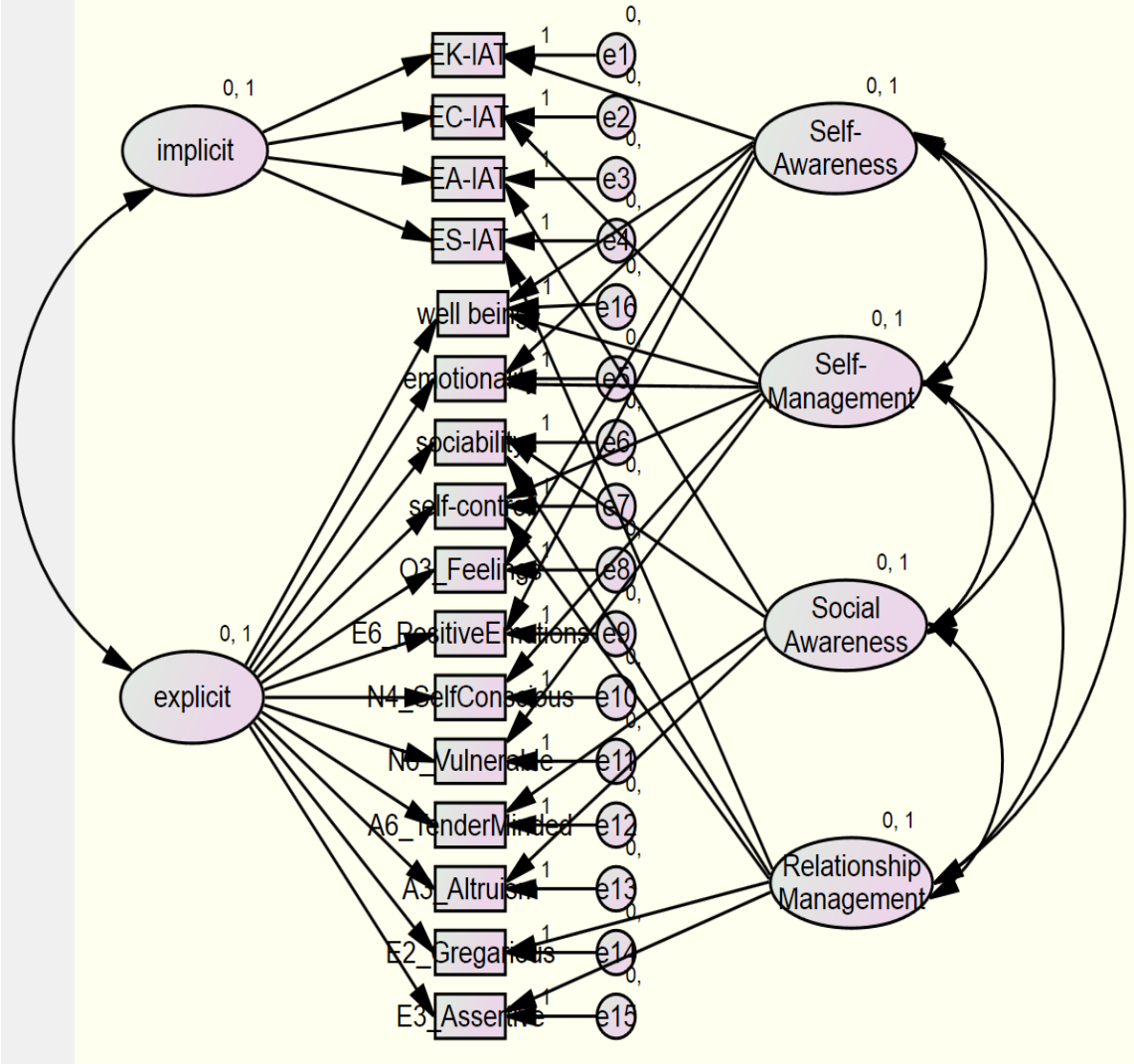

Figure 1. CFA Model 1: Two Freely Correlated Method Factors and Four Freely Correlated Trait Factors

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 the first 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).

Data Analysis

CFA methods to compare different latent trait models were used. Convergent and discriminant validity is shown through the comparison of model fit statistics through a series of nested models as first presented by Widaman (1985). The technique and guidelines suggest using nested models and comparing the first model to a series of more restricted models.

Figure 1 displays this study's hypothesized model (labeled Model 1) that will be compared against three other models. Model 1 contains four correlated latent traits (the four EI factors) and two correlated measurement method factors (explicit and implicit). Figure 2 shows the second model (Model 2). Model 2 is more restrictive in that it contains no latent traits (the only latent constructs are the two measurement method factors). Model 3 has perfectly correlated traits (i.e., only a single latent trait factor) and two freely correlated method factors (see Figure 3). Model 4 has four freely correlated latent trait factors and two uncorrelated method factors (see Figure 4).

According to Widaman (1985) the Model 1-Model 2 comparison should show Model 2 having poorer model fit statistics providing evidence for convergent validity due to the lack of specified traits. The Model 1-Model 3 comparison should show discriminant validity by comparing a model in which traits are freely correlated (Model 1) to a model in which traits are perfectly correlated (Model 3). The bigger difference in model fit statistics, the stronger the support for discriminant validity. However, it should be noted in this study we would not expect a large discrepancy because the four EI factors correlated. We would still expect a significant difference in model fit statistics,

though. Model 1-Model 4 comparison uses the same logic as used in the Model 1-Model 3 comparison but in reverse. Model 4 removes the correlation between the methods. Discriminant validity is shown in this comparison through Model 1 and Model 4 not being significantly different because we would not expect methods to be correlated thus showing no bias across methods.

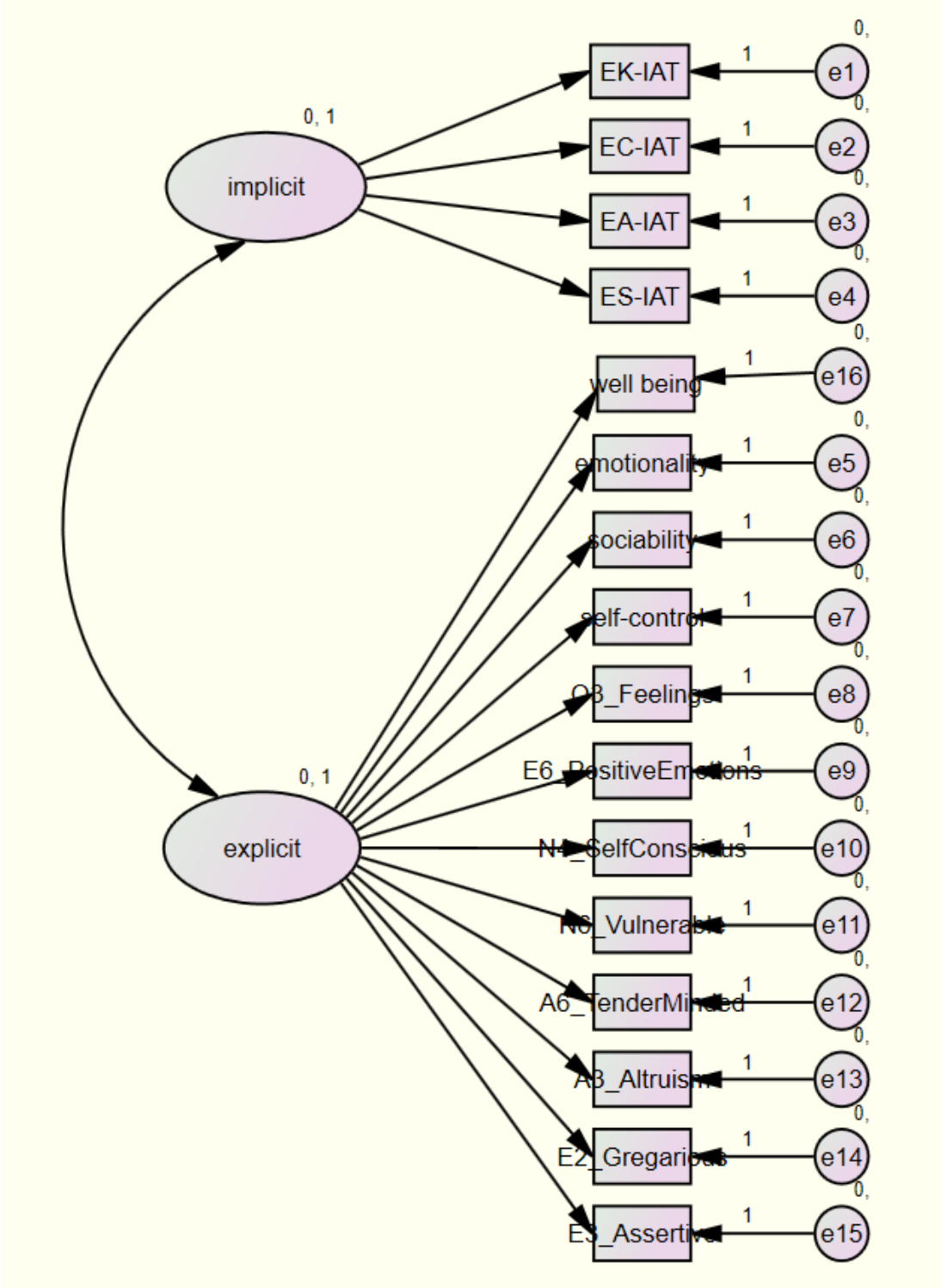

Figure 2. CFA Model 2: Two Freely Correlated Method Factors and No Trait Factors

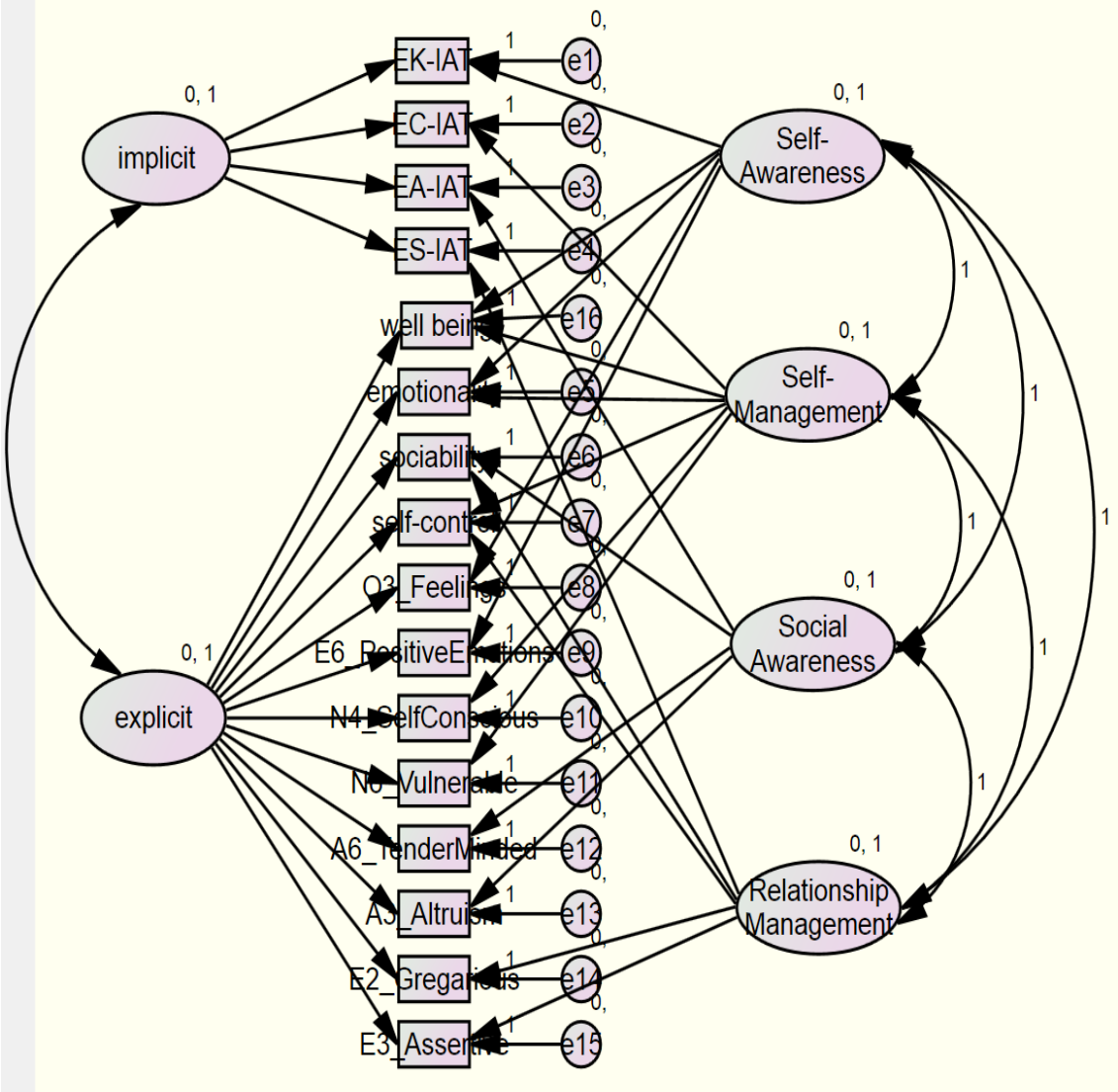

Figure 3. CFA Model 3: Two Freely Correlated Method Factors and Four Perfectly Correlated Trait Factors

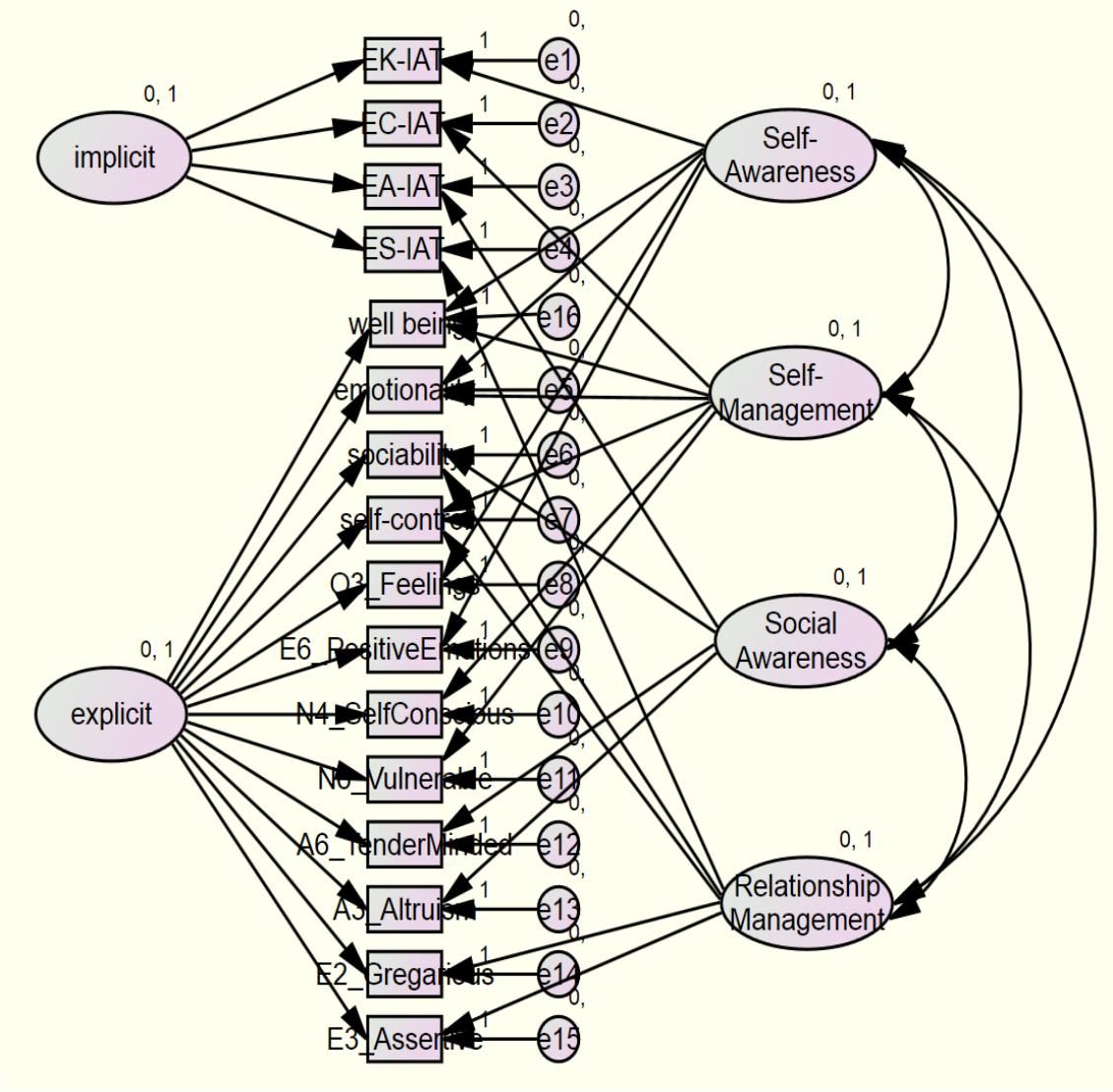

Figure 4. CFA Model 4: Two Uncorrelated Method Factors and Four Freely Correlated Trait Factors

RESULTS

Descriptive Statistics

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 4 and Table 5 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).

Table 4. Descriptive Statistics for Study Variables

Variables	N[1]	Min	Max	Mean	SD	Alpha
Implicit Measures						
EA-IAT	87	-.88	.97	.15	.36	.58
ES-IAT	86	-.89	.31	-.15	.26	.45
EK-IAT	87	-1.10	.61	-.12	.37	.71
EC-IAT	81	-1.15	.52	-.18	.34	.66
Explicit Measures						
A6-TenderMinded	92	19	37	27.56	3.30	.49
A3-Altruism	92	20	39	31.41	3.82	.74
E2-Gregarious	94	12	40	25.37	6.52	.83
E3-Assertive	94	13	33	24.30	4.95	.75
O3-Feelings	94	14	40	30.58	3.91	.62
E6-Pos. Emotions	94	18	39	29.81	4.06	.68
N4-SelfConscious	94	14	38	25.11	4.57	.61
N6-Vulnerable	94	10	32	20.20	3.98	.66
Sociability	55	3.01	5.89	4.70	.66	.76
Self-Control	55	2.89	5.65	4.40	.61	.76
Emotionality	55	3.13	6.31	4.86	.65	.75
Well Being	55	2.61	6.75	5.19	.87	.89

[1] The different N values are the result of missing data.

Table 5. Zero-Order Correlations for Study Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Implicit Measures															
1. EK-IAT	-														
2. EC-IAT	.38**	-													
3. ES-IAT	.34**	.13	-												
4. EA-IAT	.58**	.26*	.40**	-											
Explicit Measures															
5. E6-PostiveEmotion	.12	.22*	.01	.04	-										
6. O3-Feelings	.24*	.08	.17	.25*	46**	-									
7. Well Being	-41**	.04	-.06	-.18	59**	.23	-								
8. Emotionality	-.23	.23	-.06	-.20	58**	.36**	.62**	-							
9. N4-SelfConscious	.13	-.04	.03	.13	-.06	.17	-.38**	-.25	-						
10. N6-Vulnerable	.21*	.12	-.06	.09	.00	.13	-.49**	-.14	.35**	-					
11. Self-Control	-.09	-.01	.08	-.02	.03	-.23	.45**	.32*	-35**	-41**	-				
12. E2-Gregarious	.01	.21	-.03	-.09	.27**	.17	.29*	.23	-40**	.09	.08	-			
13. E3-Assertive	-.10	.02	-.09	-.12	.13	.06	.38**	.31*	-.51	-35**	.40**	.26*	-		
14. Sociability	-.13	.17	.05	-.22	.32*	.12	.46**	.44**	-47**	-.31*	.45**	.45**	.76**	-	
15. A3-Altruism	.02	.28*	.09	.14	.55**	.37**	.28*	.57**	-.14	.09	-.05	.28**	.09	.07	-
16. A6-TenderMind	.16	.18	-.02	.21*	.32**	.22*	.10	.15	-.07	.08	-.21	.19	-.00	-.05	.52**

* $p < .05$; ** $p < .01$

Test of Hypotheses

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 1) 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 2) 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 3) 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 4) 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 6 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 not a poor fit).

Table 6. Summary of Goodness-of-Fit Statistics for CFA Models

Model	χ^2	df	CFI	RMSEA	90%C.I.
1. Freely correlated traits; freely correlated methods	119.83	84	.903	.067	.037, .093
2. No traits; freely correlated methods	325.36	110	.418	.144	.126, .163
3. Perfectly correlated traits; freely correlated methods	224.64	94	.647	.122	.101, .142
4. Freely correlated traits; uncorrelated methods	120.51	85	.904	.067	.036, .093

The results displayed in Table 7 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.

Table 7. Differential Goodness-of-Fit Statistics for Nested Model Comparisons

Model Comparisons	$\Delta\chi 2$	df	ΔCFI
Test of Convergent Validity			
Model 1 vs. Model 2	208.53*	26	.485
Tests of Discriminant Validity			
Model 1 vs. Model 3	104.81*	10	.256
Model 1 vs. Model 4	0.68	1	.001

Similarly, the results displayed in Table 7 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 8 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

Table 8. Trait and Method Loadings for CFA Model 1

	Self-Aware	Self-Mgt	Reltn Mgt	Social Aware	Implicit	Explicit
Implicit Measures						
EK-IAT	.211*				.744**	
EC-IAT		-.152			.361**	
ES-IAT			.000		.747**	
EA-IAT				.238*	.484**	
Explicit Measures						
E6-PositveEmotion	.698**					.309**
O3-Feelings	.715**					.146
Wellbeing	.646**	.777**				.446**
Emotionality	.759**	.452**				.392**
N4-SelfConscious		-.383**				-.618**
N6-Vulnerable		-.662**				-.168
Self-Control		.570**	.272			.267
E2-Gregarious			-.451*			.799**
E3-Assertive			.559**			.646**
Sociability			.509**	-.059		.641**
A3-Alturism				.699**		.294*
A6-Tenderminded				.605**		.161

* $p < .05$; ** $p < 01$

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.

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.

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