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INVESTIGATING THE PROCESS UNDERLYING RESPONSES TO EMOTIONAL
INTELLIGENCE INVENTORIES

BY
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THESIS

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ABSTRACT

A recently zeitgeist, affective revolution (Barsade, Brief, & Spataro, 2003), shed lights on the importance of affective components of human nature. In the field of Industrial and Organizational (I/O) Psychology, emotional intelligence (EI) was found to be a crucial predictor for core criteria in I/O psychology such as job performance, leadership, and health outcomes beyond cognitive ability and personality. The use of EI measures in various corporate settings (e.g. selection, promotion, training, and etc.) has also increased. However, the psychometric properties of EI measures have not been fully investigated based on the theoretical backgrounds (i.e., ability or trait/mixed) and test formats (i.e., self-report and performance measure). By investigating item parameters and model fits using item response theory (IRT), we found that EI measures constructed from different theoretical backgrounds resulted in different response processes. Specifically, dominance model fit self-report ability EI scale (WLEIS) and subscales better, whereas both dominance and ideal point models fit self-report trait EI scale (TEIQue) and subscales. Interestingly, a performance ability EI scale showed good model fits for both models. Our findings suggest the nature of EI construct should be considered in the process of scale development and divergent EI theories should be acknowledged to achieve a comprehensive framework in the field.

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INTRODUCTION

In recent years, there has been growing interest in the affective underpinnings of human behavior. The rational component of human behavior (e.g., intelligence) has long been given priority over the irrational or emotional component, and consequently the role of emotion has been misunderstood and its adaptive function ignored. Although the debate between cognition and affect is not a new topic, the recent burst of interest in emotion (Barsade, Brief, & Spataro, 2003) seems to have led to heightened interest in emotional intelligence (EI) within field of Industrial and Organizational (I/O) psychology. Emotional intelligence is an individual difference distinct from traditional views of intelligence (Goleman, 1995; 2000).

Goleman's (1995) wild assertions that emotional intelligence could account for $\frac{3}{4}$ of the variance in job performance led to great skepticism about emotional intelligence from thoughtful researchers. Nonetheless, careful research seems to indicate emotional intelligence may play some useful role in I/O psychology. Some forms of EI have been found to explain additional variance (beyond general mental ability and personality) in job performance (Van Rooy & Viswesvaran, 2004; Newman & Joseph, 2010; O'Boyle, Humphrey, Pollack, Hawver, & Story, 2011), leadership (Harms & Crede, 2010), and health outcomes (Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007; Martins, Ramalho, & Morin, 2010). Moreover, the use of EI measures in various corporate settings (e.g. selection, promotion, training, etc.) also appears to have increased. Despite these advances, some researchers remain concerned about EI theory and practical applications due to two main issues: a schism in definitions/theories of EI and proper use of relevant measures.

Ability vs. Trait vs. Mixed Emotional Intelligence

Researchers have acknowledged two divergent definitions of EI, which are often referred to as the ability model and the trait model. The ability approach defined EI as the

ability to identify emotions, to harness emotional information and to enhance thinking, to comprehend emotional information, and to manage emotions, which led to the four-branch hierarchical model including (1) emotion perception, (2) emotion facilitation, (3) emotional understanding, and (4) emotion management (Mayer & Salovey, 1997; Mayer, Caruso, & Salovey, 1999). From the ability perspective, EI should be measured by items with correct answers (Mayer, Salovey, Caruso, & Sitarenios, 2001). Ability EI is treated as a maximum-performance individual difference and has been assessed via performance measures (e.g., MSCEIT, TEMNIT, STEU/STEM) and self-report measures (e.g., WLEIS).

Trait EI, on the other hand, is conceptualized as a collection of dispositions from lower-level personality hierarchies. It is also called trait emotional self-efficacy, with an emphasis on subjectivity of emotional experience (Petrides, Pita, & Kokkinaki, 2007). Content analysis of existing EI models (Salovey & Mayer, 1990; Goleman, 1995; Bar-On, 1997) led to fifteen sampling domains encompassing personality domain, social intelligence, personal intelligence, and ability EI: adaptability, assertiveness, emotion appraisal, emotion expression, emotion management, emotion regulation, impulsiveness (low), relationship skills, self-esteem, self-motivation, social competence, stress management, trait empathy, trait happiness, and trait optimism (Petrides & Furnham, 2001). Some of these traits appear to represent the ability EI construct (e.g., emotion appraisal, emotion expression, emotion management, & emotion regulation), but trait EI is treated as a set of affect-related behavioral tendencies and self-perceived abilities, not as maximum performance ability. Thus, a personality framework should be used to understand the nature of trait EI – typical behavior (Petrides & Furnham, 2001). Trait EI is measured by self-report measures (e.g., TEIQue).

Confusion about the Nature and Measurement of EI

As shown above, the theoretical background of EI results in divergent perspectives

on the nature of the construct and its measurement (Roberts, MacCann, Matthew, & Zeidner, 2010). Although EI scales may be developed to measure a single construct, convergent validity of the three EI scales involving different models was shown to be low (Brackett & Mayer 2003). According to Brackett and Mayer (2003), the correlation between one ability EI measure (MSCEIT) and a mixed EI measure (EQ-i) was only .21, so some researchers argue that EI from the two measures may refer to very different underlying constructs. Again, the theories behind the two models have significant differences in definitions, measures, facets and factor structures, and validities of the scales. Others claim that they do not have to be treated as different constructs, but they can be considered in the framework of the three-level model of EI, making both ability and trait perspectives compatible. Here, EI is viewed as individual differences in emotion-related knowledge, abilities, and dispositions (Mikolajczak, 2010). In other words, the relation of these two constructs is analogous to that of aptitude and knowledge: aptitude is “the capacity to learn” and knowledge is “what a person actually has learned (Mayer, Roberts et al., 2008).” The focus is laid on what people know, what people can do, and what people actually do.

The schism in the theories of EI not only influences how the construct is defined but it also creates inevitable confusion when classifying EI measures. There is not yet a consensus on how to distinguish the measures for each theoretical background, because the measures are often mis-categorized based on the report format instead of the construct, thereby neglecting the different operationalizations of EI (e.g., a self-report measure may be categorized as a mixed EI measure, even though the measure is based on ability EI theory). Mayer and his colleagues divided EI measures into two kinds: *ability EI* and *mixed EI*. In this approach, ability EI is a pure construct of emotion-related cognitive abilities, while mixed EI refers to multiple aspects of emotional function such as motivation, personality, temperament,

character, and social skills (Joseph & Newman, 2010; Zeidner, Matthews et al. 2004). On the other hand, Petrides and his colleagues classify EI into *ability EI* and *trait EI*, with an emphasis on the uniqueness of trait EI instead of treating it as hodge-podge construct like mixed EI. Therefore, the way of classifying the measures also differs for some EI researchers. For example, SEIT and TEIQue are classified as self-report mixed EI measure from the ability approach, while they are classified as self-report trait EI measures from the trait approach. There hasn't been a clarification whether mixed EI is equivalent to trait EI. WLEIS is classified as self-report ability EI measure from the ability approach, but as self-report trait measure from the trait approach (Mayer, Salovey, & Caruso, 2008; Spector & Johnson, 2006; Van Rooy et al., 2005; Perez, Petrides, & Furnham, 2005; Zeidner, Matthews, & Roberts, 2004).

This empirical evidence demonstrates that although the content may be the same (e.g. emotion regulation), whether it is viewed as maximum performance or typical performance changes the nature of the construct, and therefore the corresponding measure should not only take account of the content, but also how the behavior is conceptualized, because it may result in different assessment strategies.

Item Response Theory

We have reviewed some current issues regarding EI measures. The diverse perspectives are not unusual for a young field that needs attention from researchers. Considering the rapidly growing field of EI, it is not necessarily an ominous sign that there has not yet been widespread agreement on models or measures. Because the field still needs validation of models, structures, and measurements, item response theory (IRT) may provide important insights, help validate measures at the item level, and offer a guideline for new EI scale development. Therefore, in the field of I/O psychology, IRT is useful in the process of

new scale development and scale validation, especially for a high-stakes test such as a general mental ability test or personality inventory used for personnel selection. More sophisticated exploration of psychometric properties of EI measures will provide corporations solid understanding to identify emotionally competent employees with assessments.

Definition and Assumptions

Item response theory (IRT) – latent trait theory - allows investigating non-linear relationships between individuals' latent trait (θ) and the probability of a positive response ($P(\theta)$) at the item level. In other words, IRT models the probability of endorsing an item at a given theta level. The theta level represents an individual latent trait or characteristic such as ability or attitude. From IRT analyses, one can estimate the theta for individuals, as well as item parameters, and assess fit of the hypothesized measurement models. The focus of attention depends on the purpose of the analyses. When the object of interest is individual characteristics (e.g., an individual ability parameter is to be estimated by a test such as GRE), the latent trait (θ) is what needs to be estimated. When the concern is about a scale itself (e.g., the characteristics of each item are to be checked in the process of scale development or validation), item parameters are of primary interest. The item parameters, specifically in the 2 parameter logistic (2PL) model, refer to two characteristics of the given item: item discrimination (a -parameter) and item difficulty (b -parameter).

An IRT analysis requires two assumptions: unidimensionality and local independence. Hambleton, Swaminathan, and Rogers (1991) elaborated these assumptions as followings: Unidimensionality refers to the assumption that, “only one ability is measured by a set of items in a test,” (p.9). Local independence means that, “abilities specified in the model are the only factors influencing examinees' responses to test items,” (p.10). These two assumptions are related to each other. To further explain unidimensionality, this assumption

does not have to be strictly met and is hard to satisfy perfectly. The existence of a dominant factor that influences item responses is enough to proceed with the analyses (Reckase, 1979).

Advantages of IRT over CTT: Why IRT?

Compared to CTT, IRT analyses require more complex mathematical work and statistical software, which is not very popular; but there are overriding advantages of performing the analyses. The first advantage is the invariance of individual and item parameters across subpopulations. Although IRT analysis requires relatively larger sample sizes than classical test theory (CTT)-based analyses, once the individual and item parameters are obtained, improved generalizability of the results is obtained. Therefore, IRT is especially useful in developing a scale that will later be used with a group that might differ somewhat from the initial group. Second, IRT analysis offers more sophisticated information at the item level. For example, the item information function shows how much an individual item contributes to measurement accuracy at each theta level. Third, IRT serves as the theoretical model underling computer adaptive testing (CAT), which significantly reduces test length while providing trait estimates as accurate as those from much-longer CTT-based measures. As EI measures become more prevalent in personnel selection, IRT analyses would be beneficial to advance testing efficiency (e.g., CAT).

Dominance Model vs. Ideal Point Model with EI

IRT is a model-based approach for item analysis. The most popular IRT models for items utilizing a Likert response scale are dominance models (Coombs, 1964). Dominance models assume monotonic relationships between individual traits and the probability of endorsing an item. For example, if you have a higher trait level, you are more likely to endorse the item compared to individuals with lower trait levels. However, this Likert scaling based method does not necessarily model responses the best. Some personality items have

been found to have non-monotonic relationships with the trait, which violates a key assumption of dominance models (Chernyshenko, Stark, Chan, Drasgow, & Williams, 2001). Thurstone (1928) suggested another scaling method that assumes a matching strategy from respondents. The corresponding IRT model is an ideal point model, sometimes called an unfolding model. Ideal point models allow the relationship between the underlying trait and probability of endorsing an item to be non-monotonic. This different ICC shape results from the recognition that the probability of endorsing an item decreases in both directions as the item location becomes farther from individual's ideal point (i.e., where the individual's latent trait stands on theta). While dominance models are mainly used to measure maximum performance behaviors such as cognitive ability, ideal point models have been found to better represent typical performance behaviors such as responses to attitudinal measures (e.g., job satisfaction), personality inventories, and vocational interests assessments (Tay, Drasgow, Rounds, & Williams, 2009; Chernyshenko, Stark et al. 2007; Stark, Chernyshenko et al. 2006).

Understanding the Psychological Properties of EI

The two main theoretical perspectives on EI are the ability-based and the trait-based models, which lead to a distinction in the underlying nature of the construct. Since the assumed nature of the underlying construct differs, the process of responding to items may also be different. More specifically, responses to ability measure are generally modeled well by a dominance model, while the responses to measures of attitudes, personality, vocational interests, and values seem more appropriately depicted with ideal point models (Stark, Chernyshenko et al. 2006; Chernyshenko, Stark et al. 2007; Tay, Drasgow et al. 2009). When a *maximal performance* measure is given, the individuals tend to perceive the items as hurdles to overcome. If their capability exceeds an item's difficulty, a positive response ensues. This is fundamental to dominance models. On the other hand, when an ideal point

model is needed, an individual must assess whether an item's content matches his/her standing (location) on the latent trait, which is usually termed *typical performance*. The foregoing discussion leads to the hypothesis that EI scales based on trait models should be better fit with ideal point models, while EI scales based on ability models should be better fit with dominance models.

There have been two studies that examined psychometric properties of EI measures using IRT dominance models (Cooper & Petrides 2010; Karim 2010); they mainly focused on measurement accuracy compared to CTT. Additionally, the effect of extreme item wording has been scrutinized with WLEIS data using IRT (Nye, Newman, et al. 2009). Recently, Zampetakis (2011) fit an ideal point model to a trait EI measure (TEIQue) and obtained reasonable model fit. However, we still do not have an explicit investigation evaluating the EI measures derived from the two theoretical backgrounds. Whether a dominance or ideal point model really should be preferred based on the nature of the construct is still unknown. Moreover, there is not yet a study investigating the psychometric properties of existing measures of EI derived from different theoretical perspectives. In order to address these issues, IRT model comparisons seem beneficial.

In sum, IRT seems to be a good approach to scrutinize some issues involving measures of EI and to obtain a more nuanced understanding of the data. By extension, an attempt to fit both dominance and ideal point models to ability EI and trait EI data would provide insights about the underlying nature of EI. Therefore, I propose a study, based on what we have reviewed in this paper, with an aim to offer more clarity in EI studies using item response theory to address the following hypotheses:

Hypothesis 1: A dominance model will show better model fit to a self-report ability EI measure, than will an ideal point model.

Hypothesis 2: An ideal point model will show better model fit to a self-report trait EI measure, than will a dominance model.

Hypothesis 3: An ideal point model will show a better model fit to subscales for self-report mixed EI measures.

Hypothesis 4: A dominance model will show better model fit to a performance ability EI measure than will an ideal point model.

METHOD

Participants and procedures

The study consisted of two samples: undergraduates and MTurk participants. First, a sample of 383 university undergraduate students provided self-reports of their emotional intelligence. The students (71% female; Mean age = 19.35 (1.21); 99.2% Native English speakers; 15.2% Asian; 5.6 % African American; 5.9 % Hispanic; 70.1% White; 3.1% other) were recruited from introductory psychology classes during spring semester at a large Midwestern university, and were given extra credit for their participation. The students answered three EI scales with a total of 76 items through an online procedure. We deleted those who failed to pass more than 1 of 5 quality-control items that were used to identify careless or inattentive respondents, and deleted respondents who had duplicate responses. A final sample of 355 respondents resulted.

Second, we obtained 419 complete responses via a web survey service provided by Amazon.com's Mechanical Turk (MTurk). The respondents resided in the US and indicated their employment status. MTurk respondents were mainly US residents. The respondents answered 25 items from a performance ability EI scale. We excluded 4 persons who failed more than 1 of 5 quality-control items. The final sample consisted of 415 respondents (53% female; Mean age = 35.80 (29.22); 97.8% Native English speakers; 6.7% Asian; 6.0 % African American; 6.5 % Hispanic; 77.3% White; 2.2% other).

Measures

In sum, four frequently used emotional intelligence scales, representing different theoretical backgrounds, were investigated. The classification of each scale into ability, trait, and mixed models is presented with relevant references in Table 1. As shown in the Table 1, the classification of EI measures is not consistent across two streams in the field. Mayer and

his colleagues put the ability EI model as the sole EI construct, suggesting the other scales based on less restricted models are mixed with other constructs such as personality trait (Mayer, Salovey, & Caruso, 2011). On the other hand, Petrides and his colleagues advocate for the broader coverage of trait EI, highlighting the necessity to distinguish ability EI and trait EI (Perez, Petrides, & Furnham, 2005). In this study, we made the distinction not based on the ways of measuring (e.g. self-report or performance measure) but based on the theoretical background of (1) how the scales have been developed and (2) how the scales consist of sub factors of EI, which was explained in the introduction section. For example, we considered WLEIS as an ability EI construct, because the four factors of the scale were derived from the four-factor model of ability EI (Mayer & Salovey, 1997).

Self-report ability EI measure - Wong and Law Emotional Intelligence Scale

WLEIS (Wong & Law, 2002) is 16-item self-report ability EI inventory involving 4 items in each of four factors. The four major factors (and an example item) are self-emotion appraisal (SEA; *“I have a good sense of why I have certain feelings most of the time.”*), others’ emotional appraisal (OEA; *“I always know my friends’ emotions from their behavior.”*), use of emotion (UOE; *“I always set goals for myself and then try my best to achieve them.”*), and regulation of emotion (ROE; *“I am able to control my temper so that I can handle difficulties rationally.”*). The items were rated on a 7-point Likert scale. In this study, we categorized the responses into three categories to ensure clearer item locations. In particular, we decided to use three categorizations instead of dichotomization, because keeping the neutral response (neither agree nor disagree) might better reflect the original intention of respondents than a median/mean split dichotomization. Therefore, we collapsed seven options into three options: 1 (strongly disagree) to 3 (somewhat disagree), 4 (neither agree nor disagree), and 5 (somewhat agree) to 7 (strongly agree).

Self-report trait EI measure - Trait Emotional Intelligence Questionnaire

TEIQue was originally developed as a 153-item self-report inventory (Cooper & Petrides, 2010; Petrides, 2009; Petrides & Furnham, 2006). The 30-item of short form used in this study was developed to efficiently measure global trait EI by using 2 items for each of 15 facets (Petrides, Pérez-González & Furnham, 2007). TEIQue includes four major factors – emotionality measured by 8 items (emotion perception, emotion expression, relationship skills, empathy), self-control measured by 6 items (emotion regulation, stress management, low impulsiveness), sociability measured by 6 items (social competence, emotion management, assertiveness), well-being measured by 6 items (self-esteem, trait happiness, trait optimism) and a global factor measured by 4 items (adaptability, self-motivation). Example items include: “expressing my emotions with words is not a problem for me,” “I often find it difficult to see things from another person’s view point,” “I tend to change my mind frequently,” and “I normally find it difficult to show my affection to those close to me.” The items were rated on a 7-point Likert scale and categorized into 3 options.

Self-report mixed EI measure - Schutte Self Report Emotional Intelligence Test

SEIT (Schutte et al., 1998) is a 33-item scale that assesses 4 aspects of emotional intelligence (Saklofske, Austin, & Minsky, 2003; Petrides and Furnham, 2000): appraisal of emotions (AOE; “*I am aware of the non-verbal messages I send to others*”) measured by 7 items, use of emotions (UE; “*When I am in a positive mood, solving problems is easy for me*”) measured by 5 items, mood regulations/optimism (MR; “*I expect good things to happen*”) measured by 12 items, and social skills (SS; “*I arrange events others enjoy*”) measured by 9 items. The items were rated on a 5-point Likert scale and categorized into 3 options.

Performance ability EI measure - Situational Test of Emotional Understanding

The full version STEU (MacCann & Roberts, 2008) was originally developed with

42 items and the short form with 25 items used in this study was derived for succinct measurement of emotional understanding. The endorsement of the STEU items can either be correct or incorrect according to Roseman's (2001) appraisal theory of emotions. The appraisal theory of emotions provides the process of how 17 emotions may be generated by a combination of 7 appraisal dimensions (e.g., situational state, motivational state, causal agency, expectedness, certainty, control potential, and problem type). The example item in the instruction to the STEU is

Clara receives a gift. Clara is most likely to feel?

(a) Happy (b) Angry (c) Frightened (d) Bored (e) Hungry

Here, the correct answer is (a) Happy. Therefore, we used dichotomously scored items in the current study. The internal consistency of the scale, Cronbach's α , was 0.51 in this study.

Analyses

Descriptive statistical analyses were performed using SPSS 17.0 software to obtain means, standard deviations, internal consistencies (Cronbach's α), and correlations at a factor/scale level.

Unidimensionality check

In order to perform IRT analyses, the unidimensionality assumption should be checked. Since the existence of a dominant factor that influences all items would be observed, we performed an exploratory factor analysis (EFA) for each subscale and investigated the percentage of variance explained by the first factor. We confirmed unidimensionality by finding a dominant first factor (Drasgow & Hulin, 1990). The first factor is considered dominant when it accounts for at least 20% of variance, and we found dominant factors for all subscales of EI measures except for the performance ability EI measure as shown in Table 2 (Reckase, 1979). Therefore, we confirmed that IRT analyses would be appropriate for all

but one scale.

The level of analysis for STEU was at the scale level, because STEU was developed to only assess one factor of EI, *emotional understanding*. The possible reason for the low internal consistency and weak first factor may lie in the multidimensional nature of the measure not the construct per se. Internal consistency of SJTs tends to be low, because the items and options from different scenarios are likely to involve heterogeneous constructs at the item level (Whetzel & McDaniel, 2009).

For TEIQue-SF, the analyses were performed for each subscale and also for the whole scale, because the short version was specifically designed to measure global trait EI (Petrides & Funham, 2006). Additionally, Smith and Reise (1998) recommended a stricter standard of unidimensionality with a value of variance accounted for by the first factor above 40%; however, most of the trait and mixed EI factors did not reach this threshold value. The higher multidimensionality in trait and mixed EI is understandable, because the breadth of the trait EI construct is more inclusive than ability EI. Therefore, the model fit results should be carefully interpreted with a consideration of multidimensionality. For example, researchers might report test-retest reliability instead of internal consistency of SJTs, because Cronbach's alpha might not be an appropriate reliability index for the tests that lack homogeneity (Whetzel & McDaniel, 2009; Cronbach, 1951).

Item Calibration

First, we obtained classical item parameters, corrected item-total correlations (item discrimination parameters) and \hat{p} (item difficulty parameters). \hat{p} was only calculated for the performance ability EI scale (STEU), because item difficulty parameters are more relevant for scales with correct answers.

IRT item parameters were obtained for all four EI measures under two different IRT

models: the dominance model and the ideal point model. For IRT item calibration, different estimation methods are required depending on (a) the underlying model (dominance model vs. ideal point model) and (b) the number of response options (dichotomous vs. polytomous responses).

A dominance model for dichotomous data was used for the performance ability EI scale (STEU). The item parameters were estimated for the two-parameter logistic (2PL; Reise & Walker, 1990) model,

$$P(U_i = k|\theta_j) = \frac{1}{1 + \exp[-1.702a_i(\theta_j - b_i)]}, \quad (1)$$

where a_i denotes item discrimination and b_i denotes item location for the i_{th} item. .

The dominance model for polytomous data led to the use of Samejima's graded response model (SGRM; Samejima, 1969) with marginal maximum likelihood estimation to estimate item parameters. The item parameters for self-report ability, trait, and mixed EI data (WLEIS, TEIQue, and SEIT) were analyzed with the following formula:

$$P(U_{ik} = 1|\theta_j) = P_{i,k}^*(\theta_j) - P_{i,k+1}^*(\theta_j), \quad k = 1, \dots, K, \quad (2)$$

where

$$P_{i,k}^*(\theta_j) = \left[1 + \exp \left(-1.702a_i(\theta_j - b_{ik}) \right) \right]^{-1}, \quad k = 2, \dots, K, \quad (3)$$

We estimated 2PL item parameters with the BILOG program (Mislevy & Bock, 1991) for dichotomous data (STEU) and used the MULTILOG program (version 7.0; Thissen, Chen, & Bock, 2003) for polytomous data (WLEIS, TEIQue, and SEIT).

For the ideal point model, the generalized graded unfolding model (GGUM; Roberts, Donoghue, & Laughlin, 2000) was used to estimate items parameters for both dichotomous and polytomous response data. The GGUM for dichotomous data is expressed mathematically by

$$(U_i = 1|\theta_j) = \frac{\exp\{a_i[(\theta_j - \delta_i) - \tau_i]\} + \exp\{a_i[2(\theta_j - \delta_i) - \tau_i]\}}{1 + \exp\{a_i[3(\theta_j - \delta_i) - \tau_i]\} + \exp\{a_i[(\theta_j - \delta_i) - \tau_i]\} + \exp\{a_i[2(\theta_j - \delta_i) - \tau_i]\}}, \quad (4)$$

where θ_j is the location of j th respondent, a_i is the item discrimination, δ_i is the item difficulty, and τ_i is the subjective threshold. We used the GGUM 2004 program to estimate item parameters (Roberts, Fang, Cui, & Wang, 2004).

In order to identify the best fitting model for each EI data set, we calculated χ^2/df as the model fit indices of two IRT models (dominance model and ideal point model) for all EI scales, using the MODFIT 3.0 program (Stark, 2001). The item doubles and triples of adjusted χ^2/df fit statistics were compared to discern which of the two models, dominance versus ideal point, best described the EI data (Drasgow, Levine, Tsien, Williams, & Mead, 1995).

RESULTS

The results are presented in two sections due to two different types of data: three self-report measures (WLEIS, TEIQue, and SEIT) and one performance measure (STEU).

Self-report Ability vs. Trait vs. Mixed EI – WLEIS, TEIQue, and SEIT

Descriptive Statistics

Table 3 presents descriptive statistics for the three self-report measures of EI at both the scale and subscale level. The WLEIS showed good reliability at the scale level ($\alpha = .88$) and at the subscale level ($\alpha = .80$ for SEA, $\alpha = .87$ for OEA, $\alpha = .88$ for UOE, and $\alpha = .88$ for ROE). In fact, the reliability of the four-item subscales are so large that they raise concerns about whether they simply asked the same question four times. TEIQue also showed good reliability at the scale level ($\alpha = .90$) and acceptable reliabilities at the subscale level from $\alpha = .61$ to $.86$ ($\alpha = .61$ for EM, $\alpha = .68$ for GL, $\alpha = .66$ for SC, $\alpha = .72$ for SO, and $\alpha = .86$ for WB). SEIT showed good reliability at the scale level ($\alpha = .86$) and also at the subscale level except for the UE factor which had a relatively lower internal consistency ($\alpha = .78$ for AOE, $\alpha = .77$ for MR, $\alpha = .70$ for SS, and $\alpha = .59$ for UE).

There were some interesting findings about bivariate associations. First, all of the overall self-report EI measures were substantially correlated (greater than $.60$). For example, the WLEIS and the TEIQue were correlated $.73$. These large correlations suggest that all of the three measures share much in common, even though they have different theoretical backgrounds.

Second, we looked at the associations between similarly defined subscales from different scales, expecting high correlations. For example, the SEA and OEA subscales from the WLEIS represent an individual's ability to appraise self and others' emotion, respectively.

Similarly, the AOE subscale from the SEIT represents general appraisal of emotion. Surprisingly, the SEA subscale from the WLEIS and the AOE subscale from the SEIT only showed a moderate association ($r = .35$). However, the AOE correlated a substantial .64 with OEA, indicating that the SEIT subscale primarily assesses self-reported ability to appraise emotions in others. Also, the UOE subscale from the WLEIS and the UE subscale from the SEIT showed weak association ($r = .19$), although they are both defined as the ability to use emotion. The SS (social skills) subscale from the SEIT and the SO (sociability) subscale from the TEIQue showed a modest relationship ($r = .29$) as well. These weak associations between similarly defined subscales suggest similarly labeled EI measures might capture different aspects of EI, reflecting divergent operationalizations.

Item Parameter Estimation

Table 4, Table 5, and Table 6 present the results of item parameter estimation for self-report ability, trait, and mixed EI as measured by the WLEIS, TEIQue, and SEIT, respectively. As shown in Table 4, the self-report ability EI items had remarkably high discrimination parameters for all subscales ($\overline{ITC}_C = .61$, $\bar{a} = 3.18$, and $\bar{\alpha} = 1.93$ for SEA; $\overline{ITC}_C = .73$, $\bar{a} = 4.07$, and $\bar{\alpha} = 2.52$ for OEA; $\overline{ITC}_C = .70$, $\bar{a} = 3.90$, and $\bar{\alpha} = 2.71$ for UOE; $\overline{ITC}_C = .74$, $\bar{a} = 3.21$, and $\bar{\alpha} = 1.76$ for ROE), suggesting the items can distinguish individuals with different levels of emotional intelligence. Both discrimination parameters from SGRM (a -parameters) and GGUM (α -parameters) showed similar patterns in that certain items (e.g., items 6, 8, 11, and 12) had higher discriminations than the other items. The SGRM threshold parameters mostly had negative values, indicating the items were easy (i.e., individuals with low emotional intelligence endorsed the items, in addition to individuals with high emotional intelligence). The GGUM location parameters ranged from -0.99 to 0.42.

The trait EI items generally showed acceptable discriminations ($\overline{ITC}_C = .28$, $\bar{a} =$

0.94, and $\bar{\alpha} = 0.96$ for EM; $\overline{ITC}_C = .38$, $\bar{a} = 1.14$, and $\bar{\alpha} = 1.46$ for SC; $\overline{ITC}_C = .46$, $\bar{a} = 1.08$, and $\bar{\alpha} = 1.19$ for SO; $\overline{ITC}_C = .64$, $\bar{a} = 2.50$, and $\bar{\alpha} = 1.99$ for WB; $\overline{ITC}_C = .46$, $\bar{a} = 1.36$, and $\bar{\alpha} = 1.49$ for GL) as displayed in Table 5. The trait EI items also seemed to be easy items (low EI individuals also endorsed them; the threshold parameters had low values). The GGUM location parameters ranged from -1.01 to 0.56.

The discrimination parameters of the mixed EI items were large ($\overline{ITC}_C = .49$, $\bar{a} = 1.87$, and $\bar{\alpha} = 1.50$ for AOE; $\overline{ITC}_C = .29$, $\bar{a} = 1.33$, and $\bar{\alpha} = 1.61$ for UE; $\overline{ITC}_C = .39$, $\bar{a} = 1.17$, and $\bar{\alpha} = 1.32$ for MR; $\overline{ITC}_C = .37$, $\bar{a} = 1.13$, and $\bar{\alpha} = 1.22$ for SS) as shown in Table 6. The threshold parameters were mostly negative, meaning again that these were easy items (participants with low levels of emotional intelligence would endorse most of the items). The GGUM location parameters varied from -1.51 to 4.99.

Overall, self-report ability EI items showed discrimination parameters that were so large as to be implausible; with a large sample size and items that are not virtually identical, we would expect much lower discrimination parameters. Trait and mixed EI items had more plausible discrimination parameters and seemed most suited to participants at lower emotional intelligence levels.

Model Comparisons: Dominance Model vs. Ideal Point Model

The χ^2 statistics (mean adjusted χ^2/df) and fit plots are widely used to determine whether the response model fits the data adequately (Drasgow et al. 1995). When the model fits of two response models do not show enough difference, fit plots serve as a supplementary criterion to determine the better model for the data. However, there is no agreement on determining whether an empirical fit plot has a significant discrepancy just by looking, so fit plots are a rather subjective criterion. We determined model fit by examining double and triple adjusted χ^2/df , because single χ^2/df can be insensitive to misfit (Tay, Ali, Drasgow, &

Williams, 2011).

The model fit results for the three self-report EI measures are presented in Table 7, Table 8, and Table 9 and the adjusted χ^2/df with adequate values (< 3.0) are bolded. For self-report ability EI measured by the WLEIS, as hypothesized, the dominance model showed better fit than the ideal point model for all four subscales. Specifically, the mean adjusted χ^2/df of item triads were all below 3.0 (SEA = 0.06, OEA = 0.00, UOE = 0.33, and ROE = 0.00) for SGRM, whereas none showed an adequate model fit (SEA = 3.80, OEA = 11.90, UOE = 13.31, and ROE = 21.23) for GGUM. In other words, the probability of endorsement for self-report ability EI was monotonically increasing, as individuals' emotional intelligence increases.

The model fit results for the self-report trait TEIQue were mixed, as displayed in Table 8. Unlike our hypothesis that the ideal point model would fit better than the dominance model for the trait EI measure, the SGR Model generally fit the data well for the χ^2/df of item triples (scale level = 1.52, EM = 1.43, SC = 2.85, SO = 0.32, WB = 0.00, and GL = 1.65). Good GGUM fits were obtained for 2 subscales (WB = 0.00 and GL = 1.52) and the fit of the two models (dominance versus ideal point) for these 2 subscales is almost indistinguishable. Based on the χ^2/df of item doubles, four out of five subscales (EM, SO, WB, and GL) showed adequate fits for both models, but the values were smaller (better fit) for the dominance model, except for the GL scale (GL = 1.52 for ideal point model fit and GL = 1.65 for dominance model fit). Figure 1 shows the GGUM item characteristic curves (ICCs) for all 4 items from GL subscale, which favored the ideal point model, with expected scores on the vertical axis. As previously explained, we performed the analyses for the TEIQue at the scale level, because it was designed to measure global trait EI. The doubles and triples model fit results favor the dominance model. These results should be interpreted while acknowledging

the multidimensionality of the trait EI construct, which may have led to larger χ^2/df values. Also, the measure was originally developed using the methods of classical theory (Drasgow, Chernyshenko, & Stark, 2010). Although intermediate items are considered critical for ideal point measurement, they are likely to be removed during the scale development process, due to their low item total correlations and low factor loadings (Chernyshenko, Stark, Drasgow, & Roberts, 2007). Therefore, the model fit results for the ideal point model should be carefully interpreted.

In Table 9, the model fit results from the self-report mixed SEIT are presented. Generally, subscales from ability EI (AOE and UE) showed better model fits for dominance models, while the subscales from trait EI (MR and SS) showed good model fits for both models (dominance and ideal point). The results suggest that self-report EI is fit by dominance as hypothesized, but fits to the trait EI measure were comparable for the two models. More specifically, the item triples SGRM fits for four subscales were generally good (AOE = 0.96, UE = 3.66, MR = 2.14 and SS = 0.21) except for UE subscale, while the GGUM fits were good only for two subscales from trait EI (MR = 1.61, and SS = 0.76). As an example of visual presentation, figure 2 shows the GGUM item characteristic curves (ICCs) for all 12 items from MR subscale, which favored the ideal point model, with expected scores on the vertical axis. When comparing the two model fits together, subscales from the ability EI scales (AOE and UE) seem to have smaller χ^2 statistics (better fit) for the SGR model (dominance model) compared to GGUM (ideal point model), suggesting even though the scale includes subscales from both ability and traits, participants may treat ability EI items as hurdle items/dominance items. On the other hand, trait EI scales showed adequate fit for both of the models (mean adjusted $\chi^2/df < 3.0$). Therefore, Hypothesis 3 was partially supported in that the two ability EI scales (AOE and UE) showed good SGRM fits and the

two trait EI scales (MR and SS) showed good fit for GGUM as well as SGRM.

Overall, based on the results from the three self-report EI measures, the pattern that the dominance model fit better with the ability EI scales has been consistently observed, while both models fit well with some of the trait EI scales.

Performance Ability EI – STEU

Descriptive Statistics and unidimensionality check

Performance ability EI measured by the STEU ($M = 19.30$, $SD = 1.22$) had low internal consistency ($\alpha = .51$). MacCann and Roberts (2008) also reported considerably low reliability with undergraduate and nonstudent samples in their scale development studies ($\alpha = .43$ and $\alpha = .71$). Exploratory factor analysis generated 12 factors (eigenvalues > 1) and the percent of variance explained by the first factor was only 9.81, suggesting there was not a strong dominant factor. Low reliability and a weak first factor suggest that STEU may involve multiple constructs, contrary to its theoretical development, and it clearly violates the unidimensionality assumption. Regardless of the level of multidimensionality in the emotional understanding construct and measure, we proceeded with the IRT analyses with caution.

Item Parameter Estimation

Table 10 shows the estimated item parameters of the performance ability STEU scale for dominance and ideal point models. The items have a wide range of discrimination from 0.30 to 1.22 under the 2PL and from 0.56 to 2.43 under the GGUM. The negative values of difficulty parameters under the 2PL indicate that the items could be easily endorsed by low EI individuals, suggesting that most items are easy to answer correctly. The difficulty parameter for CTT, \hat{p} , refers to the percentage of people who answered the item correctly, so an item with a higher value is easier. Consistent with the b-parameters from the 2PL analyses, the

values of \hat{p} are generally higher than 0.5, indicating more than half of the respondents answered the items correctly. The location parameters from the GGUM analyses generally had small absolute values except for a few items (items 2, 3, 8, and 19). As expected from the low internal consistency ($\alpha = 0.51$), low corrected item total correlations were obtained; there were five items with negative ITC_C and the positive values ranged from 0.10 to 0.25. The negative ITC_C are usually found when the items are flawed or miskeyed. Possible interpretations could be (1) ambiguous wordings and (2) more than one correct answer. For example, there can be two or three correct answers for item 16 which is illustrated as following:

Hasad tries to use his new mobile phone. He has always been able to work out how to use different appliances, but he cannot get the phone to function. *Hasad is most likely to feel?*

(a) Distressed (b) Confused (c) Surprised (d) Relieved (e) Frustrated

The correct answer is (e) Frustrated, but (a) Distressed or (b) Confused also appear to be viable answers. If raters with high total scores systematically endorsed these alternative options instead of the keyed answer, a negative item total correlation would result. The scoring of the STEU was constructed based on Roseman's (2001) appraisal theory, which claims emotions are the result of our evaluations, and the evaluations involve seven appraisal dimensions: situational state, motivational state, causal agency, expectedness, certainty, control potential, and problem type. The scoring of ability EI, which is relevant with these results, has been an important issue with three concerns, including (1) domain of application, (2) general consensus scoring versus expert consensus scoring convergence, and (3) systematization of knowledge (Mayer, Salovey, Caruso, & Sitarenios, 2001). There seems to be a need for more research on whether a useful assessment tool can be developed based on

appraisal theory.

Model Comparisons: Dominance Model vs. Ideal Point Model

In Table 11, the model fit results for STEU are presented. We expected the dominance model would fit better than the ideal point model for performance ability EI; however, the results are equivocal. The performance ability EI did show a very good fit with the 2PL (adjusted $\chi^2/df = 0.66$ and 1.01 for doubles and triples), but also for the GGUM (adjusted $\chi^2/df = 0.69$ and 0.76 for doubles and triples). With consideration of possible multidimensionality, the fit indices were much lower than our expectation. Because the model fit indices are so similar, we looked at fit plots expecting monotonically increasing response curves. However, we found actual unfoldings for many items, which supports the use of the ideal point model for performance ability EI. In order to properly interpret the results, more research which scrutinizes the psychometric properties and response patterns of performance ability EI seems to be needed.

DISCUSSION AND CONCLUSION

The ultimate goal of this study was to understand the psychometric properties of EI measures and to make suggestions for new EI scale development. Considering the field is still young, creative suggestions may make important contributions to the field. It seems premature to reach conclusions whether we should only employ one of the two competing models (2PL/dominance or GGUM/ideal point). More research is clearly needed to place the field of EI on a firm empirical foundation. This study is the first attempt to understand the response process underlying ability and trait EI measures. Our study suggests that the nature of the EI construct can elicit different response processes from raters. More specifically, we found that whether EI is viewed as maximal or typical performance results in different instruments with different patterns of responses from raters. For example, a self-report ability EI measure (WLEIS) showed better dominance model fit as hypothesized. The trait EI measure (TEIQue) showed mixed results where the dominance model fit all subscales well and two subscales had good ideal point model fits. The self-report mixed EI measure (SEIT) exhibited mixed results with the dominance model fitting better for ability EI subscales and both models fitting well for trait EI subscales. Both models fit the performance ability EI measure (STEU).

By analyzing four EI measures, developed from different theoretical backgrounds (ability EI vs. trait EI) and different methods of measurement (self-report vs. performance measures), this study provides insights into a wide range of EI measures. Therefore, our study allows a more holistic view of the psychometric properties of EI measures, reflecting the nature of the construct and the response format.

The partially supported hypotheses for trait EI demonstrate the potential problems with developing new scales based on CTT without considering the nature of construct.

According to our results, trait EI did not favor an ideal point model, even though the construct is supposed to be treated as lower-level personality. Instead, it showed good model fits for both IRT models. These results, inconsistent with our hypothesis and other relevant studies (Tay, Drasgow, Rounds, & Williams, 2009; Chernyshenko, Stark et al. 2007; Stark, Chernyshenko et al. 2006), may not be due to the construct itself but to the process of current scale development (CTT).

Based on the results obtained in this study, we offer some guidelines for new EI scale development. First, we need to clarify the nature of the construct before beginning scale development. The EI field is rife with alternative conceptualizations, and perhaps the findings of this study can aid new theoretical conceptualizations. Second, it seems necessary to acknowledge the two EI frameworks in order to avoid inconsistent classification of EI measures. As previously mentioned, WLEIS is classified as a self-report ability measure and trait measure at the same time. There need to be studies to empirically validate whether trait EI is equivalent to mixed EI or whether they do differ. Third, a more integrative framework for EI would help us build more comprehensive EI measures. The ability EI and trait EI can both be interpreted to reside on an aptitude-attitude continuum, as measures of these contain some items that fit both the dominance response model and the ideal point response model.

TABLES

Table 1

Classification of Emotional Intelligence Scales based on Theoretical Background

EI Scale	N	Factors	Task	Classification from the two streams of EI	
				Ability vs. Mixed	Ability vs. Trait
STEU (MacCann & Roberts, 2008)	25	Emotion understanding	Performance ability	Ability (Mayer, Salovey, & Caruso, 2011)	Ability (Petrides, 2011)
WLEIS (Wong & Law, 2002)	16	(1) Appraisal and expression of Emotion in the self (SEA) (2) Appraisal and recognition of emotion in others (OEA) (3) Use of emotion to facilitate performance (UOE) (4) Regulation of emotion in the self (ROE)	Self-report of ability	Ability	Trait (Perez, Petrides, & Furnham, 2005)
TEIQue-SF (Petrides & Furnham, 2006)	30	(1) Emotionality (EM) (2) Self-control (SC) (3) Sociability (SO) (4) Well-being (WB) (5) Global factor(GL)	Self-report of trait	Mixed (Mayer, Salovey, & Caruso, 2008;2011)	Trait (Perez, Petrides, & Furnham, 2005)

Table 1 (continued)

EI Scale	N	Factors	Task	Classification from the two streams of EI	
				Ability vs. Mixed	Ability vs. Trait
SEIT (Schutte et al., 1998)	33	(1) Appraisal and expression of emotion (AOE) (2) Utilization of emotion (UE) (3) Regulation of emotion (MR) (4) Social skills (SS)	Self-report mixed	Mixed (Mayer, Salovey, & Caruso, 2008; Zeidner, Matthews, & Roberts, 2004)	Trait (Perez, Petrides, & Furnham, 2005)

Table 2

EFA Results for unidimensionality assumption

Scale	Cronbach's Coefficient Alpha	First Eigenvalue	Percentage of Variance Explained
WLEIS	.88		
SEA	.80	2.52	62.94%
OEA	.87	2.92	73.02%
UOE	.87	2.82	70.44%
ROE	.88	2.96	74.07%
TEIQue	.90	8.05	26.83%
EM	.61	2.20	27.44%
SC	.68	2.26	37.63%
SO	.66	2.58	42.93%
WB	.72	2.64	65.99%
GL	.86	2.02	50.53%
SEIT	.86		
AOE	.78	2.95	42.20%
MR	.77	3.31	27.56%
SS	.70	2.74	30.41%
UE	.59	1.74	34.86%
STEU	.51	2.45	9.81%

Note. WLEIS = Wong and Law emotional intelligence scale; SEA = Self emotional appraisal; OEA = Other emotional appraisal; UOE = Use of emotion; ROE = Regulation of emotion; TEIQue = Trait Emotional Intelligence Questionnaire-SF; EM = Emotionality; GL = Global factor; SC = Self-control ; SO = Sociability; WB = Well-being; SEIT = Schutte's self-report emotional test; AOE = Appraisal of emotions; UE = Utilization of emotions; MR = Mood regulations/optimism; SS = Social skills; STEU = Situational Test of Emotional Understanding-SF.

Table 3

Descriptive statistics of self-report emotional intelligence scales

	Scale	Item	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	WLEIS	16	4.46	0.70	(.88)															
2	SEA	4	4.48	0.83	.75	(.80)														
3	OEA	4	4.51	0.95	.65	.42	(.87)													
4	UOE	4	4.71	0.99	.74	.42	.28	(.87)												
5	ROE	4	4.15	1.14	.74	.40	.21	.40	(.88)											
6	TEIQue	30	4.12	0.68	.73	.57	.40	.65	.48	(.90)										
7	EM	8	4.10	0.76	.64	.60	.49	.43	.37	.80	(.61)									
8	GL	4	4.19	0.97	.55	.37	.25	.63	.34	.79	.50	(.68)								
9	SC	6	3.62	0.86	.59	.43	.17	.46	.58	.77	.50	.56	(.66)							
10	SO	6	4.04	0.86	.50	.39	.36	.47	.24	.74	.55	.54	.39	(.72)						
11	WB	6	4.69	0.97	.57	.41	.27	.60	.37	.82	.53	.61	.58	.46	(.86)					
12	SEIT	33	2.82	0.35	.62	.50	.57	.42	.33	.62	.59	.46	.40	.46	.52	(.86)				
13	AOE	7	2.75	0.55	.41	.35	.64	.12	.10	.33	.42	.19	.17	.34	.16	.69	(.78)			
14	UE	5	2.82	0.47	.26	.17	.27	.19	.13	.22	.21	.14	.08	.22	.18	.60	.29	(.77)		
15	MR	12	2.89	0.44	.65	.56	.30	.53	.48	.70	.53	.57	.58	.44	.63	.80	.35	.29	(.70)	
16	SS	9	2.80	0.46	.40	.27	.46	.29	.16	.43	.46	.30	.19	.29	.40	.81	.42	.50	.49	(.59)

Note. Between-scale correlations are bolded. WLEIS = Wong and Law emotional intelligence scale; SEA = Self emotional appraisal; OEA = Other emotional appraisal; UOE = Use of emotion; ROE = Regulation of emotion; TEIQue = Trait Emotional Intelligence Questionnaire-SF; EM = Emotionality; GL = Global factor; SC = Self-control; SO = Sociability; WB = Well-being; SEIT = Schutte's self-report emotional test; AOE = Appraisal of emotions; UE = Utilization of emotions; MR = Mood regulations/optimism; SS = Social skills. n = 355.

Table 4

Item wording and item parameters for self-report ability EI – WLEIS

Item	Item wording	<i>CTT</i>		<i>SGRM</i>		<i>GGUM</i>			
		<i>ITC_c</i>	<i>a</i>	<i>b1</i>	<i>b2</i>	<i>α</i>	<i>δ</i>	<i>τ1</i>	<i>τ2</i>
SEA_1	I have a good sense of why I have certain feelings most of the time.	0.61	2.70	-1.98	-1.61	1.75	0.40	-1.83	-2.84
SEA_2	I have a good understanding of my own emotions.	0.72	6.42	-1.67	-1.39	2.79	0.32	-1.91	-2.28
SEA_3	I really understand what I feel.	0.66	2.50	-1.54	-1.13	2.00	0.00	-1.38	-2.02
SEA_4	I always know whether or not I am happy.	0.46	1.09	-2.75	-1.94	1.20	-0.46	-1.65	-2.85
OEA_1	I always know my friends' emotions from their behavior.	0.71	3.07	-1.63	-1.25	1.86	-0.44	-1.79	-2.42
OEA_2	I am a good observer of others' emotions.	0.81	7.40	-1.67	-1.23	3.78	-0.36	-2.27	-1.95
OEA_3	I am sensitive to the feelings of emotions of others.	0.58	1.82	-1.96	-1.53	1.46	0.16	-1.45	-2.70
OEA_4	I have good understanding of the emotions of people around me.	0.83	4.00	-1.70	-1.24	2.97	-0.14	-2.05	-1.94
UOE_1	I always tell myself I am a competent person.	0.63	2.18	-1.94	-1.47	2.35	-0.51	-2.05	-2.29
UOE_2	I am a self-motivating person.	0.66	2.12	-1.74	-1.12	1.60	-0.18	-1.70	-2.09
UOE_3	I would always encourage myself to try my best.	0.78	5.57	-1.48	-1.15	3.35	0.11	-1.80	-1.86
UOE_4	I always set goals for myself and then try my best to achieve them.	0.75	5.75	-1.77	-1.34	3.53	0.15	-2.23	-1.99
ROE_1	I am able to control my temper so that I can handle difficulties rationally.	0.73	3.05	-1.44	-1.12	1.45	-0.53	-1.74	-2.81
ROE_2	I am quite capable of controlling my own emotions.	0.78	3.77	-1.38	-0.94	2.11	-0.47	-2.04	-2.06
ROE_3	I can always calm down quickly when I am very angry.	0.69	2.20	-0.58	-0.25	1.29	-0.99	-0.80	-2.22
ROE_4	I have good control of my own emotions.	0.76	3.84	-1.30	-0.83	2.19	-0.85	-2.29	-2.17

Note. Item calibrations were performed at the subscale level. *ITC_c* = Corrected item-total correlation; SEA = Self emotional appraisal; OEA = Other emotional appraisal; UOE = Use of emotion; ROE = Regulation of emotion.

Table 5

Item wording and item parameters for self-report trait EI – TEIQue

Item	Item wording	<i>CTT</i>	<i>SGRM</i>				<i>GGUM</i>		
		<i>ITC_c</i>	<i>a</i>	<i>b1</i>	<i>b2</i>	<i>α</i>	<i>δ</i>	<i>τ1</i>	<i>τ2</i>
EM_1	Expressing my emotions with words is not a problem for me.	0.30	0.77	-1.64	-0.97	0.87	0.56	-0.45	-2.56
EM_2	I often find it difficult to see things from another person's viewpoint.	0.26	0.55	-2.76	-2.08	1.05	-0.43	-0.33	-2.88
EM_3	Many times, I can't figure out what emotion I'm feeling.	0.27	0.87	-1.71	-0.92	0.77	0.08	-0.36	-2.59
EM_4	Those close to me often complain that I don't treat them right.	0.27	1.58	-2.18	-1.82	1.05	-0.09	-0.70	-3.67
EM_5	I often find it difficult to show my affection to those close to me.	0.44	0.87	-1.06	-0.67	1.61	0.34	-0.28	-1.92
EM_6	I'm normally able to find ways to control my emotions when I want to.	0.28	1.42	-1.90	-1.42	0.71	-0.18	-0.47	-3.89
EM_7	I often pause and think about my feelings.	0.07	0.18	-7.42	-2.78	0.43	-0.54	-0.56	-3.25
EM_8	I find it difficult to bond well even with those close to me.	0.39	1.25	-1.53	-1.08	1.16	0.37	-0.53	-2.57
SC_1	I usually find it difficult to regulate my emotions.	0.49	1.37	-1.39	-0.73	1.37	-0.18	-0.93	-1.81
SC_2	I tend to change my mind frequently.	0.33	0.51	0.21	1.54	1.66	-0.81	-0.39	-0.96
SC_3	On the whole, I'm able to deal with stress.	0.47	1.74	-1.38	-0.96	1.26	-0.12	-0.72	-2.34
SC_4	I'm usually able to find ways to control my emotions when I want to.	0.44	1.83	-1.95	-1.42	2.91	0.34	-1.80	-1.89
SC_5	I tend to get involved in things I later wish I could get out of.	0.34	0.89	-0.49	0.30	1.07	-0.55	-0.23	-1.43
SC_6	Others admire me for being relaxed.	0.22	0.51	-2.96	-0.67	0.50	-0.35	-1.16	-2.24
SO_1	I can deal effectively with people.	0.39	1.62	-2.53	-1.91	1.52	0.02	-1.72	-2.73
SO_2	I often find it difficult to stand up for my rights.	0.51	1.27	-1.37	-0.80	1.11	-0.57	-0.75	-2.31
SO_3	I'm usually able to influence the way other people feel.	0.49	0.62	-3.10	-1.29	1.18	-0.15	-1.39	-1.73
SO_4	I would describe myself as a good negotiator.	0.51	1.31	-2.00	-1.32	1.25	-0.27	-1.23	-2.38
SO_5	I tend to "back down" even if I know I'm right.	0.38	0.59	-1.37	-0.45	0.99	-1.01	-0.51	-2.32
SO_6	I don't seem to have any power at all over other people's feelings.	0.50	1.05	-2.21	-1.12	1.11	-0.34	-1.48	-2.07

Table 5 (continued)

Item	Item wording	<i>CTT</i>	<i>SGRM</i>			<i>GGUM</i>			
		<i>ITC_c</i>	<i>a</i>	<i>b1</i>	<i>b2</i>	<i>α</i>	<i>δ</i>	<i>τ1</i>	<i>τ2</i>
<i>WB_1</i>	I generally don't find life enjoyable.	0.73	3.32	-1.52	-1.31	2.22	-0.16	-1.39	-2.41
<i>WB_2</i>	I feel that I have a number of good qualities.	0.59	2.64	-2.12	-1.62	2.57	0.53	-2.55	-2.46
<i>WB_3</i>	On the whole, I have a gloomy perspective on most things.	0.67	1.99	-1.67	-1.23	1.39	-0.18	-1.28	-2.48
<i>WB_4</i>	On the whole, I'm pleased with my life.	0.71	2.79	-1.69	-1.27	2.72	-0.24	-1.84	-1.96
<i>WB_5</i>	I believe I'm full of personal strengths.	0.50	2.32	-1.97	-1.40	1.72	0.51	-2.23	-2.47
<i>WB_6</i>	I generally believe that things will work out fine in my life.	0.64	1.92	-1.72	-1.29	1.36	-0.24	-1.26	-2.59
<i>GL_1</i>	On the whole, I'm a highly motivated person.	0.49	1.53	-1.94	-1.50	1.72	-0.50	-1.43	-2.45
<i>GL_2</i>	I often find it difficult to adjust my life according to circumstances.	0.39	0.92	-1.87	-1.01	1.18	0.21	-0.88	-2.00
<i>GL_3</i>	I normally find it difficult to keep myself motivated.	0.54	1.40	-1.10	-0.67	2.00	-0.17	-0.74	-1.61
<i>GL_4</i>	Generally, I'm able to adapt to new environments.	0.41	1.58	-2.02	-1.55	1.04	0.44	-1.11	-3.29

Note. Item calibration was performed at factor level. EM = Emotionality; SC = Self-control; SO = Sociability; WB = Well-being; GL = Global factor.

Table 6

Item wording and item parameters for self-report mixed EI – SEIT

Item	Item wording	<i>CTT</i>	<i>SGRM</i>				<i>GGUM</i>		
		<i>ITC_c</i>	<i>a</i>	<i>b1</i>	<i>b2</i>	α	δ	$\tau1$	$\tau2$
AOE_1	I find it hard to understand the non-verbal messages of other people.	0.47	1.28	-1.87	-0.90	0.84	2.72	-0.92	-1.58
AOE_2	I am aware of the non-verbal messages I send to others.	0.47	1.46	-1.54	-0.35	1.65	-0.44	-1.60	-1.19
AOE_3	By looking at their facial expressions, I recognize that emotions people are experiencing.	0.58	1.83	-2.90	-1.67	1.73	-1.19	-3.47	-2.96
AOE_4	I am aware of the non-verbal messages other people send.	0.54	4.90	-1.53	-0.79	3.22	-0.81	-2.32	-1.76
AOE_5	I know what other people are feeling just by looking at them.	0.52	1.46	-1.27	0.09	1.17	-1.17	-2.13	-1.29
AOE_6	I can tell how people are feeling by listening to the tone of their voice.	0.47	1.28	-3.22	-1.39	1.15	-1.03	-3.52	-2.58
AOE_7	It is difficult for me to understand why people feel the way they do.	0.36	0.89	-2.67	-1.13	0.71	2.54	-0.65	-0.85
UE_1	Some of the major events of my life have led me to re-evaluate what is important and not important.	0.17	0.58	-6.15	-3.02	0.87	-0.44	-2.97	-2.86
UE_2	When my mood changes, I see new possibilities.	0.32	1.05	-2.41	-0.66	1.44	-0.39	-1.99	-1.33
UE_3	When I am in a positive mood, solving problems is easy for me.	0.33	1.22	-4.46	-1.92	1.84	0.64	-3.58	-2.25
UE_4	When I am in a positive mood, I am able to come up with new ideas.	0.27	2.22	-2.27	-1.04	2.28	0.27	-2.39	-1.62
UE_5	When I feel a change in emotions, I tend to come up with new ideas.	0.35	1.58	-1.40	0.28	1.60	-0.10	-1.64	-0.56
MR_1	I know when to speak about my personal problems with others.	0.30	0.86	-3.25	-2.64	0.76	0.09	-0.49	-4.42
MR_2	When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.	0.45	1.29	-2.60	-1.83	1.16	-0.07	-1.42	-2.88
MR_3	I expect that I will do well on most things I try.	0.43	1.49	-2.24	-1.09	1.44	-0.19	-1.92	-1.82
MR_4	I am aware of my emotions as I experience them.	0.29	0.59	-4.95	-3.11	1.12	0.91	-2.32	-3.09

Table 6 (continued)

Item	Item wording	<i>CTT</i>	<i>a</i>	<i>SGRM</i>		α	<i>GGUM</i>		
		<i>ITC_c</i>		<i>b1</i>	<i>b2</i>		δ	$\tau1$	$\tau2$
MR_5	I expect good things to happen.	0.45	1.28	-2.38	-0.81	1.64	-0.37	-2.08	-1.44
MR_6	When I experience a positive emotion, I know how to make it last.	0.54	1.99	-1.33	-0.07	2.21	-0.01	-1.54	-0.84
MR_7	I seek out activities that make me happy.	0.26	1.21	-3.92	-2.77	1.40	-0.83	-2.79	-3.50
MR_8	I know why my emotions change.	0.33	0.73	-3.10	-1.27	0.96	0.43	-1.79	-2.01
MR_9	I have control over my emotions.	0.48	1.43	-1.42	-0.23	1.52	0.09	-1.39	-1.10
MR_10	I easily recognize my emotions as I experience them.	0.41	0.81	-3.68	-1.80	1.32	0.60	-2.32	-2.14
MR_11	I motivate myself by imagining a good outcome to tasks I take on.	0.43	1.71	-1.84	-1.16	1.87	-0.42	-1.63	-1.98
MR_12	When I am faced with a challenge, I give up because I believe I will fail.	0.27	0.69	-3.94	-2.32	0.43	4.99	-0.63	-2.94
SS_1	Other people find it easy to confide in me.	0.41	1.50	-2.78	-1.41	1.46	-0.17	-2.38	-2.04
SS_2	Emotions are one of the things that make my life worth living.	0.33	0.86	-3.41	-1.09	0.98	-0.64	-2.72	-1.87
SS_3	I like to share my emotions with others.	0.31	0.74	-0.82	0.42	1.10	-1.51	-1.35	-1.82
SS_4	I arrange events others enjoy.	0.28	0.92	-2.43	-0.70	0.96	-0.19	-1.76	-1.56
SS_5	I present myself in a way that makes a good impression on others.	0.37	1.15	-3.68	-1.61	1.29	-0.22	-2.84	-2.06
SS_6	I compliment others when they have done something well.	0.39	0.96	-4.90	-2.67	1.37	0.08	-2.85	-2.56
SS_7	When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.	0.36	0.67	-1.91	0.39	0.69	-0.74	-1.55	-1.04
SS_8	I help other people feel better when they are down.	0.54	2.38	-2.34	-1.42	2.02	-0.36	-2.33	-2.12
SS_9	I use good moods to help myself keep truing in the face of obstacles.	0.37	0.99	-3.18	-1.33	1.08	-0.19	-2.28	-1.92

Note. Item calibration was performed at factor level. AOE = Appraisal of emotions; UE = Utilization of emotions; MR = Mood regulations/optimism; SS = Social skills.

Table 7

Model fit comparison for self-report ability EI – WLEIS

Scale	Factor	<i>Chi/df</i>	Dominance Model Fit (SGRM)		Ideal Point Model Fit (GGUM)	
			<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
WLEIS	SEA	Singles	0.00	0.00	0.00	0.00
		Doubles	1.05	2.56	3.12	5.30
		Triples	0.06	0.12	3.80	4.40
	OEA	Singles	0.00	0.00	2.71	3.15
		Doubles	0.00	0.00	7.07	5.77
		Triples	0.00	0.00	11.90	7.06
	UOE	Singles	0.00	0.00	1.52	2.14
		Doubles	0.00	0.00	2.12	2.08
		Triples	0.33	0.42	13.31	10.52
	ROE	Singles	0.00	0.00	29.11	18.62
		Doubles	0.82	1.30	22.28	12.00
		Triples	0.00	0.00	21.23	10.12

Note. Model fitting was performed at factor level. Good model fit values (*chi/df* < 3) are bolded. SEA = Self emotional appraisal; OEA = Other emotional appraisal; UOE = Use of emotion; ROE = Regulation of emotion.

Table 8

Model fit comparison for self-report trait EI – TEIQue

Scale	Factor	<i>Chi/df</i>	Dominance Model Fit (SGRM)		Ideal Point Model Fit (GGUM)	
			<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
TEIQue	Full scale	Singles	0.00	0.00	1.92	5.55
		Doubles	1.48	3.92	4.95	6.05
		Triples	1.52	3.30	5.69	5.26
	EM	Singles	0.00	0.00	0.31	0.88
		Doubles	1.14	2.36	2.92	3.39
		Triples	1.43	2.25	4.28	3.66
	SC	Singles	0.00	0.00	0.00	0.00
		Doubles	4.50	5.72	7.70	6.50
		Triples	2.85	3.16	5.17	4.45
	SO	Singles	0.00	0.00	0.19	0.47
		Doubles	0.86	3.29	2.90	3.68
		Triples	0.32	1.03	3.54	3.26
	WB	Singles	0.00	0.00	0.00	0.00
		Doubles	1.03	2.47	2.01	3.15
		Triples	0.00	0.00	0.00	0.00
	GL	Singles	0.00	0.00	0.00	0.00
		Doubles	2.24	4.74	1.31	2.27
		Triples	1.65	2.81	1.52	2.29

Note. Model fitting was performed at factor level. Good model fit values (*chi/df* < 3) are bolded. EM = Emotionality; SC = Self-control; SO = Sociability; WB = Well-being; GL = Global factor.

Table 9

Model fit comparison for self-report mixed EI – SEIT

Scale	Factor	<i>Chi/df</i>	Dominance Model Fit (SGRM)		Ideal Point Model Fit (GGUM)	
			<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
SEIT	AOE	Singles	0.00	0.00	0.00	0.00
		Doubles	0.30	1.02	1.91	3.98
		Triples	0.96	1.93	3.35	4.02
	UE	Singles	0.00	0.00	0.00	0.00
		Doubles	1.85	5.40	3.31	7.54
		Triples	3.66	4.43	7.12	8.11
	MR	Singles	0.00	0.00	0.00	0.00
		Doubles	1.85	5.45	1.16	2.87
		Triples	2.14	3.79	1.61	2.82
	SS	Singles	0.00	0.00	0.00	0.00
		Doubles	0.24	0.98	0.82	3.06
		Triples	0.21	0.65	0.76	1.97

Note. Model fitting was performed at factor level. Good model fit values (*chi/df* < 3) are bolded. AOE = Appraisal of emotions; UE = Use of emotions; MR = Mood regulations/optimism; SS = Social skills.

Table 10

Item parameters for performance ability EI – STEU

	<i>CTT</i>		<i>2PL</i>		<i>GGUM</i>		
	<i>ITC</i>	\hat{p}	a	b	α	δ	τl
1	0.24	0.63	0.52	-0.70	1.23	-0.69	-1.32
2	0.09	0.71	0.34	-1.69	0.89	-1.19	-2.23
3	-0.02	0.60	0.30	-0.84	0.69	-1.16	-1.60
4	0.23	0.93	0.92	-2.34	1.76	-0.25	-2.67
5	0.10	0.63	0.52	-0.71	1.31	0.04	-1.10
6	0.11	0.67	0.47	-0.97	1.01	-0.67	-1.52
7	-0.02	0.87	0.54	-2.33	1.03	-0.12	-2.59
8	-0.05	0.31	0.28	1.78	0.56	-2.33	-0.50
9	0.14	0.93	0.94	-2.25	1.87	-0.02	-2.50
10	0.24	0.86	0.71	-1.86	1.39	-0.33	-2.22
11	0.13	0.92	0.84	-2.30	1.64	-0.02	-2.56
12	0.10	0.76	0.62	-1.31	1.30	0.03	-1.65
13	0.15	0.88	0.78	-1.98	1.57	-0.13	-2.30
14	0.18	0.84	0.69	-1.73	1.40	-0.54	-2.19
15	0.15	0.85	1.22	-1.32	2.43	-0.08	-1.75
16	-0.31	0.81	0.55	-1.80	1.13	0.22	-2.11
17	0.19	0.80	0.50	-1.83	1.25	0.23	-1.88
18	0.20	0.77	0.64	-1.36	1.50	0.15	-1.65
19	0.17	0.72	0.32	-1.86	0.81	-1.06	-2.25
20	0.25	0.86	0.80	-1.73	1.61	-0.01	-2.03
21	0.13	0.52	0.36	-0.10	0.79	-0.32	-0.67
22	-0.04	0.38	0.32	0.94	0.80	-0.75	-0.22
23	0.17	0.88	0.93	-1.78	2.13	0.01	-2.06
24	0.20	0.63	0.66	-0.59	1.42	-0.08	-1.07
25	0.16	0.65	0.45	-0.92	1.00	-0.49	-1.37

Table 11

Model fit comparison for performance ability EI – STEU

Scale	<i>Chi/df</i>	Dominance Model Fit (2PL)		Ideal Point Model Fit (GGUM)	
		<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
STEU	Singles	0.00	0.00	0.00	0.00
	Doubles	0.66	3.31	0.69	2.65
	Triples	1.01	3.08	0.76	2.18

Note. Model fitting was performed at scale level. Good model fit values ($chi/df < 3$) are bolded.

FIGURES

Figure 1

Item Characteristic Curves for the Subscale (GL) Favoring the Ideal Point Model - TEIQue

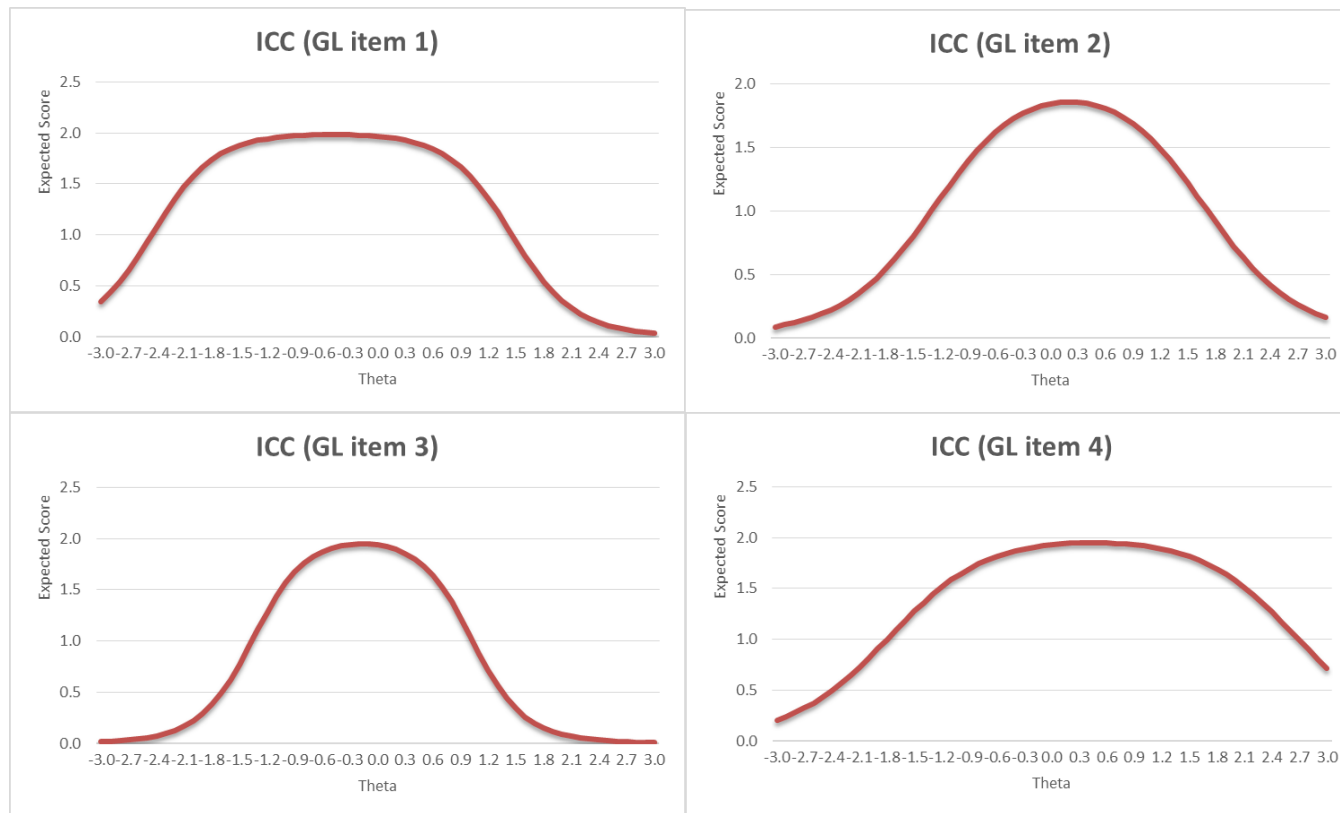


Figure 2

Item Characteristic Curves for the Subscale (MR) Favoring the Ideal Point Model – SEIT

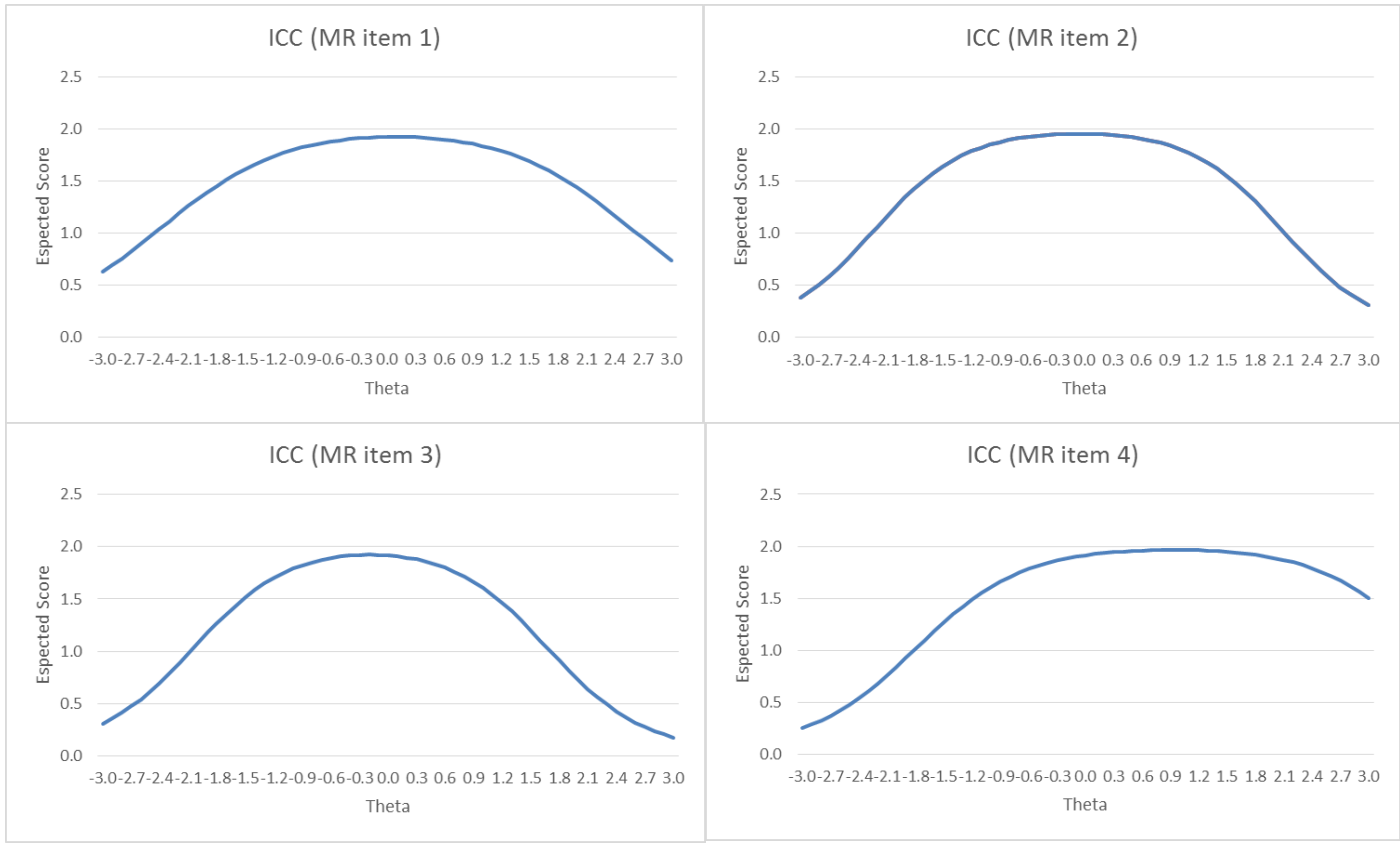


Figure 2 (continued)

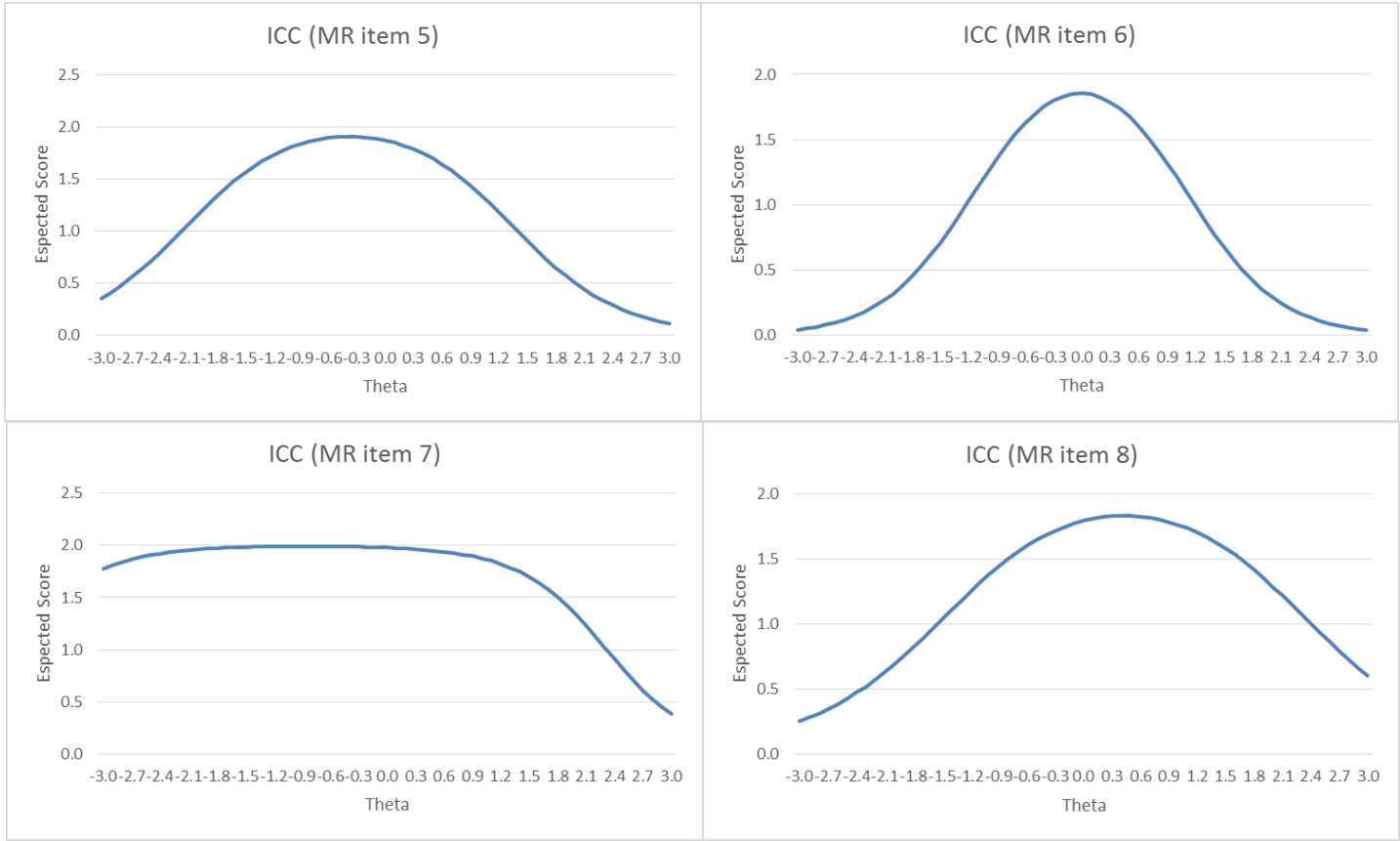
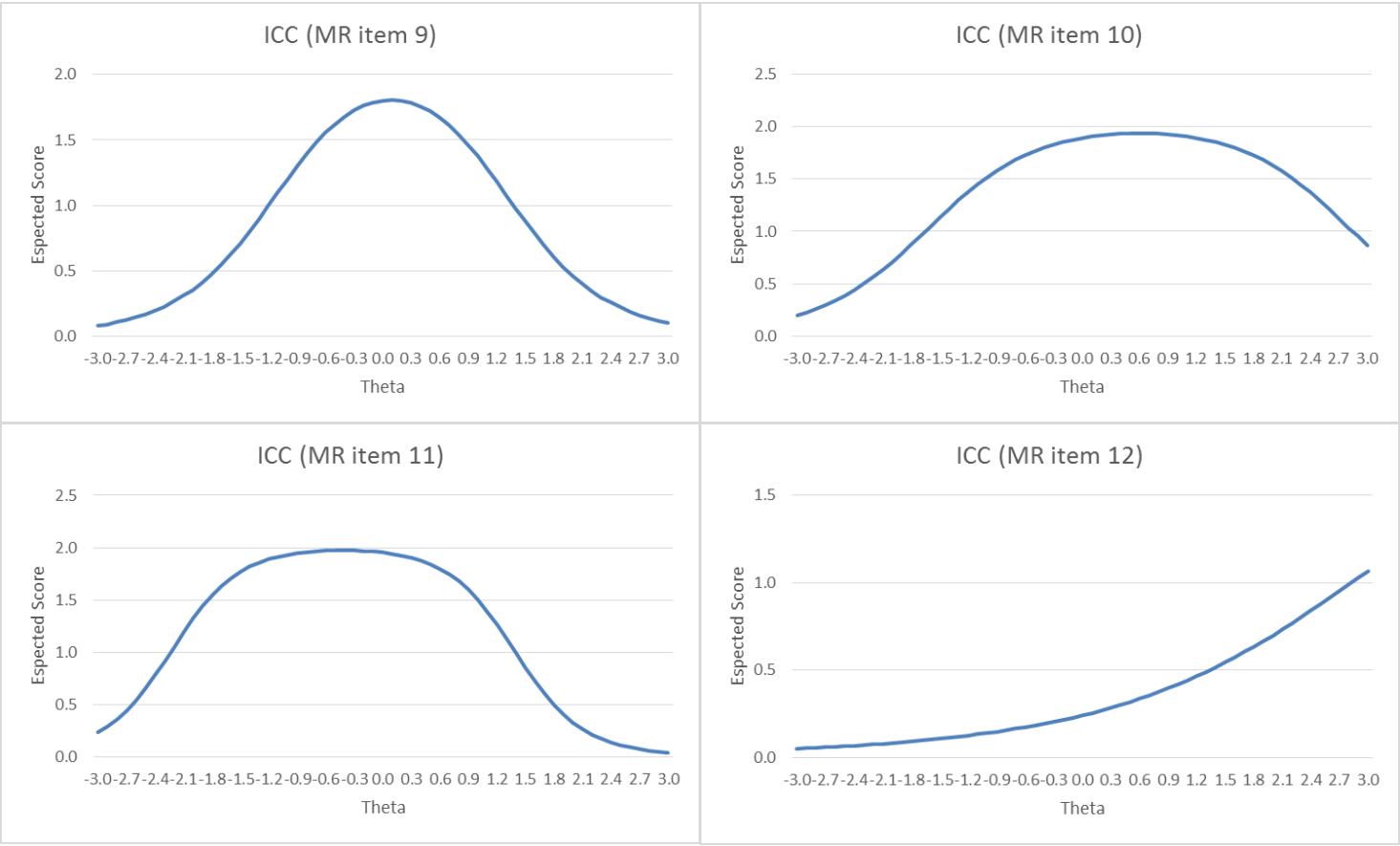


Figure 2 (continued)



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