

Emotional intelligence: More than personality and cognitive ability?

Nicholas R. Burns, Veneta A. Bastian, & Ted Nettelbeck

Department of Psychology, University of Adelaide

RUNNING HEAD: EI, personality and cognitive abilities

Corresponding author: nicholas.burns@adelaide.edu.au

Emotional intelligence: More than personality and cognitive ability?

When preparing this chapter, our brief has been to address key questions about how emotional intelligence (EI) should be conceptualized. Is EI distinct from existing personality and ability constructs? If so, what are the main components that distinguish EI from these constructs and how might EI be included within a multi-stratum model capable of predicting more favorable adaptation within real-world social environments? Is EI predominantly a single domain or is it multifactorial? If EI is a separate entity, can it be improved by training? Does it change over the lifespan?

We have preliminary answers to some of these questions; and we are prepared to speculate about others. Our conclusions have largely been shaped by new analyses of a large data set, collected from 458 young and middle-aged adults by Veneta Bastian as part of her PhD, supervised by the other two authors. This research has considered relationships between three different measures of EI, five personality traits, two different cognitive abilities and several life skills. The main aim has been to test whether EI has predictive validity for these life skills, beyond contributions of personality and cognitive abilities to these outcomes.

Background

Current interest in EI stems from a seminal article by Salovey and Mayer (1990), in which they proposed that EI is an important explanatory construct for improving understanding of individual differences in everyday achievements. Salovey and Mayer were not first to raise this possibility, crediting Payne (1986, cited by Mayer, 2001) with earlier use of “emotional intelligence”. However, Bar-On (2004) has traced the term back to Leuner (1966), while pointing to precursors to current ideas about EI in the earlier concept of “social intelligence” and in Darwin’s (1872) inquiries into emotional expression and social behavior. Social intelligence. In his recent comprehensive review of the history of ideas about social intelligence, Landy (in press) has traced this term back to Dewey (1909). Landy has plausibly

suggested that Dewey's definition of social intelligence as "the power of observing and comprehending social situations" (1909, p. 43) was the basis for E. L. Thorndike's (1920) more familiar concept of social intelligence as the way in which intelligence could be displayed in social situations. Thus, Thorndike's tripartite theory of intelligence included both cognition and behavior and social intelligence required a different kind of measurement to those employed to assess abstract (academic) intelligence or mechanical (practical) intelligence. He defined social intelligence as "the ability to understand and manage (people and) to act wisely in human relations" (1920, p. 228).

As Landy (in press) has emphasized, Thorndike's ideas differed from those who followed. Thorndike was principally concerned with different behavioral manifestations of intelligence; essentially how a unitary form of intelligence was expressed in different ways, depending on the cognitive demands of radically different environmental circumstances. Subsequently, however, social intelligence came to be envisaged as a different kind of intelligence from academic ability — and one requiring a hierarchical taxonomy to describe its more specific components. Thus, in his structure-of-intellect model, Guilford included 30 different forms of social intelligence as factors relatively independent from academic abilities, located within the behavioral contents dimension (O'Sullivan, Guilford & de Mille, 1965, as cited by Landy, in press; Weis & Süß, 2004; see also O'Sullivan, this volume).

Gardner and others. More recently, Gardner (1983, 1993) has speculated about the potential importance to successful everyday adaptation of what he has described as separate intelligences, including interpersonal intelligence (making distinctions based on mood, temperament, and intention when interacting with others) and intrapersonal intelligence (self-perception for feelings and emotions that guides one's own behavior). Similarly, Greenspan (1981) outlined a theory specific to intellectual disability that emphasized the importance of social competencies, over and above considerations of IQ and adaptive behavior.

These ideas all share to some extent the notion, intrinsic to our culture, that social competencies, including control of emotions, can be important to successful activities of daily living. Landy (in press) has traced the way in which ability to judge emotion from facial expression became linked to ideas about social intelligence (see also O'Sullivan, this volume). Surveys of lay and expert opinion about what intelligence means have typically included social skills, which must include among defining characteristics both regulating personal emotions and responding appropriately to the emotions of others (Sternberg & Detterman, 1986). Indeed, wide acceptance of the plausibility of these ideas undoubtedly reflects intuitions, bolstered by personal experience, that being able to recognize and manage one's own and others' emotions is important to successful interactions with others. And as several authors have recently concluded, attempts to develop definitions for social, and emotional, intelligence have resulted in considerable overlap between these constructs (Austin & Saklofske, 2004; Kang, Day & Meara, 2004; Weis & Süß, 2004).

Limitations of IQ. Attempts to expand descriptions of intelligence have been motivated by the aim of being better able to predict individual differences in successful real-life adaptation. A century of psychometric endeavor has clearly established that, the utility of IQ tests notwithstanding, being skilled in ways other than those tapped by IQ tests does influence important life outcomes. It is now widely accepted that, although psychometric tests of cognitive abilities generally provide the best available predictors of a diverse range of real-life outcomes, even the most reliable of such tests account for only about 25 percent of variance in educational achievement and workplace settings (Gottfredson, 1997; Neisser et al., 1996; Schmidt & Hunter, 1998)¹. This degree of predictive validity has considerable practical value, particularly for employment or work training (Schmidt & Hunter, 1998); but it is clear, nonetheless, that success at school, at work, and in other respects, must be influenced by traits and behaviors besides the cognitive abilities measured by IQ-type tests. These influences will

normally include personal motivation, persistence, interests, conscientiousness, background knowledge, learning styles, parental attitudes, peer influences, teaching and training practices. Wechsler (1940) recognized this, allowing that personal “non-intellective” characteristics might influence both test performance and broader life outcomes. However, even including such influences that can be reliably measured, together with tests of cognitive abilities, will leave in excess of 50 percent of variance in real life achievements unaccounted for (Matthews, Zeidner & Roberts, 2002). Moreover, as Schulze, Roberts, Zeidner and Matthews (2004) have pointed out, despite strong assertions about the fairness of IQ tests across diverse spectra within our culture (Jensen, 1980, 1998), widespread concern about the ecological validity of cognitive testing under some circumstances has motivated some differential psychologists to seek alternative psychological domains that may improve prediction of life achievements.

Sternberg. Personal characteristics may extend to different practical and socially relevant forms of intelligence (Sternberg, 1985); and they may extend also to emotional management skills or to forms of EI. However, it is one thing to speculate about the possible contribution of such influences but another to demonstrate the differential validity of so many different constructs. Nor does it follow that, even if management of emotion was found to contribute to valued life-style outcomes, such behaviors should usefully be held to reflect another form of intelligence. They may, for example, reflect context specific competencies, acquired by training rather than being derived from fundamental aptitudes, so that levels of skill vary across different emotions or different situations. However, until the validity of emotion-based constructs for successful outcomes has been firmly established, we prefer not to be drawn into debate about whether EI is better conceptualized as a raft of learned skills, rather than as one or more kinds of intelligence.

Salovey and Mayer. Early attempts to demonstrate the validity and practical efficacy of theories about the relevance of social judgments and competencies for important life

outcomes were widely judged by the 1960s and beyond to have been unsuccessful (Cronbach, 1960; Ford, 1994; Keating, 1978; Matarazzo, 1972), although contrary evidence could be found in some quarters. Thus, Landy (in press) has pointed out that Cronbach (1970) reversed his earlier unfavorable assessment of social intelligence research, at least insofar as he regarded as promising the attempt by Guilford and his colleagues to develop tests for “cognition of behavioral relationships” (see also O’Sullivan, this volume). Carroll (1993) also concluded that, despite limited data, there was sound evidence for a distinct broad domain of demonstrating knowledge about prosodic cues (e.g. recognizing vocal inflections, gestures, facial expressions) that communicate moods, emotions, and intentions in social interactions, consistent with Guilford’s “behavioral content”.

Nonetheless, earlier researchers did not agree about how to define critical constructs and, lacking consensus about external criteria against which to validate measurement, these efforts to develop procedures that distinguished social intelligence from academic abilities were widely considered to be unsuccessful. Even within the restricted IQ range that characterizes people with a mild intellectual disability, Mathias and Nettelbeck (1992) found only limited evidence for Greenspan’s theory, with IQ the most reliable predictor of performance in a range of activities. Salovey and Mayer (1990) should therefore be credited for reviving interest in theory that hitherto had stalled for some time (Jones & Day, 1997).

Growing interest in EI as a potentially important theoretical and practical construct has been dramatic, generating extensive research activity across several disciplines. Yet, despite wide spread interest, considerable confusion exists about how to define EI. Although this field is relatively new, Salovey and Mayer have already provided several versions of what they mean by EI. However, their intention, to bring theories about how emotions are perceived, expressed and regulated in self and others together with theories of cognitive abilities, so as to better predict adaptive behavior, has remained clear. More recently they

have defined EI as “the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge and to reflectively regulate emotions so as to promote emotional and intellectual growth” (Mayer & Salovey, 1997, p. 10). This reflects their conviction that EI is best conceived as a multifactorial form of intelligence that involves processing information to solve problems that relate to emotions. In this important respect, Mayer and Salovey’s theoretical approach has differed from conceptualizations of EI that have included links to personality (Austin & Saklofske, 2004).

Tests. Central to EI research, several different measures have been developed within alternative theoretical conceptions during the past decade (Mayer, Caruso & Salovey, 2000; Neubauer & Freudenthaler, 2004). “Mixed/trait” models have included personality, motivational, and affective dispositions and conceptions for intelligence. These have typically generated self-report scales such as the Emotional Quotient Inventory (EQ-i, Bar-On, 1997). The EQ-i has been designed to draw on “noncognitive capabilities, competencies and skills” (Bar-On, 1997, p.14), together with personality dispositions and cognitive abilities that Bar-On has argued hold relevance for successful everyday coping.

This all-encompassing approach has been criticized as conceptually confusing and unhelpful for theoretical progress (Matthews, Emo, Roberts, & Zeidner, in press; Matthews et al., 2002; Neubauer & Freudenthaler, 2004). In short, there is now considerable evidence (Ciarrochi, Chan & Caputi, 2000; Davies, Stankov & Roberts, 1998; MacCann, Matthews, Zeidner & Roberts, 2004; Van Rooy & Viswesvaran, 2004) that many self-report EI scales are essentially measures of familiar personality traits, without reliable correlations with cognitive abilities. Plausibly, therefore these scales measure different things than do so-called ability EI scales (see below). This being so, as Austin and Saklofske (2004) have remarked, it might be preferable not only to distinguish between the two forms of measurement but also to avoid referring to both underlying constructs as EI (see also Matthews et al., 2002).

The Trait Meta Mood Scale (TMMS, Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) and the Assessing Emotions Scale (AES, Schutte et al., 1998) are also self-report measures but were based on Salovey and Mayer's initial (1990) conception of EI as a form of intelligence; that is, an ability to process and integrate information about emotional feelings so as to guide thoughts and behaviors. Most recently, this ability theory of EI has generated the Multifactor Emotional Intelligence Scale (MEIS; Mayer, Caruso & Salovey, 1999) and its amended shorter revision, the Mayer, Salovey, and Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2000). The aim has been to develop ways by which EI can be assessed in accordance with objective, maximal performance criteria for which there are factually correct answers, analogous to how cognitive abilities have been measured. Consistent with this aim, such items have been described as "performance" measures.

In practice, however, the correctness or otherwise of a response has been determined by "target", "consensus", or "expert" scoring. With the first, correct answers are defined in terms of a target person's self-reported emotions. For the second and third methods, observations obtained from large samples of test respondents or from panels of "experts" (typically those interested in emotion research; see, for example Mayer, Salovey, Caruso, & Sitarenious, 2003) have been used to produce average or common answers most endorsed as appropriate by the sample. This procedure assumes that some predetermined degree of shared opinion about whether an answer is correct can provide a criterion for response accuracy. Scoring an ability item has therefore reflected the degree of correspondence between a test taker's answer and the extent of consensus about how to answer that item, either within a large sample of respondents or among experts. Thus, where 75 percent of the normative sample has advocated a particular answer, a test taker selecting this answer would score .75. Whether these scoring practices are appropriate has certainly attracted considerable debate (e.g., Stankov, 2000). Mayer and Geher (1996) have recognized that target agreement will

depend on capacities of the target person to report emotions accurately, without bias. Other researchers have challenged whether consensual agreement or expert opinion can define answers as correct (e.g. Roberts, Zeidner, & Matthews, 2001), whether expertise can be established (MacCann, Roberts, Matthews & Zeidner, 2004), and pointed out that stated intention does not necessarily translate into behavior (Brody, 2004). Elsewhere, however, Legree, Psotka, Tremble and Bourne (2004) have argued that these forms of measurement are appropriate in the absence of a formal body of knowledge that predicts performance in real-life domains, as applies with traditional psychometric tests of intelligence. Legree et al.'s position is essentially pragmatic, arguing that procedural knowledge only emerges with experience and that until objective standards for verification exist, consensual opinion provides a way forward. Nonetheless, they support this argument with evidence that larger samples of nonexperts will converge on outcomes that approximate expert opinion, even where the knowledge base involves cognitive processes rather than behavioral observations.

These developments have captured the interest of increasing numbers of researchers. Computer-based catalogues listing EI research reveal increasingly high levels of activities in this field. Several hundreds of peer-reviewed articles have been published on the topic in psychology, educational, management, and commerce journals during the past five years, together with large numbers of books and chapters. These have generated expanding interest among behavioral scientists but have also attracted broad media interest and wide acceptance among lay audiences of the validity of the basic ideas. Although Salovey and Mayer have been appropriately cautious, emphasizing that their research is still work-in-progress, others have been less constrained. Most notably, Goleman (1995, 1998) has enthusiastically promoted EI (or EQ for emotional quotient, analogous to IQ) as critically important to both educational and workplace achievements, especially at management and leadership levels within commercial organizations. Nonetheless, these developments have also attracted

considerable debate. Goleman's claims, in particular, have been criticized as speculations beyond available data that are, moreover, rendered untestable because of the diverse range of characteristics aligned to abilities, attitudes, beliefs, social competencies, learned skills, and personality traits included as relevant to EI (Epstein, 1998; Pfeiffer, 2001). As Roberts et al. (2001) have pointed out (see also Schulze et al., 2004), different authors have differently conceptualized EI and, thus far, there is confusion about how to define and measure it. Certainly, if EI is a form of intelligence, then it should fit into the currently best available psychometric model, the Cattell-Horn-Carroll hierarchical model (Carroll, 1993), either as a specific first-order factor or as a broad second-order factor. However, EI has not been confirmed as a distinct general factor and is yet to be adequately located within a comprehensive taxonomic theory of intelligence (MacCann et al., 2004). Its status as a form of intelligence is therefore still uncertain.

Proponents for EI can point to evidence that different measures have been found to correlate positively with a wide range of practically useful variables in workplace, educational, and interpersonal situations (e.g. Austin, Saklofske, Huang, & Mc Kenney, 2004; Charbonneau & Nicol, 2002; Ciarrochi, Chan, & Bajar, 2001; Ciarrochi et al., 2000; Dawda & Hart, 2000; Lopes, Salovey, & Straus, 2003; Martinez-Pons, 1998; Mayer et al., 1999; Palmer, Donaldson, & Stough, 2002; Saklofske, Austin, & Minski, 2003; Schutte et al., 1998; Schutte et al., 2001). Hall, Geher, and Brackett (2004) have recently reported that EI distinguished children with Reactive Attachment Disorder from normally developing children. Negative correlations have also been reported with socially undesirable, illegal and deviant behaviors (e.g. Brackett, Mayer, & Warner, 2004; Petrides, Frederickson, & Furnham, 2004; Trinidad & Johnson, 2002). However, while acknowledging evidence for the potential utility of EI measures, others have warned against uncritical acceptance of the many claims made for EI, pending clearer theoretical development (Day & Kelloway, 2004; MacCann et

al., 2004). Importantly, few studies have controlled for the possible effects of personality or cognitive abilities and even where one or the other has been included, typically both have not. This is an important shortcoming because, ultimately, from both theoretical and practical perspectives, the relevance of EI as a useful construct depends on its incremental predictive validity. In short, it is not sufficient that EI tests predict significant life outcomes. EI is only useful as a separate construct if it adds to knowledge about what influences real-life outcomes, beyond what can be attributed to cognitive abilities and personality.

Van Rooy and Viswesvaran (2004) have attempted to test the incremental validity of EI by conducting a meta-analysis of 57 studies that have explored whether EI predicts academic, employment, and other forms of performance. Some of these studies (theses, laboratory reports) have not been published in refereed journals and the different studies have involved different measures of trait EI and ability EI. Results suggested that the composite EI derived by combining all measures might account for 4-5 per cent of performance variance beyond that predicted by the Big Five personality variables but no incremental validity over general intelligence. Moreover, differences between the performance-based MEIS and the other EI measures (all self-report) suggested that different underlying constructs could be involved. Apart from this analysis, and a study by Brackett and Mayer (2003), we know of no investigation that has directly considered whether EI predicts performance, beyond what can be predicted by intelligence and personality. In the next section, therefore, we summarize a recent attempt to test the incremental predictive validity of EI for real-life variables, after controlling for cognitive abilities and several personality domains. EI has been operationalized specifically in terms of Salovey and Mayer's (1990; Mayer & Salovey, 1997) conceptions of EI as an information processing ability.

Bastian's data

During 2002-2003 Bastian recruited 246 predominantly first-year Psychology students (69 males, 177 females) aged 16-39 years (mean 20 years). They completed a battery of tests measuring EI (TMMS, MSCEIT, AES), cognitive abilities (Raven's Advanced Progressive Matrices [APM], the Phonetic Word Association Test [PWAT, Brownless & Dunn, 1958]), personality (Revised NEO Personality Inventory [NEO PI-R; Costa & McCrae, 1992]), life satisfaction (Satisfaction with Life Scale [SWLS; Diener, Emmons, Larsen & Griffen, 1985]), anxiety (Anxious Thoughts Inventory [ATI; Wells, 1994]), perceived problem-solving (Problem Solving Inventory [PSI; Heppner & Petersen, 1982]), and coping (COPE [Carver, Scheier, & Weintraub, 1989]). Self-reported Australian Tertiary Entrance Rank (TER) scores from the final Year 12 of secondary schooling were available for 185 younger participants, to assess their academic achievement. TER is a percentile rank based on school performance relative to other students. It is used to determine competitive entrance to tertiary education.

The aim of Bastian's study was to test whether EI, assessed by self-report (TMMS, AES) and ability EI performance measures (MSCEIT), exhibited incremental predictive validity for real-life outcomes as indicated by academic achievement, problem-solving, coping and lower anxiety, and life satisfaction, after controlling for individual differences in personality and cognitive abilities. In summary, the results from this study, published by Bastian, Burns, and Nettelbeck (2005), were that, consistent with previous research (e.g. Dawda & Hart, 2000; Petrides & Furnham, 2000; 2001; Saklofske et al., 2003; Van der Zee, Schakel, & Thijs, 2002), the TMMS and AES measures were more related to personality than was MSCEIT. Cognitive abilities tended to be more closely related to MSCEIT than to TMMS and AES, as reported by others (e.g. Brackett & Mayer, 2003; Lopes et al., 2003; O'Connor & Little, 2003), although this distinction was less clear. EI and academic achievement were not reliably correlated but, consistent with theory, higher EI was low-to-moderately correlated with higher life satisfaction, problem solving, more positive coping,

and lower anxiety. However, after controlling for personality and cognitive abilities, EI predicted only small amounts of variance in these life skills. The MSCEIT shared about 6 percent of variance with the ATI. Self-report EI (i.e., a combined measure from TMMS and AES) accounted for 4-6 percent in life satisfaction and coping.

Bastian's second study in 2004 involved 211 participants aged 40-68 years (mean 52 years) who were widely recruited from the general community. There was therefore no overlap between the ranges of ages in the two studies but together they provide a continuous but not uniform age distribution from 16 to 68 years. The battery of tests completed by these participants was identical to that in the first study but indices of academic achievement at the end of secondary education were not available for these older participants. Bastian's aims were twofold. Principally, she wanted to check whether the pattern of results found in the first study would be found with an older, more heterogeneous IQ sample. In summary, results from this study were markedly similar to those from the first – but with even less evidence of incremental validity beyond personality and cognitive ability for either the separate EI scales or the combined self-report measure (derived from TMMS and AES). Secondly, Bastian was interested in ascertaining whether the older group would score higher on the measures of EI. This question about whether EI changes over the life span will be addressed in a later section.

The main analyses presented here have been made after combining the samples from both of Bastian's studies; i.e. $N = 458$ (130 males, 328 females). Because TER scores were not available for the older group, they have been excluded from most of the analyses that follow, although within the younger group TERs have been included for the one analysis about EI and life outcomes. Similarly, because ATI data were not available for about half of the first cohort, these are not considered here.

Dimensionality of EI Measures

Prior to addressing the questions set for us by the editors (using the data at hand), some comments on our methodology are necessary. We have used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) at different points. There has been a tendency for use of EFA to be seen as naïve or old-fashioned and for CFA (or, more generally, structural equation modeling, SEM) to be promoted because of the availability of hypothesis testing and statistical significance information within its framework. We believe that this tendency is unfortunate for at least two reasons. First, as Schulze (2005) pointed out, the exploratory-confirmatory dichotomy is somewhat illusory. Much work in the SEM framework is, indeed, exploratory in nature, with liberal use of modification indices for model refinement and generation. Modern EFA techniques, on the other hand, allow confirmation of structural models and maximum likelihood implementations also provide tests of statistical fit (see also Cudeck, 2000). Second, CFA requires strong *a priori* models for its effective use (Schulze, 2005). EI research has developed a plethora of models but whether they can be considered strong is moot. It is one thing to propose a model of EI and then show that data fit it to some arbitrary level acceptable to the proponent for that model; but it is another to demonstrate that model's superiority to other models (including equivalent but substantively distinct models). At various points in what follows, we will take the opportunity to advocate for modern approaches to EFA and raise issues on the use of CFA/SEM in EI research.

For Bastian's TMMS data, EFA of the polychoric correlation matrix for the 30 items from this instrument was conducted. We used polychoric rather than Pearson correlations because it has been amply demonstrated that, for categorical data with only a few categories (say two to six), use of the Pearson correlation can lead to artefactual outcomes (Kubinger, 2003). Until recently it was thought that prohibitively large samples were required to use polychoric correlations validly, particularly in CFA, but recent research has shown that it is

valid with only moderately large samples (Flora & Curran, 2004). To determine the number of factors, we examined the scree plot, calculated Velicer's minimum average partial and used a parallel roots analysis (see O'Connor, 2000; a fuller description on use of the parallel roots procedure is given below). All three methods suggested a four-factor solution.

Again, it is common for researchers in EI to use the eigenvalue greater than unity rule as their sole criterion for determining the number of factors to extract, although it has long been known that this method is often misleading (Cattell, 1978). There are now readily available program extensions (O'Connor, 2000; see also Russell, 2002) that allow researchers to more reliably determine the number of factors in a data set, although experience and knowledge of the research field are still indispensable (Schulze, 2005). Examination of the Promax rotated four-factor maximum likelihood solution for TMMS showed that this solution was largely consistent with the three domains identified by Salovey et al. (1995). The relevant items defined the Repair and Clarity domains; the other two factors represented aspects of Attention. Thus, the three domain scores suggested by Salovey et al. (Repair, Attention, and Clarity) were used for this instrument.

Similar analysis for AES defined a two-factor solution, rather than the one- or four-factor solutions reported in the literature (Ciarrochi et al., 2001; Petrides & Furnham, 2000; Saklofske et al., 2003; Schutte et al., 1998). We designated these two factors AES-Competency/Management and AES-Recognition. Summed item scores for these as well as an AES total score are reported in different contexts here. Thus, use of polychoric correlations and applying the parallel roots criterion to determine the number of factors distinguishes our result for AES from that of, for example, Petrides and Furnham (2000). In their exploratory analysis, they used Pearson correlations and reported that the eigenvalues greater than unity rule suggested 10 factors whereas the scree plot suggested only two. In the end, however,

they decided on a four factor Varimax (i.e., orthogonal factors) solution because “it was interpretable, clear, and accounted for a reasonable amount of the total variance” (p.317).

It is also apposite to compare our exploratory approach with the CFA of the AES by Gignac, Palmer, Manocha, and Stough (2005). They assumed validity of the model on which the AES was based (but see Petrides and Furnham’s qualification on Schutte et al.’s methodology); and this model specifies six domains. Gignac et al. assigned 28 items from the AES to these six domains and also included a general EI factor on which all 28 items loaded. They also proposed that an acquiescence factor was required because only three of 33 items of the AES are negatively keyed. Thus, their model was complex, containing two factors on which all items loaded and six other factors defined by between two and seven of the 28 items. Certainly, the argument for the acquiescence factor is weak and its necessity cannot be empirically determined because there are so few negatively keyed items in the AES (see McPherson & Mohr, 2005, for further discussion on item keying and factor analysis). Here it seems clear that an EFA approach is preferable to CFA because demonstrating that data fit a model is not the same thing as providing evidence for that model (Roberts & Pashler, 2000). Our two-factor EFA solution, on the other hand, is parsimonious and interpretable.

For the MSCEIT v2.0 (pre-release version), we have four branch scores and a total EI score provided by the publishers of the instrument (MHS publishers). Following Mayer and Salovey (1997), the four branches are:

- (i) *Perception, Appraisal and Expression of Emotion* (“Perceiving”). This ability has been described as the accuracy with which emotions in self and others can be identified.
- (ii) *Emotional Facilitation of Thinking* (“Using”); how emotions are used to guide thinking.
- (iii) *Understanding and Analyzing Emotions, Employing Emotional Knowledge* (“Knowledge”); understanding how emotions change.

(iv) *Reflective Regulation of Emotions to Promote Emotional and Intellectual Growth*

(“Management”). This involves managing both one’s own and others’ emotions.

However, we also calculated consensus scores based on our own sample. These were calculated by determining the proportion of the sample that gave a particular response to each item. That proportion was then assigned as the score for that item to each individual who made that particular response. Then, for each subtest of MSCEIT, the mean of these scores was calculated for each individual. The branch scores were the mean of the two subtests comprising each branch. These scores are shown in Table 1 along with descriptive statistics for our other EI measures. Correlations of our consensus scores with those provided by MHS publishers were moderately high: .64, .67, .64, and .68 for Perceiving, Using, Knowledge, and Management branch scores, respectively, consistent with Legree et al. (2004).

We have used the consensus scores to determine how well the EI model encapsulated by MSCEIT was fit by our data. The four branch scores were each defined by two tasks from the MSCEIT as described by Mayer et al. (2000). This model, shown in Figure 1, is referred to hereafter as Model 1. For comparison purposes, we also fitted; (i) a single general factor model where all eight MSCEIT tasks load a general EI factor (Model 2); (ii) a two-factor model where four tasks load what Mayer et al. refer to as EI areas (specifically, “Emotional Experiencing” and “Emotional Reasoning”, Model 3); and (iii) a four-factor model where the tasks were arbitrarily assigned in pairs to define a factor (Model 4). It should be noted that there are other models, including higher-order models, that could be fitted to these data (see Schulze, 2005) but these four are sufficient for our current purpose.

Comparing these types of models should be done using a range of fit criteria; specifically, goodness-of-fit and model complexity should be considered (Kline, 2005). Here we have used the Bayesian Information Criterion (BIC; Schwartz, 1978; Raftery, 1995), the Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980), along with its

90 percent confidence interval, and the likelihood ratio chi-square. The BIC takes account of sample size and penalizes model complexity; the RMSEA is a parsimony-adjusted index where values less than about .05 indicate close approximate fit; and RMSEA greater than or equal to .10 suggests poor fit. The likelihood ratio chi-square tests the hypothesis that the model is correct but it is sensitive to the size of correlations and to sample size. Commonly, to overcome these problems, it is divided by the model degrees of freedom and a rule-of-thumb is that this value should be less than about 2 for a good fitting model (Kline, 2005).

Table 2 shows the fit criteria for the models considered. Several points emerge from examination of this Table. First, Model 1 with four correlated factors representing the EI branches proposed by Mayer and colleagues is clearly the best fitting model by all criteria and it is the only model that satisfies the chi-square test for exact fit. Second, Model 4, where the MSCEIT tasks were arbitrarily assigned in pairs to four factors, provides poor fit to the data. Models 2 and 3 do not satisfy the chi-square criterion but are plausible by the other criteria; the two-factor model, particularly, rivals Model 1 because its fit is not too bad and it is more parsimonious than Model 1. Nonetheless, our data provide strongest evidence for the EI model operationalized by MSCEIT. We now address the question of whether EI is distinct from personality and cognitive ability.

EI, Personality, and Cognitive Ability

In this section we address the question of how EI tests relate to existing personality and ability constructs. Data were the three measures from TMMS (Repair, Attention, and Clarity), AES total score, eight task scores from MSCEIT (based on our consensus scores), the 30 facet scores derived from NEO-PI-R, the APM score, and PWAT score. For reasons discussed above, the approach was exploratory and the Pearson correlation matrix was analyzed via maximum likelihood factoring. The number of factors was determined using a parallel roots analysis, where 1000 random permutations of the raw data were used to

generate the eigenvalues with which those from the observed correlation matrix were compared (O'Connor, 2000). A plot of both the eigenvalues for the observed data and eigenvalues from the random data against factor number showed that between factor 7 and factor 11 the two lines were close together and near-parallel and at factor 12 the eigenvalues for observed and random data were indistinguishable (see Figure 2). On this basis, we used a seven-factor model, which accounted for 50.5 per cent of variance.

Table 3a shows the pattern matrix for the Promax rotated seven-factor maximum likelihood solution and Table 3b shows the factor correlation matrix. To summarize, EFA has nicely recovered the five domains expected from the NEO-PI-R. The self-report measures in TMMS predominantly loaded on the personality factors Openness and Neuroticism and there was some overlap between TMMS and AES but the latter did not load on any domain other than Openness. The performance measures from the eight MSCEIT tasks, on the other hand, clearly defined an EI factor. Combining this outcome with the CFA described above suggests that MSCEIT captures Mayer and Salovey's (1997) definition in terms of perceiving, using, understanding, and managing emotions. EI, so defined, loaded the two cognitive ability tests to some extent; but the analytical reasoning factor (AR), here solely defined by Raven's APM performance, was relatively independent from EI and the personality dimensions.

To paraphrase Boring's (1923) famous dictum, this analysis has found that EI at this stage is what the Mayer, Salovey, and Caruso Emotional Intelligence Test tests. This EI factor is relatively independent from personality, although there was some overlap with Openness and Agreeableness (see Table 3b). Further, MSCEIT is independent from cognitive ability as defined for this sample. It is important to note, however, that, whereas personality has been well defined in these data, cognitive abilities were defined by only two marker tests, one for each of fluid ability and crystallized ability. Correlations of the AR factor with personality factors was consistent with other research that has found relationships between

personality, particularly Openness, and intelligence (Matthews, Deary, & Whiteman, 2003). However, cognitive ability, as defined here, is clearly inadequate to permit a test of where EI may be located within a well-articulated psychometric hierarchical model for intelligence.

This result suggests that future development of performance measures that characterize MSCEIT holds the best prospects for defining EI independently from personality domains. Two caveats to this conclusion should be noted, however. First, as pointed out by Brody (2004), MSCEIT performance items do not measure actual performance and, although answers may test knowledge of perception, use, knowledge, and management of emotions, such answers do not demonstrate how that person would actually behave. Given considerable evidence from diverse circumstances that self-assessment of traits, skills, and achievement are frequently substantially inaccurate (Dunning, Heath, & Suls, 2005), Brody's criticism raises a serious problem about the validity of so-called performance items. Second, and most importantly, whether the EI factor has incremental predictive validity for practical life outcomes beyond what can be predicted by measures of personality and intelligence is ultimately critical to the usefulness of the construct. We consider this in the next section.

EI and life outcomes

Here we report the extent to which measures of EI predict three self-reported measures of positive life outcomes. These life outcome measures were life satisfaction (SWLS; Diener et al., 1985), problem solving (PSI; Heppner & Petersen, 1982), and coping (COPE; Carver et al., 1989). We also consider the measure of academic achievement, TER, but this was only available for 185 participants in the younger adult group and this result will therefore be discussed separately. For the SWLS and PSI, we used total scale scores; note that lower scores on the latter indicate superior problem solving. For the COPE, we have factor analyzed the 15 domain scores and identified three qualitatively different aspects of coping: Active Coping, Social Coping, and coping by Denial. We report on these separately because,

prima facie, we expected EI to relate to these aspects of coping differentially. Thus, for example, high EI may predict Active Coping or Social Coping but not coping by Denial. In what follows, therefore, there are five separate life outcome measures.

The summary for a series of multiple regression analyses is set out in Table 4. The five measures of life outcome were regressed separately onto each of the EI measures. For TMMS, the three domain scores were used; for AES, the two domains identified by our own factor analyses (Competency/Management and Recognition) were used; and for MSCEIT, the four branch scores were used². TMMS predicted substantial variance in SWLS, PSI and Active Coping (17, 23, and 27 percent, respectively) and lower amounts of variance in Social and Denial Coping (three percent and 10 percent, respectively). AES predicted less than 10 percent of variance in life outcome measures. MSCEIT only predicted between one and six percent of variance in life outcome measures, substantially less than either of the two self-report EI measures. The differential pattern of magnitudes for the standardized regression coefficients within each EI measure is of some interest. Thus, TMMS-Repair predicted SWLS, PSI, and Active Coping whereas TMMS-Attention did not. However, TMMS-Clarity predicted coping by Denial but TMMS-Repair and TMMS-Attention did not. Of the MSCEIT branches, Management had the largest regression coefficients.

To summarize, the EI measures, particularly self-report EI, did predict substantial variance in the outcome measures of life satisfaction, problem-solving, and active coping. However, the critical question is whether the predictive validities of these EI measures add to the already well-established predictive validity of personality and ability measures?

Table 5 summarizes a series of hierarchical regression analyses completed to answer this question. The five personality domains from NEO-PI-R, together with PWAT and APM scores, were entered into regression models, as described above. Next, EI measures were entered into the same models. Table 5 shows the change in proportion of variance accounted

for when the EI measures were added to the models along with the standardized regression coefficients for the EI measures. The overall outcome is very clear. The EI measures have incremental validity that exceeds two percent for only one of the life outcome measures. TMMS predicted six percent of variance in Active Coping beyond that predicted by personality and ability measures. This outcome extends the conclusions previously drawn by Bastian et al. (2005). For these self-report life outcome measures, none of the EI measures has substantial incremental predictive validity over that of personality and ability.

Because MSCEIT has been shown to be relatively independent from personality measures (see Table 3a and 3b) and because the life outcome measures considered so far were all self-report measures, it is important to consider the possibility that MSCEIT may have incremental predictive validity for life outcome measures that do not depend on self-report. In the next analysis we therefore used the TER scores (an independent measure of academic achievement when leaving secondary schooling), available for the younger group. Table 6 shows zero-order correlations and second-order partial correlations (controlling for APM and PWAT) between MSCEIT and TER, on one hand, and APM, PWAT, and TER on the other. MSCEIT branches for Knowledge and Management correlated significantly with TER; but these correlations were substantially reduced to unreliable levels when APM and PWAT scores were partialled out. This result reflects the moderately strong correlations between these ability tests and TER. Noting that the participants in this sample were first-year university students, with restricted ranges for scores on these ability tests, this outcome suggests that EI as measured by MSCEIT has little incremental validity beyond that achievable with tests of cognitive abilities.

Does EI change over the life span?

To address this question the total sample has been divided into two groups; those 21 years or younger ($N = 206$, 54 males, 152 females, 16-21 years) and those 40 years or older

($N = 211$, 60 males, 151 females, 40-68 years). Table 7 shows the comparisons between the younger and older groups for all measures of personality, cognitive abilities, and EI. It is clear from inspection of Table 7 that the outcomes for personality and ability measures were consistent with previous findings. Thus, as would be expected, the younger group scored higher on Neuroticism and Extraversion but lower on Openness, Agreeableness, and Conscientiousness. Again, as would be expected, the older group scored higher on PWAT (i.e., a measure of crystallized ability, G_c) but lower on APM (i.e., a measure of fluid and visuo-spatial abilities, G_f and G_v). As indicated by the effect sizes, these age-related differences were large.

For the self-report EI measures, differences were largest for TMMS-Repair and TMMS-Clarity and somewhat smaller for AES, with the older group scoring higher. There was no difference between age groups on TMMS-Attention. For MSCEIT there was no difference on Perception, but small differences favoring older adults on Using and Knowledge and a larger difference again favoring older adults on Management. Insofar as Mayer and Salovey's (1997) conception for these four branches was hierarchical, with perception of emotion represented by basic psychological processes and management of emotion requiring the most complex, integrated processes, the increasing effect sizes across the four branches in Table 7 suggest that the differences between the groups have increased as the complexity of putative processes underpinning these four branches increases. Whether this is so or not, it is clear that responses among the participants between 40 and 68 years of age have indicated at least higher levels of knowledge about the regulation of emotions, compared to 20-year-olds. Taken together, these MSCEIT results suggest that more complex aspects of EI described by this instrument continue to develop beyond young adulthood. In this regard, EI would therefore appear to follow a different trajectory to psychometric cognitive abilities, which typically reach maximum levels by early adulthood. Potentially useful future research

questions may be whether the levels of EI competence registered by these older participants were attained markedly earlier than 40 years of age; and whether improvement continues into older age bands. We note again, however, that the relevance of such questions will depend on establishing that EI has useful incremental validity, beyond competencies predicted by personality and cognitive abilities.

Conclusions

Our conclusions here should not be interpreted as meaning that we believe that the attempt to develop a valid measure of EI has failed to produce worthwhile outcomes or that future attempts to develop valid tests of EI will not succeed. On the contrary, we accept that the question of whether EI is a useful construct, distinct from personality and cognitive abilities, is still open. Ultimately, this matter can only be resolved by confirmation that EI, measured from tasks that require processing of emotion-relevant information, has significant incremental predictive validity for important life outcomes, beyond what is predicted by personality and intelligence tests. Moreover, an additional important consideration yet scarcely addressed is whether EI's usefulness will depend on the kind of activities involved. As Van Rooy and Viswesvaran (2004) have surmised, EI may influence different kinds of performance to different extents and may even be counter-productive under some circumstances.

Our results have suggested that the best available test of EI (MSCEIT v2.0) cannot yet reliably and substantially improve what can be predicted about life outcomes by tests of personality and cognitive abilities. However, given the relatively short history of interest in this topic, it is expecting a lot to demand that, at this stage, it should. Our results have confirmed that the attempt, initiated by Mayer et al. (1999), to develop performance scoring methods that do not rely on self-report has successfully produced a scale in the MSCEIT v 2.0 that is largely independent from the personality domains measured by NEO-PI-R (c.f. also

Brackett & Mayer, 2003; Lopes et al., 2003) and from cognitive abilities tapped by APM and PWAT. Moreover, recent evidence from Mayer et al. (2003) has confirmed excellent reliability, a sound fit for the four-branch model that we have relied on here and predictive validity for life satisfaction. And, as our comparison between younger and older participants has shown, MSCEIT is sensitive to changes across the life span.

Although, according to our analyses, the incremental validity of MSCEIT for life outcome measures beyond regression of personality and ability measures was generally not promising, this finding should be interpreted cautiously. In fact, the life outcome measures also suffered from the same shortcomings that apply to the trait measures of EI. They relied entirely on self-report, a procedure that challenges their validity. The validity of TER scores for university entrance is, on the other hand, well established; and confirmed here by moderate correlations with the two cognitive ability tests. Nonetheless, the range of TERs among these participants was obviously restricted to, at most, the upper 25 percent of more academically able students, which might attenuate correlation with EI constructs, particularly if these were more like threshold variables than continuous variables. It is also obvious that a more fully articulated multifactorial model of intelligence than was available here will be necessary to attempt to test how ability EI aligns with an adequate description of psychometrically defined cognitive abilities.

Finally, although it will pose an enormous challenge, it may be necessary to develop performance measures that rely less on consensual agreement about ways in which people think that they ought to behave but seek instead more direct behavioral measures. As researchers attempt to explore ways of accomplishing this, it would be helpful if they could develop means for protecting their intellectual property without restricting access to scoring procedures. Of course, one understands the concerns of publishers when attempting to maintain the commercial potential of their product. On the other hand, lack of transparency

about how scores are derived may hamper attempts to further understanding of underlying constructs. That said, however, we acknowledge that MHS scores provided by the publishers for Bastian's data were sufficiently similar to those that we have calculated from consensus among the 458 participants to engender high confidence in the reliability of the MHS scores.

We remain optimistic about future prospects for EI as a useful construct for better informing understanding of individual differences in important life outcomes. The broad idea is certainly intuitively attractive. The initial enthusiasm in some quarters for a quick solution to the problems of defining and measuring EI – and for far-reaching claims about its relevance – has certainly raised lay expectations for EI among the general community that at this stage cannot be met. Clearly, we prefer an approach to a future research agenda based on the more reserved, cautious position that has been taken by Mayer, Salovey, and their colleagues, who first raised the possible utility of these ideas.

Summary

Based on a sample of 458 participants who completed the same battery of tests for EI, personality traits, cognitive abilities, and real-life outcomes, we have conducted a series of analyses that have addressed key questions about how EI should be conceptualized. We have concluded that EI should be defined as recommended by Mayer and Salovey (1997), in terms of processes that deal with information about emotions, and measured by evaluating performance, rather than by self-report. Currently, MSCEIT provides the only approximation to this standard. As measured by MSCEIT, EI has been found to be relatively independent from well-defined personality and ability constructs, although the range of cognitive abilities included in our analyses has been too narrow to permit an adequate test of independence from intelligence. This is therefore a potentially fruitful area for future research. Current evidence suggests that EI is multifactorial and well described by four subdomains (“branches”) that capture the perception, use, understanding, and management of emotions, although such

evidence is largely in the hands of the publishers of MSCEIT and we would advocate independent analyses, as we have done here, to confirm this conclusion. Cross sectional improvements in average subdomain scores from younger adults around age 20 years and adults 40 years and older were consistent with the theoretical conception of these subdomains as developmentally hierarchical, with management processes represented as most complex. However, we are not aware of any data that would yet inform on how the trajectory for EI development, through childhood into adulthood and across the life span, would look. The cross sectional changes observed in our sample imply that improvement can accompany normal, age-related life experiences; but we cannot comment further about whether EI represents a skill base, subject to improvement by training, or some more fundamental trait. Our main conclusion is that, although EI as measured by MSCEIT correlates with life skills like problem solving, coping, and satisfaction, it has only very limited incremental validity once personality and cognitive abilities have been taken into account.

Whether this outcome constitutes a theoretical or practical advance at this relatively early stage of development of such measures depends on one's expectations. Presumably, those initially persuaded by the extravagant enthusiasm of some early proponents for EI may be disappointed to learn that current measures yield so little by way of incremental validity, especially in face of the realization that, after all, IQ remains a fairly robust predictor for so many real-life activities. On the other hand, even modest incremental validity will serve a useful purpose, all other things being useful; and it is reasonable to expect that, given improved reliability and veracity of scoring methods, incremental validity will also improve. In our opinion, testing whether the relatively weak incremental validity of the MSCEIT can be overcome may require that successors move away from the current focus on consensual or expert-based scoring procedures and, instead, explore whether it is possible to develop reliable behavioral measures.

Footnotes

1. This widely accepted generality might not apply under some circumstances. A recent meta-analysis of the Graduate Record Examinations (GRE) by Kuncel, Hezlett and Ones (2001) has found that although verbal, quantitative, and analytical components of the GRE (essentially a proxy for general mental ability) predicted graduate student performance reasonably well, discipline-relevant background knowledge did better. Plausibly, this outcome might reflect more homogeneous levels of ability and higher levels of both interest and declarative knowledge required for graduate selection, compared to most jobs. Nonetheless, Kuncel et al.'s findings have demonstrated that nonspecific, general cognitive tests can prove not to have incremental validity over specific cognitive knowledge, a cautionary reminder against uncritical acceptance of psychological dogma.
2. For this and subsequent analyses the branch scores from MHS publishers were used. This was justified by comparison between results from EFAs using both our consensus scores and publishers' scores, which yielded substantially similar outcomes. The MHS scores have the advantage of being standardized to a mean of 100, with a standard deviation of 15, thereby permitting direct comparisons with other published data.

References

- Arbuckle, J. L. (1999). *AMOS 5*. Chicago, IL: Small Waters.
- Austin, E. J., & Saklofske, D. H. (2004). Far too many intelligences? On the communalities and differences between social, practical and emotional intelligences. In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 107-128). Cambridge, MA: Hogrefe & Huber.
- Austin, E. J., Saklofske, D. H., Huang, S. H. S., & McKenney, D. (2004). Measurement of trait emotional intelligence: Testing and cross-validating a modified version of Schutte et al.'s measure. *Personality and Individual Differences*, 36, 555-562.
- Bar-On, R. (1997). *Emotional Quotient Inventory (EQ-i): Technical manual*. Toronto, Canada: Multi-Health Systems.
- Bar-On, R. (2004). The Bar-On emotional quotient inventory (EQ-I): Rationale, description, and summary of psychometric properties. In G. Geher (Ed.). *Measuring emotional intelligence: Common ground and controversy* (pp. 111-142). Hauppauge NY: Nova Science.
- Bastian, V. A., Burns, N. R., & Nettelbeck, T. (2005). Emotional intelligence predicts life skills, but not as well as personality and cognitive abilities. *Personality and Individual Differences*, 39, 1135-1145.
- Boring, E. G. (1923). Intelligence as the tests test it. *New Republic*, 35, 35-37.
- Brackett, M. A. & Mayer, J. D. (2003). Convergent, discriminant and incremental validity of competing measures of emotional intelligence. *Personality and Social Psychology*, 29, 1147-1158.
- Brackett, M. A., Mayer, J. D. & Warner, R. M. (2004). Emotional intelligence and its relation to everyday behavior. *Personality and Individual Differences*, 36, 1387-1402.

- Brody, N. (2004). What cognitive intelligence is and what emotional intelligence is not. *Psychological Inquiry*, 15, 234-238.
- Brownless, V., & Dunn, S. (1958). *Manual for Shorthand Aptitude Test*. Australian Council for Educational Research. Melbourne, Australia: Australian Council for Educational Research.
- Carroll, J. B. (1993). *Human cognitive abilities: A survey of factor-analytic studies*. New York: Cambridge University Press.
- Cattell, R.B. (1978). *The scientific use of factor analysis*. NY: Plenum.
- Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing Coping Strategies: A Theoretically Based Approach. *Journal of Personality and Social Psychology*, 56, 267–283.
- Charbonneau, D., & Nicol, A. A. M. (2002). Emotional intelligence and leadership in adolescents. *Personality and Individual Differences*, 33, 1101 – 1113.
- Ciarrochi, J., Chan, A. Y. C., & Bajgar, J. (2001). Measuring emotional intelligence in adolescents. *Personality and Individual Differences*, 31, 1105-1119.
- Ciarrochi, J., Chan, A. Y. C., & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality and Individual Differences*, 28, 539-561.
- Costa, P. T., & McCrae, R. R. (1992). *NEO PI-R Professional Manual*. Odessa, Florida: Psychological Assessment Resources, Inc.
- Cronbach, L. J. (1960). *Essentials of psychological testing* (2nd ed.). New York: Harper Row.
- Cronbach, L. J. (1970). *Essentials of psychological testing* (3rd ed.). New York: Harper Row.
- Cudeck, R. (2000). Exploratory factor analysis. In H.E.A. Tinsley & S.D. Brown (Eds.) *Handbook of applied multivariate statistics and mathematical modeling* (pp.265-296). San Diego, CA: Academic Press.

- Darwin, C. (1872). *The expression of the emotions in man and animals*. Chicago: University of Chicago Press, 1965.
- Davies, M., Stankov, L., & Roberts R. D. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology*, 75, 989-1015.
- Dawda, D., & Hart, S. D. (2000). Assessing emotional intelligence: Reliability and validity of the Bar-On Emotional Quotient Inventory (EQ-i) in university students. *Personality and Individual Differences*, 28, 797-812.
- Day, A. L., & Kelloway, E. K. (2004). Emotional intelligence in the workplace. In G. Geher (Ed.). *Measuring emotional intelligence: Common ground and controversy* (pp. 215-237). Hauppauge, NY: Nova Science.
- Dewey, J. (1909). *Moral principles in education*. New York: Houghton Mifflin.
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49, 71-75.
- Dunning, D., Heath, C., & Suls, J. M. (2005). Flawed self-assessment: Implications for health, education, and the workplace. *Psychological Science in the Public Interest*, 5, 69-106.
- Epstein, S. (1998). *Constructive Thinking: The Key to Emotional Intelligence*. Westport, Connecticut: Praeger.
- Flora, D.B. & Curran, P.J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological Methods*, 9, 466-491.
- Ford, M. E. (1994). Social intelligence. In R. J. Sternberg (Ed.). *Encyclopedia of human intelligence*, 2 (pp. 974-978). New York: Macmillan.
- Gardner, H. (1983). *Frames of mind: the theory of multiple intelligences*. New York: Harper & Row.

- Gardner, H. (1993). *Frames of mind: the theory of multiple intelligences* (2nd ed.). New York: Harper & Row.
- Gignac, G.E., Palmer, B.R., Manocha, R., & Stough, C. (2005). An examination of the factor structure of the Schutte Self-Report Emotional Intelligence (SSREI) scale via confirmatory factor analysis. *Personality and Individual Differences*, 39, 1029-1042.
- Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ*. London: Bloombury.
- Goleman, D. (1998). *Working with emotional intelligence*. New York: Bantam.
- Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence*, 24, 79-132.
- Greenspan, S. (1981). Defining childhood social competence: A proposed working model. In B. K. Keogh (Ed.), *Advances in special education* (Vol. 3, pp. 41-82). Greenwich, CT: JAI Press.
- Heppner, P. P., & Petersen, C. H. (1982). The development and implications of a personal problem-solving inventory. *Journal of Counseling Psychology*, 29, 66-75.
- Jensen, A. R. (1980). *Bias in mental testing*.
- Jensen, A. R. (1998). *The g factor*. Westport, CT: Praeger.
- Jones, K., & Day, J. D. (1997). Discrimination of two aspects of cognitive-social intelligence from academic intelligence. *Journal of Educational Psychology*, 89, 486 - 497.
- Jöreskog, K.G. & Sörbom, D. (1989). *LISREL 8.5*. Chicago: Scientific Software International.
- Kang, S., Day, J. D., & Meara, N. M. (2004). Social and emotional intelligence: Starting a conversation about their similarities and differences. In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 91-105). Cambridge, MA: Hogrefe & Huber.

- Keating, D. P. (1978). The search for social intelligence. *Journal of Educational Psychology*, 70, 218-223.
- Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). NY: Guilford.
- Kubinger, K.D. (2003). On artificial results due to using factor analysis for dichotomous variables. *Psychology Science*, 45, 106-110.
- Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2001). A comprehensive meta-analysis of the predictive validity for the Graduate Record Examinations: Implications for graduate student selection and performance. *Psychological Bulletin*, 127, 162-181.
- Landy, F. J. (in press). The long, frustrating and fruitless search for social intelligence: A cautionary tale. In K. R. Murphy (Ed.). *The case against emotional intelligence: What are the problems and how can they be fixed?* Mahwah, NJ: Erlbaum.
- Legree, P. J., Psotka, J., Tremble, T., & Bourne, D. R. (2004). Using consensus based measurement to assess emotional intelligence. . In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 155-179). Cambridge, MA: Hogrefe & Huber.
- Leuner, B. (1966). Emotional intelligence and emancipation. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, 15, 196-203.
- Lopes, P. N., Salovey, P., & Straus, R. (2003). Emotional intelligence, personality and the perceived quality of social relationships. *Personality and Individual Differences*, 35, 641-658.
- MacCann, C., Matthews, G., Zeidner, M., & Roberts, R. D. (2004). The assessment of emotional intelligence: On frameworks, fissures and the future. In G. Geher (Ed.). *Measuring emotional intelligence: Common ground and controversy* (pp. 19-50). Hauppauge, NY: Nova Science.

- MacCann, C., Roberts, R. D., Matthews, G., & Zeidner, M. (2004). Consensus scoring and empirical option weighting of performance-based emotional intelligence (EI) tests. *Personality and Individual Differences*, 36, 645 - 662.
- Martinez-Pons, M. (1998). The relation of emotional intelligence with selected areas of personal functioning. *Imagination, Cognition and Personality*, 17, 3-13.
- Matarazzo, J. D. (1972). *Wechsler's measurement and appraisal of adult intelligence*. (5th ed.). New York: Oxford University Press.
- Mathias, J. I., & Nettelbeck, T. (1992). Validity of Greenspan's models of adaptive and social intelligence. *Research in Developmental Disabilities*, 13, 113-129.
- Matthews, G., Deary, I. J. & Whiteman, M. C. (2003). *Personality Traits* (2nd ed.). Cambridge: Cambridge University Press.
- Matthews, G., Emo, A. K., Roberts, R. D., & Zeidner, M. (in press). What is this thing called emotional intelligence? In K. R. Murphy (Ed.). *The case against emotional intelligence: What are the problems and how can they be fixed?* Mahwah, NJ: Erlbaum.
- Matthews, G., Zeidner, M., & Roberts, R. D. (2002). *Emotional intelligence: Science and myth*. Cambridge, MA: MIT Press.
- Mayer, J. D. (2001). A field guide to emotional intelligence. In: J. Ciarrochi, J. P. Forgas, & J. D. Mayer (Eds.) *Emotional intelligence and everyday life* (pp.3-24). New York: Psychology Press.
- Mayer, J. D., Caruso, D. R., & Salovey, P. (1999). Emotional intelligence meets traditional standards for an intelligence. *Intelligence*, 27, 267-298.
- Mayer, J. D., Caruso, D. R., & Salovey, P. (2000). Selecting a measure of emotional intelligence: The case for an ability scale. In R. Bar-On & J. D. A. Parker (Eds.). *Handbook of emotional intelligence* (pp. 320-324). San Francisco: Jossey-Bass.

- Meyer, J. D., & Geher, G. (1996). Emotional intelligence and the identification of emotion. *Intelligence, 22*, 89-113.
- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. Sluyter (Eds.). *Emotional development and emotional intelligence: Implication for educators* (pp. 3-31). New York: Basic Books.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). *Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) user's manual*. Toronto, Ontario, Canada: MHS Publishers.
- Mayer, J. D., Salovey, P., Caruso, D. R., & Sitarenios, G. (2003). Measuring emotional intelligence with the MSCEIT V2.0. *Emotion, 3*, 97-105.
- McPherson, J. & Mohr, P. (2005). The role of item extremity in the emergence of keying-related factors: An exploration with the Life Orientation Test. *Psychological Methods, 10*, 120-131.
- Neisser, U., Boodoo, G., Bouchard, T. J. Jr., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D. F., Loehlin, J. C., Perloff, R., Sternberg, R. J., & Urbina, S. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*, 77-101.
- Neubauer, A. C., & Freudenthaler, H. H. (2004). Models of emotional intelligence. In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 31-50). Cambridge, MA: Hogrefe & Huber.
- O'Connor, P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instrumentation, and Computers, 32*, 396-402.
- O'Connor, R. M., & Little, I. S. (2003). Revisiting the predictive validity of emotional intelligence: Self-report versus ability-based measures. *Personality and Individual Differences, 35*, 1893-1902.

- Palmer, B. R., Donaldson, C., & Stough, C. (2002). Emotional intelligence and life satisfaction. *Personality and Individual Differences*, 33, 1091-1100.
- Petrides, K. V., Frederickson, N., & Furnham, A. (2004). The role of trait emotional intelligence in academic performance and deviant behavior at school. *Personality and Individual Differences*, 36, 277-293.
- Petrides, K. V., & Furnham, A. (2000). On the dimensional structure of emotional intelligence. *Personality and Individual Differences*, 29, 313 – 320.
- Petrides, K. V., & Furnham, A. (2001). Trait emotional intelligence : Psychometric investigation with reference to established taxonomies. *European Journal of Personality*, 15, 425 – 448.
- Pfeiffer, S. I. (2001). Emotional intelligence: Popular but elusive construct. *Roeper Review*, 23, 138 – 142.
- Raftery, A. (1995). Bayesian model selection in social research. In P. Marsden (Ed.), *Sociological Methodology* (pp. 111-163). Oxford: Blackwell.
- Roberts, R. D., Zeidner, M., & Matthews, G. (2001). Does emotional intelligence meet traditional standards for an intelligence? *Emotion*, 1, 196-231.
- Roberts, S. & Pashler, H. (2000). How persuasive is a good fit? A comment on theory testing. *Psychological Review*, 107, 358-367.
- Russell, D.W. (2002). In search of underlying dimensions: The use (and abuse) of factor analysis in *Personality and Social Psychology Bulletin*. *Personality and Social Psychology Bulletin*, 28, 1629-1646.
- Saklofske, D. H., Austin, E. J., & Minski, P. S. (2003). Factor structure and validity of a trait emotional intelligence measure. *Personality and Individual Differences*, 34, 707-721.
- Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, 9, 185–211.

- Salovey, P., Mayer, J. D., Goldman, S. L., Turvey, C., & Palfai, T. P. (1995). Emotional attention, clarity and repair: Exploring emotional intelligence using the Trait Meta Mood Scale. In: J. W. Pennebaker (Ed.), *Emotion, Disclosure and Health* (pp. 125-154). Washington, DC: American Psychological Association.
- Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, 124, 262-274.
- Schulze, R. (2005). Modeling structures of intelligence. In O. Wilhelm & R.W. Engle (Eds.) *Handbook of understanding and measuring intelligence* (pp.241-263). Thousand Oaks, CA: Sage.
- Schulze, R., Roberts, R. D., Zeidner, M., & Matthews, G. (2004). Theory, measurement and applications of emotional intelligence: Frames of reference. In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 3-29). Cambridge, MA: Hogrefe & Huber.
- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25, 167-177.
- Schutte, N. S., Malouff, J. M., Bobik, C., Coston, T. D., Greeson, C., Jedlicka, C., Rhodes, E., & Wendorf, G. (2001). Emotional intelligence and interpersonal relationships. *The Journal of Social Psychology*, 141, 523-536.
- Schwarz, G. (1978). Estimating the dimensions of a model. *Annals of Statistics*, 6, 461-464.
- Stankov, L. (2000). Structural extensions of a hierarchical view on human cognitive abilities. *Learning and Individual Differences*, 12, 35-51.

- Steiger, J. H. & Lind, J. C. (1980 June). *Statistically-based tests for the number of common factors*. Paper presented at the Annual Spring Meeting of the Psychometric Society, Iowa City.
- Sternberg, R. J. (1985). *Beyond IQ: A triarchic theory of human intelligence*. New York: Cambridge University Press.
- Sternberg, R. J., & Detterman, D. K. (1986). *What is intelligence? Contemporary viewpoints on its nature and definition*. Norwood, NJ: Ablex.
- Thorndike, E. L. (1920). Intelligence and its uses. *Harper's Magazine*, 140, 227-235.
- Trinidad, D. R., & Johnson, C. A. (2002). The association between emotional intelligence and early adolescent tobacco and alcohol use. *Personality and Individual Differences*, 32, 95-105.
- Van Der Zee, K., Schakel, L., & Thijs, M., (2002). The relationship of emotional intelligence with academic intelligence and the big five. *European Journal of Personality*, 16, 103-125.
- Van Rooy, D. L., & Viswesvaran, C. (2004). Emotional intelligence: A meta-analytic investigation of predictive validity and nomological net. *Journal of Vocational Behavior*, 65, 71-95.
- Warwick, J. & Nettelbeck, T. (2004) Emotional intelligence is? *Personality and Individual Differences*, 37, 1091-1100.
- Wechsler, D. (1940). Non-Intellective Factors in General Intelligence. *Psychological Bulletin*, 37, 444 -445.
- Wells, A. (1994). A multi-dimensional measure of worry: Development and preliminary validation of the Anxious Thoughts Inventory. *Anxiety, Stress and Coping*, 6, 289-299.

Weis, S. & Süß, H. (2004). Social intelligence – a review and critical discussion of measurement concepts. . In R. Schulze & R. D. Roberts (Eds.). *Emotional intelligence: An international handbook* (pp. 203-230). Cambridge, MA: Hogrefe & Huber.

Table 1

Means and standard deviations for measures from three EI instruments

	<u>Mean</u>	<u>SD</u>	<u>Range</u>
<u>TMMS</u> ^a			
Repair	22.4	4.1	6 – 30
Attention	49.5	6.9	20 – 68
Clarity	39.6	7.0	15 – 58
<u>AES</u> ^b			
AES-Competency/Management	88.1	9.2	54 – 112
AES-Recognition	37.1	5.0	16 – 50
AES-Total	125.2	12.7	78 – 161
<u>MSCEIT</u> ^c			
MHS-Perception	102.4	15.3	41.9 – 123.5
MHS-Using	100.9	13.0	41.5 – 126.7
MHS-Knowledge	104.7	11.4	51.2 – 123.5
MHS-Management	99.1	12.0	50.9 – 124.1
MHS-EI	101.5	12.2	32.9 – 123.6
Consensus-Perception	.499	.089	.13-.62
Consensus-Using	.428	.061	.13-.54
Consensus-Knowledge	.570	.074	.24-.69
Consensus-Management	.396	.057	.12-.50

^a TMMS is Trait Meta Mood Scale (Salovey et al., 1995)^b AES is Assessing Emotions Scale (Schutte et al., 1998)^c MSCEIT is Mayer-Salovey-Caruso Emotional Intelligence Test v2.0 (Mayer et al., 2000);

MHS scores are those provided by the publishers; consensus scores were calculated on our own sample (see text for details).

Table 2.

Fit criteria for four measurement models for MSCEIT showing Bayesian Information Criterion (BIC), Root Mean Square Error of Approximation (RMSEA) and its 90% CI, and Likelihood Ratio Chi-Square.

<u>Model</u>	<u>BIC</u>	<u>RMSEA CI₉₀</u>	<u>χ^2 (df)</u>	<u>p</u>
1	156.2	.03 [.00, .05]	21.5 (14)	.090
2	203.7	.10 [.08, .12]	105.7 (20)	<.001
3	160.8	.07 [.05, .09]	56.7 (19)	<.001
4	232.8	.12 [.09, .14]	98.1 (14)	<.001
Saturated	220.5	-	0 (0)	-
Null	681.1	.22 [.20, .23]	632.1 (28)	<.001

Note: For comparison purposes, the relevant statistics are shown for the saturated model, where no constraints are imposed and fit is perfect; and for the null model where population correlations are assumed to be zero. See text for description of the four measurement models.

Table 3a

Pattern matrix for Promax rotation of seven factor maximum likelihood solution for EI measures, NEO-PI-R facets, APM and PWAT

	<u>N</u>	<u>E</u>	<u>O</u>	<u>A</u>	<u>C</u>	<u>EI</u>	<u>AR</u>	<u>h²</u>
Neuroticism 1	-0.94	0.05	0.09	-0.01	0.17	0.04	-0.03	0.69
2	-0.46	-0.14	0.18	-0.59	0.04	0.04	-0.11	0.73
3	-0.93	-0.01	0.10	0.03	0.02	-0.02	0.01	0.77
4	-0.84	-0.05	0.07	0.08	0.05	0.06	0.03	0.60
5	-0.33	0.18	0.32	-0.33	-0.28	0.03	-0.08	0.53
6	-0.84	0.04	0.02	0.16	-0.17	-0.02	0.03	0.75
Extraversion 1	0.04	0.72	0.18	0.25	0.03	-0.01	-0.06	0.78
2	0.00	0.86	-0.21	0.05	-0.13	0.10	0.03	0.62
3	0.48	0.30	0.02	-0.48	0.19	0.05	0.04	0.55
4	0.17	0.31	0.13	-0.26	0.25	0.00	0.06	0.35
5	-0.20	0.63	-0.16	-0.19	-0.12	0.00	0.23	0.48
6	0.19	0.55	0.25	0.08	-0.02	-0.01	0.07	0.63
Openness 1	-0.03	0.10	0.39	-0.09	-0.32	0.00	0.33	0.43
2	-0.22	-0.03	0.60	0.10	0.11	-0.13	0.26	0.42
3	-0.26	0.08	0.79	-0.15	0.06	0.03	-0.06	0.60
4	0.25	0.03	0.37	0.11	-0.12	-0.08	0.20	0.35
5	-0.01	-0.06	0.38	-0.03	0.23	-0.17	0.60	0.61
6	0.22	-0.16	0.66	0.00	-0.16	0.01	0.03	0.47
Agreeableness 1	0.30	0.15	0.22	0.53	-0.15	0.02	-0.01	0.64
2	-0.13	-0.07	0.12	0.57	0.20	0.07	-0.06	0.42
3	-0.19	0.38	0.25	0.41	0.28	0.03	-0.11	0.55
4	0.02	0.10	-0.06	0.84	-0.02	-0.02	0.05	0.70
5	-0.29	-0.05	0.06	0.44	-0.11	0.07	-0.16	0.26
6	0.12	-0.18	0.69	0.17	-0.04	-0.06	-0.06	0.50
Conscientiousness 1	0.21	0.05	0.06	-0.05	0.69	0.03	0.07	0.72
2	-0.13	-0.12	-0.05	-0.10	0.75	0.05	-0.06	0.47
3	0.02	-0.05	0.00	0.17	0.74	0.02	-0.08	0.67
4	-0.17	0.13	0.01	-0.10	0.88	-0.06	0.12	0.65
5	0.16	-0.07	0.04	0.00	0.75	-0.01	-0.03	0.72
6	-0.04	-0.09	-0.27	0.26	0.61	0.06	0.09	0.48
TMMS-Repair	0.44	0.28	0.14	0.21	0.00	0.01	-0.08	0.55
TMMS-Attention	-0.13	0.06	0.69	-0.02	-0.12	0.08	-0.13	0.47
TMMS-Clarity	0.61	-0.19	0.27	-0.04	0.09	0.12	-0.19	0.56
AES-Total	0.17	0.15	0.28	-0.10	0.08	0.02	-0.12	0.21
MSCEIT-Faces	-0.13	0.11	-0.14	0.00	-0.03	0.49	0.00	0.36
MSCEIT-Facilitation	0.08	0.09	-0.14	-0.06	-0.02	0.57	-0.10	0.42
MSCEIT-Changes	-0.05	-0.05	0.09	-0.02	-0.01	0.51	0.18	0.36
MSCEIT-Emotion Management	0.00	0.03	0.09	0.01	0.08	0.51	0.06	0.42
MSCEIT-Pictures	0.10	0.06	-0.14	0.02	-0.01	0.52	0.02	0.36
MSCEIT-Sensations	-0.15	0.06	-0.01	0.07	0.12	0.55	0.00	0.42
MSCEIT-Blends	0.06	-0.23	0.22	0.04	-0.04	0.39	0.25	0.36
MSCEIT-Social Management	0.05	0.08	0.12	0.09	-0.01	0.47	0.05	0.42
APM	-0.06	0.16	-0.16	-0.04	-0.07	0.24	0.61	0.42
PWAT	0.05	-0.25	0.22	0.05	0.00	0.36	0.21	0.36

Table 3a (cont.)

Note. Factors are N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, EI = Emotional Intelligence, AR = Abstract Reasoning, h^2 is communality. Loadings $\geq .25$ in bold.

Table 3b

Factor correlation matrix for Promax rotation of seven factor maximum likelihood solution for eight EI measures, thirty NEO-PI-R facets, APM and PWAT

	<u>N</u>	<u>E</u>	<u>O</u>	<u>A</u>	<u>C</u>	<u>EI</u>
<u>E</u>	0.25					
<u>O</u>	0.34	0.40				
<u>A</u>	0.42	0.00	0.22			
<u>C</u>	0.54	0.11	0.20	0.27		
<u>EI</u>	0.14	0.00	0.35	0.22	0.03	
<u>AR</u>	0.18	-0.05	0.24	-0.05	-0.08	0.13

Note. Factors are N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, EI = Emotional Intelligence, AR = Abstract Reasoning

Table 4

Multiple regression of life outcome measures onto EI measures

	<u>SWLS</u>	<u>PSI</u>	<u>COPE-Active</u>	<u>COPE-Social</u>	<u>COPE-Denial</u>
<u>TMMS</u>					
R^2_{adj}	.17	.23	.27	.03	.09
$F(3, 406)$	29.3 $p < .001$	41.7 $p < .001$	50.9 $p < .001$	5.00 $p = .002$	15.0 $p < .001$
β Repair	.35 $p < .001$	-.24 $p < .001$	.37 $p < .001$	.11 $p = .061$	-.04 $p = .469$
β Attention	.01 $p = .774$	.06 $p = .182$	-.06 $p = .208$	.14 $p = .006$	.09 $p = .065$
β Clarity	.12 $p = .024$	-.34 $p < .001$	.25 $p < .001$	-.01 $p = .862$	-.31 $p < .001$
<u>AES</u>					
R^2_{adj}	.05	.09	.09	.02	.00
$F(2, 407)$	12.6 $p < .001$	19.9 $p < .001$	22.8 $p < .001$	5.05 $p = .007$	1.13 $p = .326$
β Comp/Manage	.30 $p < .001$	-.24 $p < .001$	.33 $p < .001$	.17 $p = .007$	-.05 $p = .461$
β Recognition	-.14 $p = .024$	-.08 $p = .189$	-.02 $p = .716$	-.02 $p = .753$	-.04 $p = .560$
<u>MSCEIT</u>					
R^2_{adj}	.02	.06	.04	.01	.03
$F(4, 405)$	3.52 $p = .008$	8.04 $p < .001$	5.11 $p = .001$	1.47 $p = .210$	3.79 $p = .005$
β Perception	.01 $p = .811$	.11 $p = .046$	-.11 $p = .045$	-.08 $p = .153$	-.03 $p = .550$
β Using	.02 $p = .706$	.00 $p = .950$	-.01 $p = .801$	.00 $p = .991$	.06 $p = .323$
β Knowledge	.05 $p = .382$	-.13 $p = .011$	.07 $p = .192$	.04 $p = .509$	-.11 $p = .034$
β Management	.15 $p = .006$	-.21 $p < .001$	.20 $p < .001$	.10 $p = .072$	-.13 $p = .020$

Table 5

Multiple regression of life outcome measures onto EI measures after regression of personality and ability measures showing R^2_{cha} when EI is added and standardized regression coefficients for the EI measures only

	<u>SWLS</u>	<u>PSI</u>	<u>COPE-Active</u>	<u>COPE-Social</u>	<u>COPE-Denial</u>
<u>TMMS</u>					
R^2_{cha}	.02	.00	.06	.01	.01
F_{cha} (3, 399)	3.51 $p = .015$	1.19 $p = .313$	11.1 $p < .001$	1.36 $p = .256$	1.04 $p = .376$
β Repair	.16 $p = .007$	-.02 $p = .678$	.26 $p < .001$	.03 $p = .705$	-.04 $p = .469$
β Attention	.07 $p = .154$	.08 $p = .066$	-.11 $p = .040$	.05 $p = .411$	.09 $p = .065$
β Clarity	-.01 $p = .899$	-.01 $p = .833$	.15 $p = .011$	.09 $p = .164$	-.31 $p < .001$
<u>AES</u>					
R^2_{cha}	.01	.01	.02	.01	.00
F_{cha} (2, 400)	3.33 $p = .037$	3.02 $p = .050$	5.81 $p = .003$	1.25 $p = .287$	0.13 $p = .880$
β Comp/Manage	.14 $p = .012$	-.06 $p = .187$	.18 $p = .002$	.09 $p = .177$	.02 $p = .712$
β Recognition	-.10 $p = .059$	-.04 $p = .341$	-.03 $p = .521$	-.01 $p = .926$	-.03 $p = .622$
<u>MSCEIT</u>					
R^2_{cha}	.01	.01	.01	.01	.01
F_{cha} (4, 398)	1.24 $p = .295$	1.07 $p = .373$	1.45 $p = .218$	0.71 $p = .583$	0.92 $p = .450$
β Perception	-.01 $p = .853$	.07 $p = .100$	-.09 $p = .089$	-.08 $p = .170$	-.07 $p = .150$
β Using	.06 $p = .228$	-.03 $p = .414$	.00 $p = .932$	.00 $p = .920$	.06 $p = .264$
β Knowledge	.04 $p = .498$	-.06 $p = .186$	.09 $p = .098$	.05 $p = .364$	-.03 $p = .592$
β Management	.05 $p = .289$	-.02 $p = .959$	.04 $p = .488$	.02 $p = .706$	-.04 $p = .432$

Table 6

Correlations of MSCEIT, APM and PWAT with TER and partial correlations controlling for APM and PWAT (N = 185)

	<u>TER zero-order</u>	<u>TER controlling for APM and PWAT</u>
<u>MSCEIT-Perception</u>	-.05 $p = .51$	-.10 $p = .20$
<u>MSCEIT-Using</u>	-.02 $p = .80$	-.03 $p = .72$
<u>MSCEIT-Knowledge</u>	.33 $p < .001$	.14 $p = .06$
<u>MSCEIT-Management</u>	.17 $p = .02$	.08 $p = .27$
<u>APM</u>	.43 $p < .001$	-
<u>PWAT</u>	.35 $p < .001$	-

Table 7

Comparison of young- and middle-aged adults on personality, ability and EI measures

	<u>Young</u> (<i>N</i> = 206)	<u>Middle-aged</u> (<i>N</i> = 207)			
	<u>Mean (SD)</u>	<u>Mean (SD)</u>	<i>d</i> ^a	<i>t</i> (411)	<i>p</i>
<u>NEO-PI-R</u>					
Neuroticism	99.8 (24.1)	79.7 (26.0)	.80	8.15	<.001
Extraversion	119.3 (21.3)	111.1 (20.1)	.40	4.03	<.001
Openness	124.9 (19.1)	129.5 (18.9)	-.24	2.46	.014
Agreeableness	116.3 (19.2)	128.4 (16.2)	-.68	6.94	<.001
Conscientiousness	106.7 (23.3)	121.1 (21.4)	-.65	6.57	<.001
<u>Cognitive Ability</u>					
PWAT	35.9 (8.6)	42.5 (7.4)	-.83	8.42	<.001
APM	23.5 (7.0)	18.8 (6.6)	.69	7.06	<.001
<u>TMMS</u> ^a					
Repair	21.3 (4.3)	23.4 (3.8)	-.53	5.39	<.001
Attention	49.6 (6.5)	49.4 (7.4)	.02	0.25	.807
Clarity	36.7 (6.6)	42.5 (6.3)	-.91	9.20	<.001
<u>AES</u> ^b					
AES-Total	123.5 (12.3)	127.0 (12.7)	-.28	2.89	.004
<u>MSCEIT</u> ^c					
Perception	102.4 (15.2)	102.2 (15.9)	.01	0.15	.883
Using	99.2 (13.6)	102.6 (12.7)	-.26	2.63	.009
Knowledge	103.4 (11.2)	106.1 (10.7)	-.25	2.50	.013
Management	95.2 (11.9)	103.3 (11.3)	-.70	7.13	<.001
EI	99.2 (13.0)	103.8 (11.4)	-.37	3.75	<.001

^a*d* is Cohen's *d*, the difference between means divided by the pooled standard deviation estimate. Negative values indicate higher means for the middle-aged group.

Figure Captions

Figure 1. Measurement model for MSCEIT showing eight tasks defining four EI branches and showing standardized parameter estimates.

Figure 2. Plot of eigenvalues against factor number for 44 variables and for the mean of 1000 random permutations of the raw data for the same 44 variables. The two lines become nearly parallel at about factor number 7 and eigenvalues are indistinguishable at factor number 12



