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**Learning to Discriminate Terrorists: The Effects of Emotional Intelligence
and Emotive Cues**

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Angela N. Fellner

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Committee Chair:
Gerald Matthews, Ph.D.

ABSTRACT

Emotional intelligence (EI) is the presumed ability to successfully understand and manage emotion. EI may affect the ability of security personnel to gauge the relevance of emotional cues in determining whether a suspect is a terrorist. 180 participants decided whether “virtual reality” animated characters were to be designated as terrorists, in a discrimination-learning paradigm. Three types of identifying cue (positive or negative facial emotion, and an emotion-neutral cue) were manipulated, and the number of errors was recorded, over 100 trials. EI, personality, and general cognitive ability were assessed pre-task. Subjective state was assessed pre- and post-task. Results showed faster learning with emotive cues. EI and personality failed to predict performance; but EI predicted subjective state, which predicted rate of learning with emotive cues. Practical techniques for support of security personnel should focus on how subjective states may impact attention to potentially relevant cues to the status of a suspect.

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CHAPTER 1

Introduction

Definition of Emotional Intelligence

Emotional intelligence (EI) is the presumed ability to successfully understand and manage emotion in oneself and others. It implies skills for emotional awareness, interpersonal sensitivity, mood regulation, and managing the outcome of emotional encounters (Mayer, DiPaolo & Salovey, 1990). However, although various tests and scales for EI have been developed, its validity as a predictor of human performance is uncertain. This thesis represents an attempt to validate EI as a predictor of an objective index of learning to process emotional cues in a discrimination task. Specifically, it investigates whether high EI may facilitate learning to use facial emotion as a means for discriminating “terrorists” from “non-terrorists”.

I will open this thesis with an account of EI as it has become known through the popular press. Included are synopses of a number of applications pertaining to interpersonal, workplace, and health care settings. I will then present the scientific conceptualization of EI, focusing on its theoretical foundations and implications. I will also describe the four-branch conceptualization of EI set forth by Mayer and Salovey (1997), summarizing the branches and their implied abilities. Next, I will explain the measurement strategies that have been developed to assess EI, concentrating on several different questionnaire measures. After that, I will consider a contrary opinion that has been advanced by critics of EI, focusing on their call for objective assessment methods. Then, I will discuss EI with respect to the body of research on facial expressions of emotion, and I will describe national security settings in which identifying facial expressions may be important. Finally, I will suggest a possible mechanism for the apparent intuition attributed to highly emotionally intelligent individuals, and review a supporting body of research.

Emotional Intelligence in the Popular Press

Emotional intelligence (EI) emerged in popular psychology as a result of Daniel Goleman's (1995) book, *Emotional Intelligence: Why it can matter more than IQ*. In it, Goleman attributes to EI the abilities of self-control, persistence, and self-motivation, as well as the ability to control emotional impulses, to discern the innermost feelings of others, and to navigate personal relationships smoothly. He then applies these ideas to different facets of intra- and interpersonal interactions. For instance, with respect to marital relationships, Goleman asserts that from the earliest stages of life, girls and boys inhabit separate emotional worlds while growing up. In general, girls receive more information about, and experience of, emotions from their parents than boys. Thus reared from childhood through adolescence and young adulthood, women enter marriage much more emotionally competent than men.

Another area to which Goleman (1995) applies EI is the workplace, especially alluding to the prevalence of increasing globalization in many industries. He asserts that the improvement in worker performance and expertise, the increase in collaboration within and among work teams, and the heightened effectiveness of management decision-making and motivation brought about by EI can add considerable value leading directly to a more profitable bottom line.

A third venue in which Goleman (1995) advocates for EI is that of medical care for patients undergoing diagnosis and treatment for serious disease. He argues that in the current environment of managed health care, the emotional condition of patients is at risk for careless neglect, or worse, callous disregard. Consequently, he believes that in conjunction with treatment for physical disease, patients should also receive assistance in managing their emotional condition. This effort could include active attention to answering patients' questions; promptly

providing them with detailed information about their disease, which can be obtained easily from medical databases; and training patients in relaxation techniques. Goleman asserts that use of these techniques can be a form of disease prevention. Furthermore, he states that in some cases in which these approaches were used, patients have been released from the hospital two to three days earlier than might have been expected without them, thus leading to substantial savings in health care costs.

This diverse set of situations unarguably represents practical and worthwhile applications for EI. Inherent in the conception encompassing these scenarios are a number of self-control, self-motivation, and personal relationship abilities, which Goleman (1995, 1998) attributed to EI. Goleman's identification of EI as a key set of competencies for personal and social success triggered a succession of popular books focusing on the importance of EI in business and personal development. While these popular works have been widely influential, they are not rigorous works of science; Goleman has not provided empirical support for his broad model of EI. I now turn to research that aims to provide a more scientific basis for conceptualizing EI, and will present research findings that represent the best work in that area.

Scientific Conceptualization of Emotional Intelligence

A theoretical presentation of EI by Salovey and Mayer (1990) appeared almost concurrently with an article reporting the first empirical study on EI (see Mayer et al., 1990). In fact, each publication cites the other several times. These authors assert that the concept of EI draws from research on emotion as well as that of intelligence. With respect to emotion they point out that it has been considered by many philosophers and scientists since antiquity, and that

opinions have varied widely. Some characterized emotion as disruptive of mental activities, and therefore an affliction that must be controlled. Others viewed it as an adaptive tool which afforded effective action on the environment arising from focused mental activity. Salovey and Mayer adopt a view that emotions are an organized, multi-system, psychological response to some internal or external event that the individual perceives as positive or negative. They conceive emotions as being related to mood, though they are more intense and of shorter duration than moods. In addition, as an adaptive response, they have the potential to greatly enhance intra- and interpersonal interactions.

With respect to intelligence, Salovey and Mayer (1990) likewise point out that a wide variety of philosophers and scholars have defined it differently over the millennia. They credit Wechsler (1958) as having the most frequently cited definition: “intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment”. They further assert that this broadly encompassing definition captures the essence of the collective belief about what intelligence is, thus including verbal, visuospatial and social intelligences as conceptualized by E. L. Thorndike (1920); Gardner’s (1983) concept of multiple intelligences; and Sternberg, Conway, Ketron, and Bernstein’s (1981) notion of everyday vs. academic intelligence.

Salovey and Mayer (1990) go on to point out an important difference between intelligence and *models of intelligence*. Whereas the construct intelligence describes a comprehensive set of abilities exhibited by individuals, the models of intelligence paradigm involves a grouping of mental abilities into categories that may share little or no variance with respect to how much of a particular intelligence an individual possesses. For example, an individual might be very high in verbal intelligence and only mediocre in visuospatial

intelligence. Importantly, the criteria for any of the intelligences encompassed by this paradigm indeed fulfill the conceptual definitions of intelligences as advanced by theoreticians like Wechsler (1958).

In 1997, Mayer and Salovey presented a clarifying modification of the concept of EI, stemming from the diverse manner in which the popular media (Gibbs, 1995; Goleman, 1995) as well as psychological researchers (cf. Emmons & Colby, 1995) were interpreting and applying it. To define the general scope and origin of EI, Mayer and Salovey decompose the term to its constituents, *emotion* and *intelligence*, and place these two constructs under an overarching construct of *mind*. They describe the three long-recognized divisions of mind—cognition, affect, and motivation—and place intelligence and emotion in the spheres of cognition and affect, respectively. They are careful to mention that links between cognition and affect do not necessarily imply emotional intelligence: mood congruent behavior may be beneficial or detrimental (Mayer, Gaschke, Braverman, & Evans, 1992). EI is being exhibited when emotions are used to guide behavior constructively, leading to more successful outcomes. For example, while it is usually inadvisable to act aggressively as a result of anger, there may be times when antagonistic behavior is necessary in order to bring about a desired impact.

Mayer and Salovey (1997) assert that research into EI should concern enhanced emotional or mental capabilities, rather than simply referring to motivational abilities (cf. Goleman, 1995). Consequently, their slightly abbreviated definition conceives EI as, “the ability to perceive accurately, and express emotion, the ability to access and/or generate feelings when they facilitate thought, the ability to understand emotion and emotional knowledge, and the ability to regulate emotions to promote emotional and intellectual growth” (p. 10). This revised

interpretation encompasses the notions that emotion affords more intelligent thinking, and that emotions are considered in an intelligent manner, thus uniting intelligence and emotion.

In order for it to be considered a new type of intelligence, Mayer and Salovey (1997) assert that measures of EI should yield low to moderate correlations with other, more securely established, intelligences. This would imply that the new construct could yield some incremental information about an individual with respect to older constructs. Inordinately high correlations would indicate that the construct is not really distinct from other intelligences, while extremely low correlations would suggest that it is not an intelligence at all.

Similarly, Mayer and Salovey (1997) argue that it should be possible to differentiate EI from traits and talents, which involve an individual's typical demeanor and nonintellectual skills. Indeed, they propose that over and above traits like amiability, dependability, and kindness, abilities such as ascertaining another person's feelings might exist. Those skills might entail substantial mental deliberation, and could therefore be deemed an intelligence. Hence, this particular cognitive skill could reasonably be called "emotional intelligence".

Besides relating EI to intelligence research, Mayer and Salovey (1997) express the importance of relating it to research on emotion. Contrary to the view that extreme emotions always detrimentally interfere with rational thought, they believe that these interruptions can act as a focusing agent, targeting potentially meaningful information. According to this view, all kinds of emotions could promote rational thought rather than preventing it.

Working under the assumption that emotions impart information about an individual's relationships with the world, Mayer and Salovey (1997) assume that some generalizations and principles of emotion can be used to recognize and reason with feelings, thereby extending emotional reasoning into the realm of relationships. An illustration of this assertion is that a

compliment to a colleague might elicit complaisance in a grateful recipient, or smugness in a skeptical one. Being able to differentiate between these two responses involves some type of intelligence.

This conceptualization of EI dictates that, at least in some cases, there are responses to feelings, which are objectively accepted as appropriate. However, there are other instances in which a consideration of personal history, group practices, and cultural customs is necessary in order to recognize appropriate emotional reactions to situations. For example, Mayer and Salovey (1997) assert that shouting at another individual does not necessarily denote hatred. In the context of a close friendship, it might simply demonstrate temporary frustration. In fact, comprehensive appreciation of one's own social and cultural context can greatly facilitate the logically consistent assessment of certain emotional reactions. This involves emotional intelligence.

Four-Branch Conceptualization of Emotional Intelligence

This revised conceptualization of EI, which adds a dimension of thinking about feelings, implies a hierarchy of ability levels, ranging from simple to complex, as well as a progression through increasingly sophisticated levels of EI development that is described by the “four-branch” model (Mayer & Salovey, 1997). At the base of this hierarchy is the first branch, referring to the perception, appraisal, and expression of emotion. Early in development, normally-developing children are able to distinguish emotions in their own physical states, thoughts, and feelings. Building on this, they learn to attribute feelings to other people, and also other objects, by evaluating sounds, language, and behavior. Soon, they become skilled at

accurately expressing their emotions, and communicating their accompanying needs. Finally, they gain the ability to differentiate true and honest emotional expressions from artificial or deceitful ones.

The second branch of the EI hierarchy involves emotional facilitation of thinking. Early in development, this branch is characterized by using emotions to focus thoughts on information that is essential to the situation of interest. As individuals progress through this branch of the hierarchy, they can begin to engender emotions that will be useful in fully comprehending a certain situation, and thereby lead to more effectual decisions. As they advance through this stage of EI development, individuals begin to realize that manipulating their moods can help them to consider various perspectives, and they may intentionally change their mood in order to facilitate a variety of reasoning modes.

The third branch in the EI hierarchy entails understanding and analyzing emotions, and using emotional knowledge. Children begin to label and categorize emotions not long after they begin to identify them. For instance, they become aware of varying degrees of intensity in emotions such as affection and discontent. This ability is facilitated by experiencing how different situations and relationships produce the various degrees of emotions. Eventually, people come to understand complex or conflicted feelings, as well as feeling blends like awe. This culminates in the ability to evaluate the progressions of emotion, a skill which, with respect to interpersonal interactions, is essential for emotional intelligence.

The fourth branch in the EI hierarchy involves consciously regulating emotions in order to improve emotional and intellectual achievement. This facet of EI requires being open to emotions, be they pleasurable or objectionable, as a precursor to disentangling emotions from behavior when they might lead to detrimental outcomes. As individuals develop, they begin to

reflect upon their moods and emotions, rather than simply experiencing them. This meta-experience can be divided into two components. Meta-evaluation involves paying attention to one's mood and being mindful of its appropriateness to the situation at hand. Meta-regulation involves attenuating negative emotions and cultivating positive ones while preserving the integrity of the information they communicate.

Having discussed EI as a concept that implies a set of skills, Mayer and Salovey (1997) raise the question whether emotional achievement and emotional competence can be said to exist as analogous to academic achievement and academic competence, which relate to academic intelligence. They posit that, theoretically at least, it is sensible to develop these ideas because they offer a concrete, yet flexible method by which to evaluate emotional abilities.

In the next section I will describe various strategies that have been developed to measure EI. I will begin by describing two related, though distinct, constructs. Then, I will present a description of the different models of EI and their consequent measurement approaches.

Measurement of Emotional Intelligence

The Mayer and Salovey (1997) account of EI refers to various personal characteristics that are challenging to measure. In fact, strategies for assessment of EI have been influenced by attempts to measure various constructs that can be said to be precursors to EI. I will briefly review the measurement of two of the best-known precursors – social intelligence and alexithymia – before surveying measurement models for EI itself.

Precursors to Emotional Intelligence

Social intelligence. Especially relevant to the conceptual development of EI is social intelligence, which has long been considered as distinct from other forms of ability. E. L. Thorndike (1920) conceived social intelligence as the capacity to recognize the internal states, intentions and actions of oneself and others, and to use that information to formulate one's own behavior. Demonstrating that social intelligence was independent from other types of intelligence was difficult because of its overlap with other abilities. For instance, Wechsler (1958) asserted that some verbal intelligence items were inextricably linked not only to social knowledge but also morality. R. L. Thorndike and Stein (1937) suggested that incorporating scales less dependent on verbal abilities might ultimately lead to a valid and reliable measure of social intelligence. Salovey and Mayer (1990) note a contemporary renewal of interest in defining and operationalizing social intelligence (cf. Ford, 1982; Sternberg et al., 1981; Sternberg & Smith, 1985). Cantor and Kihlstrom (1985; 1987) viewed social intelligence as a useful paradigm within which to comprehend personality, and Epstein and Meier (1989) believed that effectively adapting to the environment was a central component of personality; hence, engaging in flexible thinking would afford more success in life (Epstein & Feist, 1988). However, there is still no generally-accepted test for the construct, which contrasts with the status of EI assessment. Perhaps effort with respect to the latter construct has been more successful because of the focus on observable behavior of emotion in others as opposed to relying on inference of their internal states.

Alexithymia. Alexithymia is a psychiatric condition characterized by an inability to appraise and verbally express emotions. As such, it should be negatively related to the emotion perception and expression facets of EI. Apfel and Sifneos (1979) summarized the clinical understanding of alexithymia, and described various questionnaire assessment measures. The Beth Israel Hospital Psychosomatic Questionnaire was the first measure to assess emotional expressiveness. It presented patients with descriptions of a number of brief emotion-inducing situations about which they were to give an open-ended response (Sifneos, 1973). Alexithymic patients were found to respond in a manner lacking emotion, whereas normal subjects expressed an appropriate emotion (e.g., terror with respect to a life-threatening situation). Unfortunately, because it was a subjectively-scored measure, its reliability was low (Taylor, 1984), as was the case with several other projective measures of alexithymia (Apfel & Sifneos, 1979; Cohen, Auld, Demers, & Catchlove, 1985; Defourny, Hubin, & Luminet, 1976/1977; Vogt, Burckstummer, Ernst, Meyer, & von Rad, 1977). Current scales designed to assess emotional expressiveness include the State Meta-Mood Scales (SMMS; Mayer & Gaschke, 1988), the Trait Meta-Mood Scales (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) and the Toronto Alexithymia Scale (TAS; Bagby, Taylor, & Ryan, 1986; Taylor, Ryan, & Bagby, 1985). These differ methodologically from the Beth Israel scale in that they measure specific attitudes regarding emotions.

Salovey and Mayer (1990) posit that alexithymia research has targeted negative emotions to the exclusion of positive, mixed, and neutral emotions and states. Hence, it may be that alexithymia could pertain to a wider variety of feelings, and might be more accurately conceptualized as a multi-dimensional construct consisting of feeling/thought and defensiveness/openness aspects (Mayer, Salovey, Gomberg-Kaufman, & Blainey, 1991).

Furthermore, research on alexithymia demonstrates that valid assessment of emotional competencies may be possible using questionnaires rather than the objective tests conventionally used to assess abilities. In the next section, I will introduce three different models for assessment of EI. After that, I will discuss each of these three models, and discuss in detail an EI measure typical of the kind used under each model.

Models for Assessment

Approaches to the assessment of EI are nearly as varied as the collection of researchers investigating it. EI can be measured by different methods depending in large part upon the model of EI that is adopted by the authors of the assessment instrument. Mayer, Salovey, and Caruso (2000b) identify two competing models of EI that have gained ascendancy: *mental ability models* and *mixed models* of EI, while Petrides and Furnham (2001) identify a third, *trait EI*. Those who conceive EI as a mental ability that consists in cognitive processing of emotional information believe that it should be measured by maximal performance tests (cf. Mayer & Salovey, 1997). Those who consider EI to be a facet of personality assert that it can be assessed by questionnaire measures based on self-reports of typical social-emotional functioning (cf. Bar-On, 1997; Petrides & Furnham, 2001; Schutte et al., 1998).

Mental ability models. Mental ability models of EI concentrate on emotions and how they interact with cognitions (cf. Mayer & Salovey, 1997; Salovey & Mayer, 1990). They also focus on the individual's ability to manage the situations encountered throughout life more effectively (Mayer et al., 2000b). Furthermore, according to this conceptualization, as a discrete intelligence,

EI will meet three empirical criteria: (a) mental problems will have correct or incorrect answers, as demonstrated by convergence of scores on alternative assessment instruments; (b) the measured skills will relate to other mental abilities, and also with self-reported empathy; and (c) the absolute level of skill will increase with age. Abilities typical to mental ability models of EI include perception and expression of emotion, facilitating emotion in thought, and regulating emotion.

Mayer and Salovey's (1997) four-branch model of EI served as the basis for two performance-based assessment instruments for EI: the Multifactor Emotional Intelligence Scale (MEIS; Mayer, Caruso, & Salovey, 1999), and the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002). Both of these tests consist of four sections, each of which corresponds to one of the four branches: (1) perceiving emotion, (2) using emotion to aid in thought processes, (3) understanding emotions, and (4) managing emotions. Notably, the items contained in these measures have objectively-defined correct and incorrect answers. As such, they constitute objective tests, and can validly be used to substantiate or deny the presence of a particular ability.

The MEIS contains 12 subscales, and scoring is based upon a combination of consensual, expert, and target methods. In consensual scoring, the individual's answer on each item is scored on the basis of the proportion of the participant group who answered that item in the same manner. For instance, if .75 of the participant group responded that happiness was "definitely present" in a particular item, an individual who responded "definitely present" would receive .75 for that item. In expert scoring, experts are first identified, and they complete the test, choosing the best alternative for each item based upon their expert knowledge of the construct. Participants' responses are scored "1" if they agree with the experts' response or "0" if they

differ. Target scoring involves scoring items according to information obtained from the individual whose behavior is being judged (the target). This latter method is not widely used.

Overall, the MEIS is reliable, distinctive, and related to some important life outcomes (Matthews, Zeidner, & Roberts, 2002). However, it suffers from several weaknesses, including the long duration of administration time; low reliabilities on some subscales; limited empirical support of the four-branch model; problematic scoring, even though it purports to be an objective test; and uncertainty as to whether it measures EI, or just individual differences in emotionality.

The MSCEIT ([Version 1.1] Mayer, Salovey, & Caruso, 2000a; [Version 2.0] Mayer, Caruso, & Salovey, 2000) was modeled as a refinement of the MEIS. Each subsequent version trimmed the number of items from its predecessor in order to shorten the test, but both retained the 12 subscales based on the four-branch hierarchy of EI. Expert scoring on Version 2.0 is based on judgments of 21 members from the International Society of Research on Emotions (ISRE), rather than two of the test authors, as had been the case with the earlier measures. Matthews, Zeidner, et al. (2002) report that the mean reliabilities for scales declined from .77 for the MEIS to .71 for the MSCEIT, which is problematic. Finally, the authors did not present a comparison of Version 2.0 and Version 1.1, which would have provided evidence of construct validity, and confirmed that Version 2.0 was measuring the same construct. Overall, the MSCEIT improves some of the psychometric properties over the MEIS, but some of the above-mentioned weaknesses remain.

Mixed models. Mixed models of EI offer a broader conceptualization of the construct as they include non-cognitive traits, such as personality variables, which purportedly promote life success. Consequently, in addition to mental abilities like perception and expression of emotion,

mixed models of EI also incorporate such attributes as self-regard, impulse control, handling relationships, and motivating oneself (cf. Bar-On, 1997; Goleman, 1995). A typical questionnaire, the Emotional Quotient Inventory (EQ-i; Bar-On, 1997) is a 133-item self-report measure containing five second-order factors which are comprised of 15 subscales. These include (a) intrapersonal EQ, which consists of assertiveness, emotional self-awareness, independence, self-actualization, and self-regard; (b) interpersonal EQ, which consists of empathy, relationship skills, and social responsibility; (c) adaptability, which consists of flexibility, problem solving, and reality testing; (d) stress management, which consists of impulse control and stress tolerance; and (e) general mood, which consists of happiness and optimism. This instrument has emerged as a prototypical assessment tool for mixed-model conceptualizations of EI.

Trait EI. As defined by Petrides and Furnham (2001), trait EI should be differentiated from ability models of EI as a separate and distinct construct. According to their conceptualization, trait EI consists of an array of traits, behavioral dispositions, and self-perceived abilities, as opposed to the cognitive-emotional abilities attributed to ability models of EI. Hence, they believe that trait EI is most appropriately investigated within the domain of personality, whereas ability models of EI fit most suitably in the realm of cognition. Petrides and Furnham propose a sampling domain for trait EI, which includes characteristics such as assertiveness, relationship skills, and trait optimism. In the next section I will introduce several leading questionnaire measures of EI, which are appropriate to assessing trait EI, and review evidence of reliability and validity for each.

Questionnaire Measures of Emotional Intelligence

SEIS. The first questionnaire measure of EI to be considered here is the Schutte Emotional Intelligence Scale (SEIS; Schutte et al., 1998), which is based on Salovey and Mayer's (1990) comprehensive theoretical model of emotional intelligence. In contrast to Bar-On's (1997) lengthy EQ-i, Schutte et al. identified a need for an abbreviated measure of EI, which succinctly encompassed the full range of characteristics attributed to EI. As such, this instrument consists of 33 items on which individuals rate themselves on a five-point response scale. The items in the scale can be divided into three subscales: appraisal and expression of emotion in oneself and others (13 items), regulation of emotion in oneself and others (10 items), and using emotions to solve problems (10 items).

Schutte and her colleagues (1998) conducted a series of validation studies. Their findings indicated significant positive correlations with other conceptually related constructs such as alexithymia (Toronto Alexithymia Scale, TAS; Taylor et al., 1985); attention to emotion, clarity of emotion, and mood repair, the degree to which an individual can extend positive moods or abbreviate negative ones (Trait Meta-Mood Scale, TMMS; Salovey et al., 1995); and optimism (Life Orientation Test, LOT; Marshall, Wortman, Kusulas, Hervig, & Vickers, 1992; Scheier & Carver, 1985). Conversely, they reported negative relationships with pessimism (measured by the LOT), depression (Zung Self-Rating Scale, ZSRS; Zung, 1965), and impulsivity (Barratt Impulsivity Scale, BIS; Patton, Stanford, & Barratt, 1995). Internal consistency, as indexed by a Cronbach's alpha of .87 was obtained in a sample of 32 participants. A test-retest reliability coefficient of .78 was reported, based on a sample of 28 participants who completed the scale at two-week intervals. Predictive validity was demonstrated by comparing the SEIS scores of 64

incoming college freshmen with their end-of-year cumulative grade point averages. It was found that SEIS scores significantly predicted the students' year-end GPAs. Discriminant validity was reported with respect to cognitive ability, and also to the Big Five personality traits (Openness [O], Conscientiousness [C], Extraversion [E], Agreeableness [A], Neuroticism [N], NEO PI-R; Costa & McCrae, 1992). For 42 college freshmen, SEIS scores were not significantly related to their pre-admission SAT scores.

Brackett and Mayer (2003) conducted independent validity studies on a number of prevalent EI measures, which included the SEIS. Brackett and Mayer were satisfied with the test-retest reliability of the SEIS as reported by Schutte et al. (1998), but were more critical of its discriminant validity. First, in multiple regression analyses which used the Big Five personality traits and psychological well-being (PWB; Ryff, 1989) scales as predictors, the SEIS was shown to share substantial variance with extraversion, openness, and agreeableness, as well as five of six scales of the PWB. In addition, a principal axis factor analysis with an oblique rotation confirmed this pattern of associations. These findings led Brackett and Mayer to conclude that it was difficult to distinguish EI from personality and well-being based on SEIS scores. Finally, the SEIS showed negligible predictive and incremental validity with respect to the "behavioral life space criteria" (p. 1154) examined by Brackett and Mayer. One anomaly with respect to incremental validity was the emergence of an inverse relationship between the SEIS and academic achievement when the Big Five and verbal SAT scores were controlled for, contrary to the relationship reported by Schutte et al.

A validity study of the SEIS as a trait EI measure was also undertaken by Saklofske, Austin, and Minski (2003), who correlated scores on the SEIS with a number of self-report measures of affect and personality that were believed to be reflective of social-emotional

functioning. These measures included the Toronto Alexithymia Scale (TAS; Taylor et al., 1985), the Temporal Satisfaction with Life Scale (TSWLS; Pavot, Diener, & Suh, 1998), the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999), the Short Form of the Social and Emotional Loneliness Scale for Adults (SELSA-S; Ditommaso & Brannen-McNulty, 1999), the Depression Proneness Rating Scale (DPRS; Zemore & Bretell, 1983), the Short Form XI of the Marlow-Crowne Social Desirability Scale (MCSDS-XI; Strahan & Gerbasi, 1972), and the NEO Five Factor Inventory: Form S (NEO-FFI; Costa & McCrae, 1988). Some of the participants in this study also completed the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). In accord with their prediction, Saklofske et al. found that SEIS scores were not significantly related to total WASI scores, or with the verbal and performance subscales, thus confirming the ability of the SEIS to distinguish between trait EI and psychometric intelligence. Also, in agreement with other studies of EI and personality (e.g., Dawda & Hart, 2000; Petrides & Furnham, 2003), SEIS scores correlated significantly, and in the expected directions, with all of the Big Five personality traits (i.e., positively with O, C, E, and A; and negatively with N), and alexithymia (TAS). In addition, SEIS scores correlated positively with the MCSDS-XI, SHS, and TSWLS scales; and negatively with SELSA and DPRS; all as predicted. Furthermore, partial correlations of the SEIS with all of these scales, except the MCSDS-XI, remained significant when the Big Five were controlled for. This pattern of correlations strongly indicates that trait EI provides incremental predictive power for explaining these outcomes over and above that which can be attributed to personality characteristics, although the additional variance explained by trait EI was modest.

TMMS. Another self-report measure of EI, the Trait Meta-Mood Scale (TMMS), was developed by Salovey et al. (1995). This is a 30-item instrument consisting of three scales. Attention to Feelings assesses the amount of attention that individuals pay to their feelings; Clarity of Feelings measures the degree of clarity they experience as to their feelings; and Mood Repair assesses what they believe about extending positive moods or curtailing negative ones. It is intended to help in identifying fundamental individual differences in reasonably stable characteristics that may be inherent in emotionally intelligent individuals who are able to acknowledge their feelings to themselves and convey them to others.

Salovey et al. (1995) report convergent and discriminant validity with respect to other measures of mood and mood regulation. In a study involving 86 undergraduates, they found that the Attention to Feelings scale was related to Fenigstein, Scheier, and Buss's (1975) Self-Consciousness Scale (SCS), which assesses public and private self-consciousness. Individuals who paid attention to their feelings also attended somewhat to other facets of their conscious experience. In addition, Clarity of Feelings was negatively related to the Ambivalence Over Emotional Expressiveness Questionnaire (AEQ; King & Emmons, 1990), which evaluates an individual's dissatisfaction with the ability to express emotion; and also with the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). Individuals who experience their feelings clearly tend to experience less ambivalence over the amount and quality of the feelings they display to others, and are less likely to be depressed. Finally, Mood Repair correlated negatively with the CES-D; and positively with the Life Orientation Test (LOT; Scheier & Carver, 1985), which measures optimism; and the Expectancies for Negative Mood Regulation (NMR; Catanzaro & Mearns, 1990), which assesses beliefs about negative mood regulation.

Additional validation evidence is provided in a cross-cultural study conducted by Ghorbani, Bing, Watson, Davison, and Mack (2002). While this study involved 220 American and 231 Iranian university students, the present analysis will deal only with results from the American participants. These researchers view the three scales of the TMMS as a conceptually meaningful operationalization of an information-processing system whereby inputs (attention to emotions) lead to cognitive processes (clarity of emotions) that ultimately generate outputs (repair of emotions). Ghorbani et al. found that, in accordance with expectations, all three TMMS scales correlated with enhanced self-esteem as measured by Rosenberg's (1965) 10-item Guttman scale. They were also related to decreased levels of depression as measured by Costello and Comrey's (1967) depression and anxiety scales; and exhibited the anticipated negative associations with all three TAS factors (EOT: Externally Oriented Thinking, DIF: Difficulty Identifying Feelings, DDF: Difficulty Describing Feelings; Taylor et al., 1985). The TMMS Clarity and Repair scales predicted lower anxiety on Costello and Comrey's depression and anxiety scales; and lower perceived stress on Cohen, Kamarck, and Mermelstein's (1983) Perceived Stress Scale (PSS). These associations clearly mirror those reported by Salovey et al. (1995).

TEIQue. A third self-report questionnaire of trait EI is the Trait Emotional Intelligence Questionnaire (TEIQue; Petrides, Pérez, & Furnham, 2003). This 144-item measure consists of 15 subscales including Adaptability, Assertiveness, Emotion Expression, Emotion Management (others), Emotion Perception, Emotion Regulation, Empathy, Happiness, Impulsiveness (low), Optimism, Relationship Skills, Self-Esteem, Self-Motivation, Social Competence, and Stress Management. Petrides and Furnham (2003) assert that the items in this questionnaire provide

comprehensive treatment of the sampling domain of EI, by incorporating various facets identified by earlier EI researchers (cf. Bar-On, 1997; Goleman, 1995; Salovey & Mayer, 1990)

Petrides and Furnham (2003) argue for construct validity of trait EI based on the results of two studies they conducted. In the first study, they found that high trait EI individuals were able to identify six universally recognized facial expressions of emotion (happiness, sadness, anger, fear, surprise, and disgust; Ekman & Friesen, 1975) more quickly and more accurately than low trait EI individuals. In the second study, participants rated as being high in trait EI, as measured with the TEIQue, were found to be more sensitive to mood induction, as measured by the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1992), even when the effect of the Big Five personality traits (NEO PI-R; Costa & McCrae, 1992) had been partialled out. Validation studies such as this, and the others cited above, are accepted by many EI researchers as robust evidence that EI is a new construct that offers incremental information about individuals that is not obtained from other measures of general intelligence and personality. However, those who view EI as a mental ability (cf. Matthews, Zeidner, et al., 2002; Mayer & Salovey, 1997) consequently demand a more rigorous method of substantiation. I now turn to a description of those alternative views and requirements.

Contrary Opinion Regarding Emotional Intelligence

Although there is some promising evidence supporting validity of scales for EI, the construct is still a new one, and its value in research is still being debated. Critics of EI (cf. Matthews, Zeidner, et al., 2002) express reservations as to whether EI is actually a new construct, or simply a newly organized conceptualization of existing constructs of intelligence

and personality. In order to build a sound empirical case for EI, Matthews, Zeidner, et al. argue for an operationalization of EI that would demand the same type of psychometric validation as has been required for other psychological constructs in the past, namely reliability, content validity, predictive validity, and construct validity, which entails both convergent and discriminant validity. They are skeptical as to whether the foregoing evidence is rigorous enough to achieve this goal. They emphasize the need for tests that differentiate individuals at all levels of EI, from the emotionally sophisticated to the emotionally deficient, as well as discriminating differing abilities in the mid-ranges, thus following a normal distribution as demonstrated for other constructs. Developing psychometrically sound EI measures is particularly problematic because of the difficulty of designing suitable test items, and the potential confounds relating to scoring. With respect to the suitability of test items, for performance-based tests, the “correct” answer to a test item may differ depending on whether consensus or expert judgment was used in its determination. With respect to scoring, self-report questionnaires are susceptible to response bias. Consequently, Matthews, Zeidner, et al. insist on the need to be firmly guided by theoretical conceptualization when creating items, deciding on scoring tactics, and distinguishing EI from other facets of individual differences.

In discussing the measurement of EI, Matthews, Zeidner, et al. (2002) review a number of EI measures in both the performance-based and self-report category. Performance-based measures include the MEIS (Mayer et al., 1999) and the MSCEIT (Mayer et al., 2002), both of which have been critiqued above. Various self-report measures of EI are included in their review. I will use, as an example, one of the more widely-used instruments, the Emotional Quotient Inventory (EQ-i; Bar-On, 1997).

The EQ-i consists of 15 subscales and five higher-order dimensions, as well as four validity indicators for social desirability (Bar-On, 1997). Researchers independent of the test author have replicated its internal consistency and test-retest reliability, but factor analytic findings have been mixed. One solution yielded 10 factors instead of 15, and another, conducted by Matthews, Zeidner, et al. (2002), produced a three-factor solution consisting of self-esteem (11 scales), empathy (3 scales), and impulse control (1 scale). In addition, a lot of validity data are presented by the author, but without demonstrating that the EQ-i retains predictive power over and above personality. Furthermore, the measure has a near-zero correlation with IQ, and an independent validation study revealed no predictive ability for academic achievement or cognitive ability. Finally, the EQ-i correlates highly with the Big Five personality factors (Dawda & Hart, 2000), a fact that, combined with the foregoing analyses, suggests that the measure might be nothing more than another personality measure.

The Bar-On (1997) scale exemplifies the problems that may arise when seeking to assess personality by questionnaire: poorly defined factorial structure, a high degree of overlap with conventional personality dimensions, and lack of evidence indicating that the scale measures a true ability or set of competencies. Furthermore, at a conceptual level, the questionnaire appears principally to be a reformulation of the Big Five personality traits, mixed in with other constructs such as leadership and achievement orientation, which appear in the social psychological and motivational literatures. A multitude of other questionnaire scales have been developed subsequently, which are open to some of the same criticisms (see Matthews, Zeidner, et al., 2002). However, some of the scales, including the SEIS, TEIQue, and TMMS, have shown incremental validity over personality as predictors of outcome criteria related to social-emotional

functioning, as described above. Thus, it would be premature to reject the potential utility of questionnaire methods for investigating EI.

The majority of the validation studies rely upon other self-report questionnaire measures for criteria such as psychological well-being, alexithymia, and satisfaction with life (cf. Brackett & Mayer, 2003; Saklofske et al., 2003). There is, therefore, a concern that criterion validity for EI scales is elevated by common method variance (i.e., the use of questionnaires to assess both the predictor and the criterion), or even overlap in content of the items used to assess EI and the outcome criteria. Unfortunately, there is currently a lack of validation studies comparing levels of EI against objective behavioral data. Robust evidence showing that EI measures offer additional information about individuals that is incremental to what can be obtained using existing personality measures demands that experimental studies be conducted in which objective performance-based data are collected. The study I will report contains such a task, based on processing facial expression of emotions, and will examine the degree to which three of the most widely-used self-report EI measures (SEIS, TMMS, TEIQue) predict performance on this task.

Emotional Intelligence and Facial Expression of Emotion

Emotional intelligence might be linked to the facial expression of emotion for three reasons. First, as discussed above, according to the four-branch hierarchical model (Mayer & Salovey, 1997), as well as other conceptualizations of EI (cf. Petrides & Furnham, 2001; Schutte et al., 1998), the expression and recognition of emotion is central to EI. Both ability-model and trait-model adherents agree that EI involves the ability to perceive and evaluate emotions.

Moreover, a well-established empirical finding is the universality of recognition of the six basic emotions (happiness, sadness, anger, fear, surprise, and disgust; Ekman & Friesen, 1975; cf. Ekman, 1980, 1999; Ekman et al., 1987). For instance, individuals in cultures around the world consider smiling people to be happy. This finding clearly demonstrates that facial expressions are central to emotions. As with other psychological constructs, individuals may differ in how accurately they can pick up on facial emotion as an important source of information.

The second reason why EI may be associated with the facial expression of emotion is that facial expressions constitute overt, observable behavior. Thus, studies of the facial expression of emotion may provide the desired objective performance criteria required to augment the validity studies of the self-report questionnaire measures reviewed above. In the work of Mayer and Salovey (1997; Mayer et al., 1990), the recognition of facial emotions has been developed into a formal test for emotion perception. Direct assessment of EI has been investigated through identification of facial expressions of emotion in studies using the Multifactor Emotional Intelligence Scale (MEIS; Mayer et al., 1999), and the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT (Version 2.0); Mayer et al., 2002). Each of these measures contains items expressly designed to objectively assess the four abilities specified in Mayer and Salovey's (1997) four-branch conceptualization, one of which is whether individuals can accurately identify emotions in facial expressions. In the MEIS, for instance, 48 of its 186 items display six different facial emotions (happiness, sadness, anger, fear, surprise, and disgust). The individual responds on a five-point scale to indicate the degree to which he or she believes each face expresses a given emotion. In a study involving 503 adults, Mayer et al. (1999) reported "promising" reliabilities with respect to the degree to which the participants' scores agreed with consensus and expert scoring for the identification of facial expression. The coefficients alpha

for each scoring method were .89 for consensus scoring and .74 for expert scoring. The MSCEIT facial emotion perception subtest (Mayer, Salovey, Caruso, & Sitarenios, 2003) also shows acceptable reliabilities: .80 for consensus scoring, and .82 for expert scoring.

Psychometric studies of the MEIS and MSCEIT (e.g., Mayer et al, 2003) show that scores on the facial recognition subtest correlate with subtests for the other branches (assimilating, understanding, and managing emotion), suggesting that the facial emotion recognition test may be a sign of some more general ability of EI. This finding is in concert with expectations for a test of intelligence with multiple subtests, namely that scores on different subtests should be intercorrelated, indicating a general ability expressed through various more specific abilities. Consequently, it is reasonable to argue that some general faculty of EI is operating, rather than simply a narrow ability of recognizing emotions.

The third reason why EI may be related to the facial expression of emotion is that two empirical studies indeed show that EI can predict performance on facial emotion recognition tasks. Mayer et al. (1990) conducted a study on perceiving affective content in ambiguous visual stimuli. They tested 139 adults for their ability to rate the emotional content of a variety of visual stimuli including pictures of faces, color swatches, and abstract designs. Participants rated each stimulus on a five-point scale, judging six basic emotions (happiness, sadness, anger, fear, surprise, and disgust). Participants also completed criterion measures for empathy (Questionnaire Measure of Emotional Empathy; Mehrabian & Epstein, 1972), alexithymia (Toronto Alexithymia Scale, TAS; Taylor et al., 1985), and the personality traits neuroticism and extraversion (a shortened version of the Eysenck Personality Inventory, EPI; Eysenck, 1973).

As predicted, Mayer et al. (1990) found a significant correlation between empathy and the ability to detect facial emotion. Contrary to their expectations, alexithymia correlated

positively with the range and amplitude of emotion detected in the stimuli. Likewise unexpectedly, neuroticism correlated with range and amplitude. With respect to alexithymia, Mayer et al. point out that, rather than identifying individuals who presumably have difficulty accessing emotional terminology, the TAS might instead be measuring general distress. Consequently, they deemed it more appropriate to consider the TAS results along with those of neuroticism, which according to Eysenck (1973), involves greater negative affect and wider mood swings, as indicating levels of distress. Mayer et al. conclude that, at least in part, EI consists of abilities that can be measured by tasks that can be objectively scored, such as the one they presented.

Petrides and Furnham (2003) also reported that EI was related to the ability to successfully identify the six universally recognized emotions. Petrides and Furnham selected 17 high-EI and 17 low-EI individuals from an initial sample of 85 participants who had completed a modified version of the EQ-i questionnaire. These participants represented the upper and lower 20% of the overall sample. They viewed 18 stop-frame videos of faces progressing from a neutral expression to one of the six basic emotions (three videos of each, presented in pseudo-random order). Each video consisted of 21 frames, and each frame was displayed for two seconds before progressing to the next frame. Participants were asked to identify the emotion as quickly as possible without guessing, and were allowed to change their answer as often as desired until the final frame had been viewed. Scoring was based only on the final answer. Performance data consisted of response latency in seconds, and the frame number for correct identification of the emotion. Results indicated that the high-EI participants identified the facial emotions significantly more rapidly, and required significantly fewer frames than the low-EI participants to correctly identify facial emotions. These findings, combined with those of Mayer

et al. (1990), constitute strong evidence that EI measures can predict performance on objective facial emotion processing tasks.

Practical Application for the Identification of Facial Emotion

A practical setting in which the successful identification of facial expressions of emotion might be useful is the detection of deceit. Smiles, though generally interpreted as an indicator of happiness, might also be misleading when employed by an individual who is lying (Ekman, Friesen, & O'Sullivan, 1988). However, the liar might be exposed by inadvertently leaking negative emotions, thereby revealing his or her true intention (Ekman & Friesen, 1969).

Various clues have been identified for decoding deceit in spite of the overt display of a smile. In fact, Ekman (2001) reports being able to identify more than 50 distinct types of smiles, some of which mask lies. Based on eight years of research Ekman and Friesen (1978) developed the Facial Action Coding System (FACS), which affords a comprehensive, fine-grained evaluation of facial expressions through observation of specific facial muscle movements. For instance, according to Ekman et al. (1988):

Felt happy expressions are defined as the action of the zygomatic major and orbicularis oculi, with no muscular activity associated with any of the negative emotions. Masking smiles are defined as the action of the zygomatic major muscle and muscles associated with fear (risorius, or the combination of frontalis and corrugator), disgust (levator labii superioris, alaeque nasi or levator labii superioris, caput infraorbitalis), contempt (buccinator), sadness (triangularis, or

corrugator and frontalis, pars medialis), or anger (orbicularis oris, or corrugator and levator palpebrae superioris). (p. 417)

Detection of deceit has been widely studied by forensic psychologists and law enforcement researchers (Porter, Campbell, Stapleton, & Birt, 2002). Various cues, including emotion, and nonverbal and language behaviors have been investigated (e.g., Porter & Yuille, 1995; 1996), but most people are unable to use such cues to judge deceit reliably (Ekman, O'Sullivan, & Frank, 1999). However, some law enforcement agents are quite accurate (Ekman, O'Sullivan, Friesen, & Scherer, 1991), and parole officers who received feedback and training in deceit detection showed significant improvement (Porter, Woodworth, & Birt, 2000). Although the mechanism for learning is not well understood, it appears that learning to process the relevance of multiple cues plays some role in the skill (Porter et al., 2002).

This ability might be vitally relevant to the imperative of U.S. security forces to detect terrorists, since acts of terrorism are likely to require deceitful actions. A particular case in which EI may have led to the capture of a terrorist is that of the "Millennium Bomber" (Bernton, Carter, Heath, & Neff, 2002). On December 14, 1999, Ahmed Ressam, an Islamic terrorist of Algerian descent, entered the U.S. on a ferry at Port Angeles, Washington, in a rental car transporting explosive materials. These had been destined for an attack on the Los Angeles International Airport in conjunction with a series of attacks on the U.S. intended to coincide with the millennium. Upon arrival at Port Angeles, he was detained by a customs inspector, who observed a number of behavioral cues that disturbed her. Based on her decision to take a closer look, a thorough inspection of the car was conducted, the nefarious materials hidden in the trunk of the car were discovered, and Ressam was arrested.

Although somewhat clumsy terrorists, like Ressam, may betray themselves through obvious anxiety, in other cases the cues that would reveal suspects as terrorists may be more subtle. As the work of Porter et al. (2002) on deceit suggests, security forces may need to learn those facial-emotional cues that are most diagnostic. According to models of EI (e.g., Mayer & Salovey, 1997), high-EI individuals should learn the utility of emotional cues more rapidly than those low in EI. Effective cue processing may relate to branch 2 of the Mayer and Salovey model: using emotions to facilitate thinking. Selecting security agents for this learning aptitude, and training them to process cues effectively could greatly improve national security. To date, no research has been conducted to test this hypothesis. In the next section, I will propose a possible means for the seemingly intuitive behavior credited to highly emotionally intelligent individuals.

A Probability Learning Mechanism for Emotionally Intelligent Behavior

It is often said that more emotionally intelligent individuals have an intuitive ability to assess the feelings and intentions of others (Goleman, 1995), but the basis for such intuitions has not been clearly specified or tested empirically. As detailed above, EI researchers have demonstrated empirical relationships between the construct and various criteria. Advocates of trait EI showed that while EI shared variance with the Big Five personality traits, there was incremental variance with respect to sensitivity to mood induction in the context of viewing emotionally inflammatory video segments (Petrides & Furnham, 2003). In addition, supporters of ability models of EI clearly demonstrated individual differences in performance on objective tests. Specifically, Mayer et al. (1990) reported significantly better performance for high-EI participants on tasks requiring identification of emotion in ambiguous visual stimuli.

A possible mechanism for this purported intuitive ability of emotionally intelligent individuals to process emotional information is provided by probability learning (Estes, 1976). Reber and Reber (2001) define probability learning as “learning the probabilities with which events occur,” (p. 393), and further explain that it is typically investigated in simple conditions in which each of two or three events occurs with different probabilities. The participant’s task is to predict the event that will occur on each trial. Over a number of trials, participants’ prediction frequencies come to approximate the actual probabilities of occurrence of the various events.

Estes (1976) considers probability learning in the context of the theoretical framework of cognitive models of learning and memory. In a series of experiments, he sought to determine which type of memory process supported probability learning and predictive behavior. Estes observed that when discrete events, which occur under seemingly identical conditions, produce varying results, people develop expectations of the likelihood of future outcomes based on the relative frequency with which they occurred in the past. Specifically, he wondered whether these expectations arose from the memory that a greater number of specific results had occurred, or if the antecedent events were categorized in some manner with respect to the outcomes. Consequently, he investigated predictive behavior using an observation-transfer experimental design.

Using a number of visual stimulus items, Estes (1976) presented subjects with a series of pairs of the stimuli. In each of these observation trials, he indicated to the individual which one of the pair was preferred over the other. Throughout the observation trials, elements of the pairs were designated as preferred based on a probability schedule (e.g., .62 – .38 for the pair A_1 — A_2 , meaning that A_1 would be the preferred element of that pair 62% of the time). In addition, different pairs were presented different numbers of times, thereby separating the overall

frequency of preference for any particular stimulus item from its probability of preference during the observation trials. In subsequent test trials, the same and different pairings of the stimuli were presented, and subjects were asked to predict which element of each pair would be the preferred item. As illustrated in Table 1, Estes found that subjects predicted preference for the stimulus items based on the frequency with which they had appeared in the observation trials (Columns C & D), rather than their probability of preference, even when the probability of preference for that item was lower (Column C vs. A). From these findings, Estes concluded that people make predictions based on categorical frequencies, but that due either to inadequate training or memory capacity limitations, participants often stop short of formulating a categorization that would afford optimal performance on a particular task. Nevertheless, he attributed this and other accumulated evidence (Bower, 1959; Estes, 1962, 1966) as support for his hypothesis that associative memory served as the basis for probability estimates, relative frequency judgments, and predictive behavior, all of which are encompassed in probability learning. Next, I examine a further body of research that lends support to the idea that probability learning may underlie abilities afforded by EI.

Table 1.

Illustration of probability learning outcomes

	Pair 1		Pair 2	
	A	B	C	D
Number of observation trials (300 total)	100		200	
Probability of preference in observation trials	0.75	0.25	0.50	0.50
Frequency of preference in observation trials	75	25	100	100

After Estes (1976), Figure 2.

Numerous experiments have shown that people can learn to predict outcomes that are only imperfectly correlated with predictive stimuli or *cues* (cf. Gluck, Shohamy, & Myers, 2002; Knowlton, Squire, & Gluck, 1994). Typically, such studies require individuals to predict binary outcomes such as the weather (sun or rain) or the stock market (up or down) from arbitrary cues such as geometric patterns. Gluck et al. assigned a cue probability, which defined an association with one of two outcomes (sun or rain), to each of four different cards. These four cards could be either present or absent on a particular experimental trial. From these, they developed a probability structure involving 14 different combinations of the cards, and presented these 14 different patterns to participants. Each card was assigned a probability level for the presence of rain, and each pattern contained one to three of the cue cards. Based upon conditional probabilities of each outcome and card occurring together, each pattern yielded a specific probability for the presence of rain. The overall probability of rain was .50 based on the formula: $\sum [p(\text{pattern}) \times p(\text{rain} | \text{pattern})]$. Results indicated a significant improvement in prediction over 200 trials. In the first block of 50 trials, performance was at near chance levels (~50%), but improved to over 70% optimal responding during the fourth block. Gluck et al. attributed this improved prediction to non-declarative memory processes, which comprise a part of the implicit memory system (Richardson-Klavehn & Bjork, 1988).

Further evidence that this improvement in predictive ability is, at least in part, supported by implicit learning mechanisms that are inaccessible to consciousness is provided by Evans, Clibbens, Cattani, Harris, and Dennis (2003). They conducted a series of experiments which modeled the manner by which experts acquire expertise and make judgments based upon multiple pieces of information, or *cues*, the availability and relevance of which frequently vary. This experimental paradigm, known as *multicue probability learning*, involves providing

outcome feedback to which a particular amount of noise, or random error, has been added. It is expected that participants will be able to improve the accuracy of their judgments despite the imperfect outcome feedback they receive. This paradigm is veridical because, in daily practice, the outcome feedback on which experts base their judgments is invariably tainted by some degree of noise. It is limited in that experts have previously obtained explicit knowledge of their subject from textbooks, lectures, and other such sources, throughout the course of their training.

In two experiments, Evans et al. (2003) asked participants to predict which of two job applicants would be generally more suitable, based on a number of relevant and irrelevant cues relating to either ability (Experiment 1) or personality tests (Experiment 2). Outcome feedback was imbued with a sizeable degree of noise, such that in 25% of the training trials, the relevant cues contributed to false feedback; irrelevant cues had no effect on outcome. In both experiments, participants improved significantly in their predictive ability. In a separate post-task measure designed to determine whether explicit learning had contributed to their performance, participants were asked to rate each cue as to its degree of relevance. Again, in both experiments, while explicit learning was demonstrated by moderately accurate judgments of cue relevance, explicit ratings of cue relevance correlated poorly with actual cue relevance, implying that two independent processes might have led to outcome judgments. From this, Evans et al. inferred that participants used implicit as well as explicit processes in making their judgments, and that “explicit knowledge independently influences judgments even when such knowledge is *not soundly based*” (p. 617, italics in original). They also assert that their results strongly support dual-process theories of reasoning (Sloman, 1996), and learning (Dienes & Perner, 1999), which distinguish abstract analytical, or explicit, processes from associative, or implicit, ones. Implicit

processes are usually characterized as being unavailable to consciousness and self-report (Evans et al., 2003).

These research findings carry important implications for EI. Specifically, emotionally intelligent individuals may possess an aptitude for learning how to predict the attributes and behavior of other people based on implicitly-learned emotional cues. Because the individual cannot verbalize how cues are used, this predictive ability may be characterized as “intuitive.”

Aims and Hypotheses

The current study was designed to test whether EI related to an individual’s ability to use emotional cues in decision making, in the context of learning to judge whether animated characters were designated as terrorists or not. It was believed that high EI persons might learn faster than those low in EI, when emotional cues were relevant. This study is the first of its kind to investigate EI. Thus, by contrast with some of the learning tasks previously described, the discrimination task was designed to be simple, so that cue probabilities were always 1 or 0 (i.e., the cues reliably distinguished terrorists from non-terrorists).

This study used a cognitive task to assess the ability to use emotional and non-emotional cues to make accurate decisions about target individuals. Participants viewed 3-D animated characters generated by a virtual reality program (People Putty; Haptik, 2004), whose facial expressions displayed realistic positive or negative emotions. A verbal message, which was neutral for emotional content, was spoken by the character. Both facial emotion and a non-emotive cue (the height of the crown of the character’s hat) were manipulated across trials. After each trial, the participant was required to decide whether the character was a terrorist or

not, and then feedback, indicating whether the decision was correct or not, was given. The task consisted of 100 trials, over which two independent cues were manipulated: facial expression (happy vs. sad); and the height of character's hat (tall vs. short crown). Three different conditions were constructed, each of which contained a different critical cue (happiness, sadness, tall hat). Piloting was necessary to finalize parameters of the task so that reliable learning effects could be obtained. Notably, the magnitude of stimulus difference between the positive-emotive and negative-emotive cues was matched to that of the non-emotional cues (Marks, 1991). This was the first, exploratory research to investigate such issues, but it was expected that it might eventually contribute to procedures for selecting law enforcement and security agents.

In general, it was predicted that participants in all cue conditions would commit fewer errors in identifying terrorist status in later trials, evidencing learning of the correct discrimination. However, with personality and general intelligence held constant, the error rate would decrease more rapidly over blocks of trials in high-EI individuals than in low-EI individuals, provided that the cue was an emotional one. There appear to be no grounds for predicting effects of EI on performance with a non-emotional cue.

A secondary aim was to examine the relationship between EI and subjective response to task performance. It has been suggested that more emotionally intelligent individuals may cope better with stress (Salovey, Bedell, Detweiler, & Mayer, 1999), and therefore it was deemed possible that high-EI individuals would show greater task engagement and less distress during performance of a novel and potentially stressful task.

CHAPTER 2

Method

Participants

The sample consisted of 180 participants (111 women, 69 men; aged 18-35; $M = 19.4$; $SD = 2.1$) drawn from the University of Cincinnati's introductory psychology research pool. All had normal or corrected-to-normal vision, and were randomly assigned to the experimental condition in which they participated. An additional 33 participants (15 women, 18 men) completed the experiment, but failed to reach the 80% criterion level of performance on the emotional cue discrimination task (described below in the *Apparatus and Materials* section), and were excluded from further analysis. All participants received 2 research participation credit hours, which contributed to fulfillment of their course requirements, and all were treated ethically (APA, 1992).

Design

The experiment used a 3×4 mixed model design (cue condition $\times$ blocks of trials). Cue condition was the between-subjects factor with three levels: positive-emotive cue, negative-emotive cue, or neutral cue. Blocks of trials was the within-subjects factor consisting of four successive blocks of 25 trials each. The dependent variable was the number of errors committed in discriminating terrorists and non-terrorists.

Materials and Apparatus

Materials and apparatus consisted of a test battery administered prior to performance of a maximal performance multiple-cue discrimination learning task, followed by two post-task questionnaires, and a final face discrimination task. Pre-task measures included three questionnaire measures of EI, a personality measure, two tests of general cognitive ability, and a pre-task measure of subjective state. Post-task assessments included questionnaire measures of subjective state and task coping. The concluding task was designed to evaluate the participant's ability to discriminate facial expressions of emotion. Each measure is described in detail below.

Emotional intelligence (Appendix A). The Schutte Emotional Intelligence Scale (SEIS; Schutte et al., 1998) is a reliable questionnaire for assessing EI that has been validated as a predictor of wellbeing. It consists of 33 items representing three dimensions of EI: Appraisal and Expression, Regulation, and Utilization of Emotion. A version with a seven-point rating scale was provided for participant response. High scores on this measure have been associated with academic achievement (Schutte et al., 1998).

Trait emotional intelligence (Appendix B). The Trait Meta-Mood Scale (TMMS; Salovey et al., 1995) consists of 30 items, which produce scores on three factors: Attention to Emotion, Clarity of Emotional, and Emotion Repair. A seven-point rating scale was provided for participant response. High scores on these subscales have been related to low depression, high mood recovery, and goal orientation (Ghorbani et al., 2002).

Trait emotional intelligence (Appendix C). The Trait Emotional Intelligence Questionnaire (TEIQue; Petrides et al., 2003) is a comprehensive measure of trait emotional intelligence that has been employed in various empirical studies. It consists of 144 items with a

seven-point rating scale response, and yields a Trait EI total score, four factors, and 15 subscales. The present study used only three of these subscales consisting of 29 items (EPE: Emotional Expression [10 items], Emotional Perception [10 items], and Empathy [9 items]).

Personality: The Big Five (Appendix D). The 40-item Mini-Modular Markers (3M40; Saucier, 2003) assesses the Big Five personality traits as orthogonal dimensions: Openness (Intellect), Conscientiousness, Extraversion, Agreeableness, and Neuroticism. This is a new Big Five marker set that has been shown to have markedly lower interscale correlation, with no loss of validity, relative to previous marker sets with a comparable number of items. It requires the participant to rate his or her personality in relation to a series of descriptor adjectives, on a 10-point rating scale.

Letter Series and Esoteric Analogies (Appendices E and F). These two paper-and-pencil tasks (Stankov, 2000) are tests of general reasoning ability, or intelligence, used in internal research by the Educational Testing Service (ETS; Princeton, NJ). They were supplied for use in this study by Dr. Richard D. Roberts, who is a senior research scientist at ETS. The Letter Series test contains 15 series of letters for which examinees are instructed to supply the next letter. Task instructions and sample items are presented in Appendix E. The Esoteric Analogies test contains 24 sets of word pairs that are related to each other in some manner. A third word is given for which the examinee must choose a word from a set of four additional words that is related to it in the same manner as the second word is related to the first word. Task instructions and sample items are presented in Appendix F.

Pre-task DSSQ (Appendix G). The 96-item Dundee Stress State Questionnaire (DSSQ; Matthews et al., 1999) assesses 11 dimensions of mood, motivation, and cognition in performance settings. Scales are grouped into three higher-order factors associated with task

engagement (e.g., energy, task motivation), distress (e.g., negative mood, lack of confidence), and worry (e.g., self-focused attention, interfering thoughts). Scores on the three factors may be calculated from the 11 scale scores, using regression equations based on data obtained from a large normative sample (Matthews, Campbell, et al., 2002)

Discrimination learning task (Appendix H, I, and J). A discrimination learning task was presented on a Dell Pentium PC with a P780 on Rage Pro Turbo AGP 2X graphics adapter, and a Yamaha Native DS1 WDM sound adapter. The monitor was a Dell 16" SVGA flat screen model set at 1152×864 resolution. Participants sat at a viewing distance of approximately 17".

Stimuli consisted of a series of 100 animated characters that were created using virtual reality software (People Putty; Haptik, 2004). This software facilitates the creation of lifelike interactive 3-D characters, which can be used in standalone applications, or in developing personalized user interfaces for Internet websites. Its features include Text to Speech (TTS) capability. This software has been used in a variety of research applications. The University of North Carolina at Charlotte used it in applications relating to the treatment of social phobias, diversity training, and human-computer interactions; NASA used it to investigate human usability, ergonomics, and comfort in designing space vehicles (Haptik, 2006); and the Division of Pediatric Informatics at Cincinnati Children's Hospital Medical Center used it to generate interactive characters in a web-based education and training application (John Pestian, personal communication, October 20, 2004).

Stimuli for the current study were created by using a number of People Putty's face templates, which were modified with respect to face shape and facial features, to yield 25 different Caucasian male faces. Two emotions (happy and sad) were combined factorially with two hat heights (tall and short), to create four different emotion/hat-height combinations. Each of

the 25 characters received all four attribute combinations, thus yielding 100 characters.

Caucasian males were used exclusively in order to guard against biases that might have arisen from a more heterogeneous stimulus set. Only the head, neck, and shoulders of the characters were displayed (see examples in Appendix H).

In addition to visual attributes, each character was programmed to speak a verbal message that relayed a piece of personal information. Messages were created by pairing one of five sentence stems, indicative of an imminent personal disclosure, with an appropriate sentence completion (e.g., My name is...John Smith). Sentence stems were chosen based on categories of personal information (e.g., favorite sport, occupation); sentence completions consisted of typical or popular responses. A complete list of stems and completions is presented in Appendix I. The verbal messages were programmed using People Putty's TTS function.

In each condition, two independent cues were manipulated across trials, one emotive (happy or sad face), and one non-emotive (tall or short hat). The verbal message was an extraneous cue unrelated to the discrimination task. The three task conditions differed only in terms of which cue served as the identifier for "terrorists": happy facial emotion, sad facial emotion, or a taller hat. The animated characters were displayed in a window 300×300 pixels in size in the center of the screen, and were invoked by calling the animation file via MatLab. The verbal message commenced 0.5 s after the window containing the character was displayed. Message durations ranged from 1.5 to 3.5 s. Stimuli were displayed in a unique randomized order for each participant.

In a series of prior pilot studies, the magnitude of stimulus difference for the non-emotional cues was matched to that of the emotional cues (Marks, 1991), so that cue salience was psychophysically equated across conditions.

In the final pilot study, the hat height differences were adjusted to magnitudes falling in between the two that had been identified as closest to the emotion difference magnitude in the previous pilot study. Participants were asked to compare 25 pairs of animated characters with respect to emotion difference magnitude, and 24 pairs of animated characters with respect to hat height difference magnitude. The response sheet consisted of 75 mm horizontal line scales labeled “no difference”, “moderate”, and “extreme” at the left, middle, and right of the line, respectively (Appendix J). Participants marked an “X” on the line corresponding to their judgment of how different the two stimuli were with respect to the pertinent attribute. Results of pilot study 2 indicated that the smaller of the two hat height difference magnitudes was not significantly different from that of the emotion difference magnitude ($M = 36.9$, $SD = 16.6$; $M = 36.7$, $SD = 15.9$, respectively). It was therefore used in developing the stimuli for the discrimination learning task.

In the multiple-cue discrimination learning task, following presentation of each stimulus, participants responded by using the mouse to click Yes (“Terrorist”) or No (“Non-terrorist”), and then received on-screen feedback. Notably, the stimuli were displayed for as long as the participant took to decide about terrorist status. Data were collected using MatLab. Following the multiple-cue discrimination learning task, a post-task measure of subjective state was administered.

Post-task DSSQ (Appendix K). The post-task DSSQ assesses the same 11 dimensions of mood, motivation, and cognition in performance settings as set forth above. The three second-order factors of task engagement, distress, and worry were computed. In addition, it includes an embedded version of the NASA Task Load Index (NASA-TLX; Hart & Staveland, 1988), a standard measure of workload based on ratings of task demands and subjective reactions to the

task that is widely used in human performance research. It also includes a 21-item coping subscale, which identifies three coping strategies: task-focused, emotion-focused, and avoidance coping.

Emotional cue discrimination (Appendices H and L). Participants completed a judgment task requiring discrimination of positive and negative facial emotions. Twenty still shots of the animated characters used in the discrimination learning task (Appendix H) were presented individually via PowerPoint, and participants were required to decide whether the face expressed a positive or negative emotion. Participants were provided with a response sheet containing 20 numbered sets of forced-choice responses specifying “positive” and “negative” (Appendix L). Reaching a criterion of 80% correct responses on this measure served to confirm that participants were capable of discriminating the emotional cues used in the multiple-cue discrimination learning task. This test was administered at the end of the study, to remove the likelihood of priming the participants as to the nature of the main task.

Procedure

Participants first read and signed an informed consent form. They then completed questionnaire measures of EI and personality, followed by the pre-task DSSQ, and a short test of cognitive ability. Each of these measures is described in the *Apparatus and Materials* section.

Participants then completed a multiple-cue discrimination learning task that required them to decide whether animated characters were terrorists or not. The critical cue was manipulated between-subjects, and participants were randomly assigned to one of three task conditions (positive-emotive, negative-emotive, or neutral critical cue). For each animated

character, participants were prompted by an on-screen question, “Terrorist?” and they responded by mouse-clicking a Yes (for “Terrorist”) or No (for “Non-terrorist”) button on the PC screen. On-screen feedback was given on each trial (“Correct” or “Incorrect”), and participants clicked an “OK” button when they had seen this feedback. The task consisted of five practice trials to familiarize the participant with the nature and mechanics of the task, followed by 100 main trials. Practice trial stimuli consisted of a subset of those used in the main trials, but the critical cue indicating terrorist status was the presence of facial hair. Practice trial stimuli were also randomized for each participant, and participants received feedback during practice.

After the multiple-cue discrimination learning task, participants completed the post-task DSSQ, followed by the emotional cue discrimination task. The latter task was presented via PowerPoint slide show, which the experimenter invoked when the participant had finished the DSSQ. The first slide contained task instructions, which the experimenter read to the participant. The participant was given the opportunity to ask questions regarding the task, and when those had been answered, the experimenter clicked the mouse to advance to the first stimulus. During this task, the experimenter looked away from the participant and computer screen so that the participant would not be influenced by any experimenter reaction. The experimenter clicked the mouse to advance to the next slide after she had heard the participant circle an answer. The stimulus remained on the PC screen until the participant made a response.

When the last task was completed, participants were invited to ask any questions they might have. Before leaving, participants were debriefed, and assured that the cue used in the main task to designate that an individual was a terrorist was not one that security forces actually used to identify terrorists in the real world.

CHAPTER 3

Results

Criterion Measures

The following data were entered to an SPSS database for each participant: (1) case number, experimental condition, age, and sex; (2) questionnaire data for the three EI measures, the personality measure, the pre-task DSSQ, and the post-task DSSQ; (3) correct and incorrect responses, plus confidence ratings, for the items on the LS and EA tests; (4) correct and incorrect responses for the emotional cue discrimination task, plus a code indicating whether the participant had met the predetermined inclusion criterion of 80% correct; (5) the number of incorrect responses made in the practice trials, and four blocks of main trials of the multiple-cue discrimination learning task. Means and standard deviations for all these measures and tasks are presented in Table 2. Because some participants did not respond to all questionnaire items, sample sizes for some measures were less than the experiment-wise sample of 180.

Predictors of Performance

Main effects for cue type and learning. To test for effects of the experimental variables on learning, a 3 (cue type) $\times$ 4 (blocks of trials) mixed-model ANOVA was conducted. There was a significant main effect for blocks of trials, $F(2.55, 450.48)^1 = 29.59, p < .001$, indicating that significantly fewer errors were committed in block 4 than in block 1. There was also a significant main effect for cue type, $F(2, 177) = 25.95, p < .001$, indicating that participants in the emotive

¹Box-corrected df reported in this and subsequent repeated measures analyses, to compensate for violations of the sphericity assumption.

Table 2

Means and standard deviations for all measures and tasks

Measure	N	Mean	SD
SEIS			
Expression of Emotion	177	79.3107	9.31638
Regulation of Emotion	176	60.2017	7.11662
Use of Emotion	179	38.0503	4.67515
Total	172	177.5727	18.22453
TMMS			
Attention to Emotion	179	70.3520	9.96985
Clarity of Emotion	175	54.4800	10.49622
Emotion Repair	179	31.9274	5.21884
TEIQue-EPE			
Emotion Expression	179	46.3128	12.24481
Emotion Perception	180	49.3556	8.02136
Empathy	179	45.2011	7.08010
3M40			
Extraversion	180	48.7833	12.80462
Agreeableness	180	59.3944	7.81525
Conscientiousness	180	53.6611	9.85207
Neuroticism	178	34.2191	10.33246
Openness	180	54.3028	7.79011
Letter Series			
Correct Responses	180	9.3167	2.01246
Esoteric Analogies			
Correct Responses	180	12.8611	3.20224
Pre-task DSSQ			
Worry (z-scores)	180	0.4835	0.98962
Tast Engagement (z-scores)	180	0.4201	0.78534
Distress (z-scores)	180	-0.6072	0.81059
Multiple-cue Discrimination Learning Task			
Block 1 Errors	180	11.8300	3.43500
Block 2 Errors	180	10.9300	4.59500
Block 3 Errors	180	10.1000	5.16600
Block 4 Errors	180	9.1400	5.47600
Post-task DSSQ			
Subjective State			
Worry (z-scores)	180	-0.3065	0.89238
Tast Engagement (z-scores)	180	0.2098	0.89757
Distress (z-scores)	180	0.2337	1.05897
Coping Style			
Task-focused	180	17.5944	4.85855
Emotion-focused	180	6.3333	5.17514
Avoidance	179	5.8547	5.33603
Emotional Cue Discrimination			
Correct Responses	180	18.3500	1.29664

cue conditions committed fewer errors than those in the neutral condition. Participants in the negative-emotive condition committed the fewest mean number of errors throughout all blocks.

This is displayed graphically in Figure 1.

There was a significant interaction between blocks of trials and cue type, $F(5.09, 450.48) = 5.90, p < .001$. The error rate declined more rapidly in the two emotional conditions than in the neutral condition initially, indicating more rapid learning with emotional cues. This is displayed graphically in Figure 1.

Figure 1. Mean number of errors by block for the positive-emotive, negative-emotive, and neutral task conditions in the multiple-cue discrimination learning task. Error bars represent standard error.

Main effects for sex and learning. To test for the effects of participant sex on learning a 2 (sex) $\times$ 4 (blocks of trials) mixed-model ANOVA was conducted. The interaction between sex and blocks of trials was non-significant, $F(2.47, 439.79) = 0.425, p > .05$, indicating that men and women learned at similar rates on this task.

Table 3.

Correlations between EI questionnaire measures

	EPE-EX	EPE-P	EPE-EM	SEIS-EXP	SEIS-REG	SEIS-UE	SEIS-TOT	TMMS-ATT	TMMS-CLAR
TEIQue¹									
Emotion Expression (EPE-EX)	---								
Emotion Perception (EPE-P)	.548*	---							
Empathy (EPE-EM)	.313*	.457*	---						
SEIS²									
Emotion Expression (SEIS-EXP)	.405*	.580*	.552*	---					
Emotion Regulation (SEIS-REG)	.347*	.620*	.442*	.629*	---				
Use of Emotion (SEIS-UE)	.266*	.499*	.409*	.554*	.611*	---			
Total (SEIS-TOT)	.415*	.662*	.563*	.902*	.868*	.774*	---		
TMMS³									
Attention to Emotion (TMMS-ATT)	.398*	.405*	.281*	.340*	.290*	.412*	.384*	---	
Clarity of Emotion (TMMS-CLAR)	.531*	.810*	.376*	.452*	.597*	.442*	.573*	.376*	---
Emotion Repair (TMMS-REP)	.267*	.428*	.392*	.425*	.608*	.558*	.585*	.251*	.435*

¹ Trait EI Questionnaire (Petrides et al., 2003); ² Schutte EI Scale (Schutte et al., 1998); ³ Trait Meta-Mood Scale (Salovey et al., 1995)

* Correlation is significant at $p = .001$.

Correlations between EI measures. The scales from the three EI questionnaires employed were all substantially positively correlated (Table 3), suggesting a high degree of convergent validity for the measurement of EI. Conversely, the EI scales did not correlate with the Letter Series or Esoteric Analogies test (Table 4), thus demonstrating discriminant validity with respect to conventional intelligence.

Table 4.

Correlations between EI questionnaire measures and general intelligence

	Letter Series	Esoteric Analogies
TEIQue ¹		
Emotion Expression (EPE-EX)	.001	-.136
Emotion Perception (EPE-P)	-.004	-.125
Empathy (EPE-EM)	.035	-.076
SEIS ²		
Emotion Expression (SEIS-EXP)	-.003	-.138
Emotion Regulation (SEIS-REG)	.038	-.116
Use of Emotion (SEIS-UE)	.052	-.009
Total (SEIS-TOT)	.021	-.107
TMMS ³		
Attention to Emotion (TMMS-ATT)	-.008	-.073
Clarity of Emotion (TMMS-CLAR)	.034	-.098
Emotion Repair (TMMS-REP)	.078	-.053

¹ Trait EI Questionnaire (Petrides et al., 2003); ² Schutte EI Scale (Schutte et al., 1998); ³ Trait Meta-Mood Scale (Salovey et al., 1995)

All correlations are non-significant.

Correlations between learning and EI. The incidence of significant correlations between EI and error frequencies across the four blocks of trials did not greatly exceed chance levels (Table 5). Indeed, in the final block (block 4), the correlations between the EI scales and errors were all non-significant, and none exceeded $\pm .05$ in magnitude. The personality and general intelligence measures also failed to predict performance.

Table 5.

Correlations between EI, personality, and general intelligence with block 1 and block 4 errors on the multi-cue discrimination learning task

	Block 1 Incorrect	Block 4 Incorrect
Emotional Intelligence Measures		
TEIQue ¹		
Emotion Expression (EPE-EX)	.082	-.026
Emotion Perception (EPE-P)	.149*	-.014
Empathy (EPE-EM)	.127	-.040
SEIS ²		
Emotion Expression (SEIS-EXP)	.069	-.006
Emotion Regulation (SEIS-REG)	.113	.026
Use of Emotion (SEIS-UE)	.104	.045
Total (SEIS-TOT)	.103	.010
TMMS ³		
Attention to Emotion (TMMS-ATT)	.154*	.050
Clarity of Emotion (TMMS-CLAR)	.184*	-.010
Emotion Repair (TMMS-REP)	.024	-.012
Big Five Personality Traits		
3M40 ⁴		
Openness (O)	-.026	.020
Conscientiousness (C)	.090	.164
Extraversion (E)	.065	.053
Agreeableness (A)	.034	.052
Neuroticism (N)	-.047	-.006
General Intelligence ⁵		
Esoteric Analogies	-.057	.004
Letter Series	.011	.013

¹ Trait EI Questionnaire (Petrides et al., 2003); ² Schutte EI Scale (Schutte et al., 1998);

³ Trait Meta-Mood Scale (Salovey et al., 1995); ⁴ 3M40 (Saucier, 2003); ⁵ Gf/Gc Test Battery (Stankov, 2000).

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

Correlations between learning and subjective state. Significant correlations were found between performance and stress state measured post-task (i.e., ratings of mood during the task; Table 6). With the sole exception of post-task worry, which showed a negative correlation in the neutral condition, none of the state factors predicted performance in block 1. However, by block 4, several significant correlations emerged. Table 6 shows the correlations between the three state factors and error rates in block 4, for the whole sample, and for each task condition. Task engagement was generally associated with fewer errors, and specifically with fewer errors in the positive-emotion condition. Distress was associated with more errors in the positive-emotion and negative-emotion condition. Worry was associated with fewer errors in the neutral condition.

Table 6.

Correlations between post-task DSSQ¹ subjective states and block 1 and block 4 errors on the multi-cue discrimination learning task

	Whole Sample <i>N</i> = 180	Happy Condition <i>N</i> = 60	Sad Condition <i>N</i> = 60	Neutral Condition <i>N</i> = 60
Block 1				
Engagement	-.026	-.047	.005	.022
Distress	.134	.002	.213	.145
Worry	-.111	.037	-.084	-.268*
Block 4				
Engagement	-.200**	-.364**	-.090	.033
Distress	.163*	.267*	.262*	-.212
Worry	-.066	.075	-.098	-.283*

¹ Dundee Stress State Questionnaire (Matthews et al., 1999)

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

Multiple regressions for learning and subjective states. To further investigate the relationship between subjective state and performance, multiple regressions were run as follows, using error rate in block 4 as the criterion. Two dummy variables were used to code the three cue types. To test for interaction between cue type and stress state, six product terms (dummy variable $\times$ stress factor) were computed. Centering the product terms was unnecessary because the DSSQ factors are scaled as z -scores. Predictors were entered into the equation in four steps as follows: (1) block 1 error frequency, to control for initial performance level, (2) the two dummy variables, (3) the three DSSQ factors, (4) the six product terms representing cue type $\times$ stress factor interactions. The final regression equation was significant ($R = .599, p < .001$). There were significant increments in variance at step 1 ($\Delta R^2 = .183, p < .001$), step 2 ($\Delta R^2 = .096, p < .001$), and step 4 ($\Delta R^2 = .056, p < .05$). This analysis indicates that the linear DSSQ terms did not predict change in performance with respect to baseline, but the interaction terms predicted learning.

Partial correlations. Due to the relatively small sample size in each condition ($n = 60$), subsequent partial correlations were run separately for each cue condition, controlling for block 1 error rate (Table 7), in place of further regressions. In the positive-cue condition, task engagement was uniquely related to fewer errors in block 4, while distress was related to more errors in block 4. In the neutral condition, partial correlations for worry and distress each approached significance ($.10 > p > .05$), showing a mild relationship with increased error rate.

Table 7.

Partial correlations between DSSQ¹ post-task subjective states and block 4 errors, controlling for block 1 errors

Post-task Stress State	Block 4 Incorrect
Positive-emotive condition	
Engagement	-.369**
Distress	.281*
Worry	.066
Negative-emotive condition	
Engagement	-.103
Distress	.190
Worry	-.067
Neutral condition	
Engagement	.029
Distress	-.252
Worry	-.240

¹ Dundee Stress State Questionnaire (Matthews et al., 1999)

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

Predictors of Subjective State

Main effects for cue type and subjective states. To examine the effects of cue type on subjective state, a series of 2 (pre-task, post-task) $\times$ 3 (cue type) mixed ANOVAs was conducted for task engagement, distress and worry. Participants were significantly less engaged, $F(1,177) = 12.28, p < .01$, more distressed, $F(1,177) = 170.60, p < .001$, and less worried, $F(1,177) = 181.48, p < .001$, following the multi-cue discrimination learning task. Mean subjective state differences, expressed in z -scores, are displayed graphically for each cue type in Figure 2. There was not a significant interaction between cue type and subjective state for task engagement or distress, $ps > .05$. There was, however, a significant interaction for worry,

$F(2,177) = 3.07, p < .05$. Participants were significantly more worried in the neutral condition than in the two emotive-cue conditions, as can be seen in Figure 2.

Figure 2. Mean difference (z) in task engagement, distress, and worry arising from the positive-emotive, negative-emotive, and neutral task conditions in the multiple-cue discrimination learning task.

Correlations between EI and subjective states. Measured pre-task, two of the three DSSQ subjective state factors were clearly related to EI when considering the entire participant sample (Table 8). Task engagement showed significant positive, and distress significant negative, correlations with all the EI scales used in this study. The only overall relation for worry was a negative correlation with TMMS Clarity of Emotion. Measured post-task, task engagement remained significantly positively related only to TEIQue Empathy, and SEIS Use of Emotion. Distress remained significantly related to all but two EI scales: TMMS Attention to Emotion, and

Table 8.

Correlations between emotional intelligence and subjective states measured before and after the multi-cue discrimination learning task

	DSSQ ¹ Subjective State					
	Pre-task			Post-task		
	Worry	Engage	Distress	Worry	Engage	Distress
TMMS ²						
Attention to Emotion	.045	.151*	-.227**	.096	.131	.022
Clarity of Emotion	-.195*	.243**	-.423***	-.042	.034	-.279***
Emotion Repair	-.121	.347***	-.529***	.018	.129	-.246**
TEIQue ³						
Expression of Emotion	-.075	.154*	-.313***	.038	.077	-.155*
Perception of Emotion	-.079	.280***	-.426***	-.007	.094	-.294***
Empathy	-.051	.286***	-.270***	-.047	.186*	-.112
SEIS ⁴						
Expresion of Emotion	-.009	.217**	-.399***	.013	.101	-.215**
Regulation of Emotion	-.017	.320***	-.530***	.070	.104	-.314***
Use of Emotion	.087	.355***	-.430***	.114	.153*	-.203**
Total	.012	.311***	-.522***	.059	.117	-.282***

¹ Dundee Stress State Questionnaire (Matthews et al., 1999); ² Trait Meta-Mood Scale (Salovey et al., 1995); ³ Trait EI Questionnaire (Petrides et al., 2003); ⁴ Schutte EI Scale (Schutte et al., 1998)

* $p < .05$; ** $p < .01$; *** $p < .001$

TEIQue Empathy; all other negative correlations remained. Appendix M provides the correlations obtained in each of the three task conditions. Given the large number of correlations computed for the table, it is likely that chance played some role in the differences in correlation magnitudes across task conditions. As the prediction of subjective state was a secondary priority in this study, these findings were not explored further.

Predictors of Coping Strategies

Main effects for cue type and coping strategy. To explore the effects of cue type on coping style, a 3 (cue type) $\times$ 3 (coping style) between subjects ANOVA was conducted. A

significant main effect was found only for avoidance, $F(2,176) = 96.09, p < .05$. Post-hoc pair-wise comparisons showed that avoidance coping was used by significantly more participants in the neutral condition than in the positive-emotive condition ($M \text{ diff} = 2.34, p < .05$), or the negative-emotive condition ($M \text{ diff} = 2.04, p < .05$). Task-focused and emotion-focused coping were used by about the same number of participants in all cue conditions. Mean levels of task-focused, emotion-focused, and avoidance coping for the positive-emotive, negative-emotive, and neutral cue types are presented in Figure 3.

Figure 3. Mean levels of task-focused, emotion-focused, and avoidance coping for the positive-emotive, negative-emotive, and neutral task conditions in the multiple-cue discrimination learning task. Error bars represent standard error.

Correlations between EI and coping strategies. For DSSQ coping strategies, in general, task-focused coping was positively related to most of the EI scales, when all conditions were aggregated (Table 9). Emotion-focused coping was related only to TMMS Clarity, and TEIQue Perception of Emotion; and avoidance coping correlated negatively with TEIQue Expression and

Empathy. As above, given the large number of correlations for individual task conditions it is likely that chance played a role in the differences in correlation magnitudes across task conditions. As the prediction of coping strategies was a secondary priority in this study, these findings were not explored further. Appendix N provides the correlations obtained in each of the three task conditions.

Table 9.

Correlations between emotional intelligence and coping strategies measured after the multi-cue discrimination learning task

	DSSQ ¹ Coping Styles		
	Task-Focused	Emotion-Focused	Avoidance
TMMS ²			
Attention to Emotion	.167*	.094	.054
Clarity of Emotion	.219**	-.185*	-.086
Emotion Repair	.152*	-.069	-.076
TEIQue ³			
Expression of Emotion	.122	-.088	-.156*
Perception of Emotion	.150*	-.200**	-.140
Empathy	.172*	-.125	-.192*
SEIS ⁴			
Expresion of Emotion	.135	-.119	-.097
Regulation of Emotion	.227**	-.121	-.039
Use of Emotion	.243**	.047	.019
Total	.213**	-.093	-.046

¹ Dundee Stress State Questionnaire (Matthews et al., 1999); ² Trait Meta-Mood Scale (Salovey et al., 1995); ³ Trait EI Questionnaire (Petrides et al., 2003); ⁴ Schutte EI Scale (Schutte et al., 1998)

* $p < .05$; ** $p < .01$; *** $p < .001$

CHAPTER 4

Discussion

The principal aim for this study was to test whether EI related to an individual's ability to use emotional cues in making decisions, in the context of learning to judge whether animated characters were designated as terrorists or not. It was predicted that high-EI individuals would learn faster to correctly identify terrorist status than low-EI individuals, but only if the relevant cue was an emotional one. In fact, this central prediction of the study was not confirmed in that EI did not predict rate of learning. However, performance was related to cue type and to subjective state. Learning was better for emotional cues than for the non-emotive cue, and higher task engagement and lower distress were associated with faster learning in the positive-emotive task condition. A secondary intention for the study was to investigate the relationship between EI and subjective response to task performance to see if high-EI individuals might cope better with the stress induced by the task. It was believed that high-EI individuals might show greater task engagement, and less distress during performance of this potentially stressful task. Findings confirmed that the task was somewhat stressful, and higher EI was associated with more positive states of mind.

Predictors of Performance

Task condition effects on learning confirmed that task performance was sensitive to emotional factors. In general, participants in the emotive-cue conditions tended to make fewer errors than those in the non-emotive condition. Participants in the negative-emotive condition

made the fewest mean number of errors throughout the experiment. Furthermore, while errors decreased substantially in both emotional conditions, no significant decrease in errors was obtained across the four blocks of trials in the non-emotive condition. In fact, error rates were initially similar in the positive- and non-emotive conditions, but subsequent performance improvement was seen only in the positive-emotive condition.

Although the results of this study showed a learning effect over the four blocks of trials for the emotive conditions, they failed to confirm the hypothesized influence of EI on learning to judge terrorist status when the relevant cues were emotional ones. Correlations between EI and performance across the four blocks of trials revealed little more than a chance number of associations with performance on this task. Where correlations attained significance in block 1, higher levels of EI were associated with a higher error rate. Standard personality traits and conventional intelligence also failed to predict performance.

These findings raise several questions about which ability and personality scales may be most predictive of learning to use emotional cues. First, the failure to obtain the predicted association between EI and learning is surprising, given the theoretical underpinnings of the prediction, as well as some empirical foundations (Petrides & Furnham, 2003). Theory assigns a central role in EI to emotion perception (cf. Mayer & Salovey, 1997; Petrides & Furnham, 2003). A positive association between EI and learning is also suggested by the utility of emotion in arriving at more advantageous outcomes (Schutte et al., 1998), and the assertion that EI may be more important than IQ for social adaptation (Goleman, 1995). The failure to confirm the association might potentially be attributed to methodological factors (as further discussed in the section on limitations below). For example, the artificial task may be too far removed from real-

life emotional challenges for EI to be relevant. Also, the power of the design may have been insufficient to detect small associations between EI and performance.

Alternatively, the null result might be taken to support the critical perspective on EI outlined in the introduction. The major criticism advanced was that self-report scales are inadequate to assess abilities that are usually measured using objectively-scored maximal performance items (Matthews, Zeidner, et al., 2002). Consistent with a critical stance, participants' self-reports of their emotional abilities were unrelated to actual rate of learning. This finding adds to other evidence suggesting that people at every level of education and accomplishment are often inaccurate in their estimates of their everyday skills and competencies (Dunning, Heath, & Suls, 2004). The data contrast with those of Petrides and Furnham (2003), who found that their TEIQue scale was related to faster identification of basic facial emotions. It is possible that the trait EI construct assessed by the questionnaires relates only to a limited set of abilities, such as emotion perception, that do not include learning to process emotional cues. Further work is needed to test which types of tasks requiring processing of emotional stimuli reliably correlate with trait EI.

One might also question whether the particular questionnaires used were optimal for measuring EI. However, in addition to being among the most-widely used questionnaires in this field (e.g., Brackett & Mayer, 2003; Petrides & Furnham, 2003), the present data also confirmed that they are substantially intercorrelated, implying that the questionnaires measure some "general factor" of self-reported EI. Furthermore, collectively, the questionnaires sampled various subcomponents of EI that might be considered especially relevant to the learning task, including emotion perception (TEIQue), use of emotion (SEIS) and attention to emotion (TMMS). None of these scales predicted superior learning. Given that EI is typically rather

broadly defined, it is possible that some new additional subcomponent trait that predicted learning might be identified. However, the present data suggest that trait EI scales do not seem to be promising for predicting learning tasks of the present kind.

On the other hand, the finding that learning occurred in the emotional conditions is unsurprising given that, in daily life, emotions are often very facilitative in conveying information about the thoughts, feelings, and motivations of others (Mayer & Salovey, 1997). The results suggest that in this study, participants seem to have spontaneously focused their attention on the emotive aspects of the animated characters, to the apparent exclusion of non-emotive characteristics, in deciding whether the character was a terrorist or not. The fact that emotions and emotional information are so salient in everyday interactions may explain why it was easier to learn with the emotional cues rather than the neutral cue. It is not surprising that initial performance was higher when the cue was negative emotion, as terrorists are most likely assumed to be disturbed, unhappy individuals. However, the rate of learning was similar with both positive and negative cues, implying that emotional cues were generally salient, despite the emotional valence. The primacy of emotion is also consistent with the overt reactions made by some participants. It was noticed by the experimenter that a few participants observed the animated character intently until the character averted his eyes from a direct gaze, whereupon the participant immediately clicked a response to indicate terrorist status. This suggests that at least some individuals identified a particular element of the characters' behavior on which to base their decisions.

Conventional intelligence also failed to predict learning on the task employed in this study, which on the surface, seems counterintuitive, as the task might be performed on the basis of rational analysis of the linkage between cues and outcomes. However, since such tasks may

call upon implicit learning processes, the outcome is more understandable considering other research on the relation between implicit learning and conventional intelligence (cf. Atwell, Connors, & Merrill, 2003; Reber, Walkenfeld, & Hernstadt, 1991). Results obtained by these researchers indicate that for two different participant populations, implicit learning was unrelated to IQ. Atwell et al. studied young adults with and without mental retardation in the context of an artificial grammar paradigm. They found that on the implicit learning task, participants with mental retardation performed just as well as those without, but on the explicit learning task, participants without mental retardation performed much better. Reber et al. studied a group of college undergraduates using a standard artificial grammar learning task to evaluate implicit learning, and a series-completion problem solving task to test explicit learning. Their results indicated that performance on the explicit task was linked strongly to IQ, and there were substantial individual differences between subjects on this task. However, performance on the implicit task was unrelated to IQ, and produced relatively minor individual differences between subjects.

The failure of the Big Five personality traits to predict learning on this task was also counter to initial expectations, especially since one of its dimensions, Openness, is often considered as a proxy for self-reported intellect (cf. Peabody & Goldberg, 1989). It is expected that intellect would be related to learning; however, as discussed above, empirically it is not, especially when the learning processes are implicit. Since the personality and EI questionnaires used in this study constituted explicit measures, it may be that these measures, in general, are inadequate for picking up on individual differences in implicit processing ability. Indeed, studies that have correlated alternative explicit and implicit measures of traits including trait anxiety and self-esteem (e.g., Egloff & Schmukle, 2004) have typically found only small associations across

measures ($r_s < .20$). While the research of Egloff and Schmukle focuses on gender differences between implicit and explicit measures of these traits, their results clearly indicate method variance between self-report questionnaires and maximal-performance tasks aimed at assessing them. Development of implicit scales for social-emotional competence may be necessary to predict learning on tasks of the present kind.

Subjective state factors seemed to be more predictive of learning. Performance in block 1 showed a negative association with post-task worry. In block 4, task engagement was generally associated with fewer errors, especially in the positive-emotion condition, and distress was associated with more errors in both emotional conditions. Worry maintained its association with fewer errors in the neutral condition. Regression and partial correlational analyses tested for learning effects in block 4 while controlling for initial error rate. These analyses revealed that DSSQ subjective state factors interacted with cue conditions in predicting learning; higher task engagement related especially to learning in the positive emotive condition. Additionally, distress related to more errors in both emotional conditions, and worry related to fewer errors in the neutral condition.

The finding that subjective states correlated most strongly with learning in the emotional conditions, particularly the positive-emotive condition, are consistent with the hypothesis that task engagement may constitute a marker for attentional resources (Matthews, Davies, & Lees, 1990; Matthews, Davies, Westerman, & Stammers, 2000). Indeed, Matthews and Davies (1998) report that energy was found to be positively correlated with the availability of attentional resources in the context of sustained attention and visual search tasks, especially when the task was highly resource-demanding (e.g., stimuli were partially masked, rendering them difficult to identify). This finding is analogous to the current study in that designating the characters with a

positive emotion as terrorists represented a more difficult task, requiring the participant to reject the more intuitively plausible hypothesis that negative emotion was diagnostic of terrorist status. By contrast, as suggested by the low initial error rate in the negative-emotive condition, focusing on negative emotion as the most likely cue may not have required a high investment of resources, so that performance in this condition was not sensitive to task engagement. Thus, it is possible that the correlations might be mediated by individual differences in availability of resources, assuming that task engagement acted as an index of resources. Another possibility is that participants in the positive-emotive condition might have been more highly motivated to perform well in the face of this more difficult task condition.

The role of task engagement in performance suggests that learning may not have been fully implicit. Explicit learning has been found to be highly resource demanding, whereas implicit processes have been found to require few resources (Ackerman, 1988; Shiffrin & Schneider, 1977). Thus, in the positive-emotive condition at least, performance might depend on explicit, rather than implicit, learning processes. Participants may need to be sufficiently alert to analyze the stimulus-response contingencies systematically and consciously. It may also be the case that explicit learning is important in the early stages of skill acquisition, becoming supplanted with implicit processing as performance becomes more automatized (Ackerman, 1988).

Predictors of Subjective State

The analyses of task effects on subjective state showed that participants were significantly less engaged, more distressed, and less worried following the task. Similar findings

have been obtained with tasks requiring sustained attention (Matthews, Campbell, et al., 2002), implying that discrimination learning may be prone to induce fatigue. Furthermore, there was a differential effect of cue type on changes in subjective state. Task engagement and distress changed similarly for each cue type, whereas participants became significantly more worried in the neutral condition. The elevation of worry may reflect the difficulty participants experienced in identifying the correct cue in this condition.

The analyses of effects of cue type on coping strategy revealed a significant main effect only for avoidance coping. Participants in the neutral condition used significantly more avoidance coping than those in either the negative- or positive-emotive conditions. Again, preference for avoidance coping may have been a consequence of performance failure.

By contrast with performance data, the results suggest that scales of EI may be useful in predicting subjective response to the task. With cue conditions collapsed, task engagement was related positively, and distress negatively, to all the EI scales used in this study. Worry was negatively related only to TMMS Clarity of Emotion. Measured post-task, task engagement maintained a positive correlation only with the TEIQue Empathy, and SEIS Using Emotion scales. Distress remained significantly related to all but two EI scales: TMMS Attention to Emotion, and TEIQue Empathy; all other negative correlations remained. This is similar to results obtained by Saklofske et al. (2003), who found that SEIS scores related in expected directions to satisfaction with life, loneliness, and depression, even with personality traits controlled for. Furthermore, Ghorbani et al. (2002) found that the TMMS Clarity and Repair scales related to lower perceived stress. However, it is notable that the EI scales tended to correlate more strongly with subjective state pre-task than post-task. It appears that high EI

participants arrive for the study in a more positive frame of mind, which carries over, to some extent, to the task performance phase of the study.

Examining DSSQ coping styles showed that, with cue conditions aggregated, task-focused coping correlated positively with most of the EI scales. Emotion-focused coping was negatively related to TMMS Clarity of Emotion and TEIQue Perception of Emotion. Avoidance coping was negatively related to TEIQue Expression of Emotion and Empathy. These data provide some support to Salovey et al.'s (1999) contention that high EI facilitates coping with external pressures. Task-focused coping might be expected to be adaptive in performance environments, although in this study, its benefits were not evident in the objective performance data.

With respect to the correlations between EI and subjective state, it is possible that these are mediated by Big Five personality traits. Previous studies (cf. Brackett & Mayer, 2003; Petrides & Furnham, 2003; Saklofske et al., 2003; Salovey et al., 1995) have suggested that these scales of EI tend to be related to low N (SEIS, TEIQue), high E and O (SEIS, TEIQue), and high A (SEIS). Mixed correlations have been reported for the TMMS Attention and Clarity scales for N, E and O (Coffey, Berenbaum, & Kerns, 2003). The associations found in the present study are similar to those of a previous study (Fellner, Pérez, Emo, & Matthews, 2005), which showed the following relations between the Big Five and the TEIQue scales: low N related to Empathy; high O related to Empathy and Perception; and high E, A, and C related to all three TEIQue scales. However, Fellner et al. followed these correlations up with a series of multiple regressions, using each DSSQ subjective state as the criterion, and adding the Big Five to the model as the first block, in order to test for incremental predictive power of EI. They found that for task engagement, the TEIQue Emotion Perception scale added significantly to the

variance explained; for distress, TEIQue Emotion Perception and Empathy added significantly; and for Worry, SEIS Emotion Expression added significantly to the variance explained. These results clearly show that while EI was correlated with personality, the Big Five left a substantial amount of variance unexplained, and that some EI scales were able to predict subjective state over and above personality. This study did not attempt similar analyses, as the prediction of subjective state was of secondary importance to the analysis of performance effects, but it is clearly important to determine the extent to which EI scales show incremental validity with respect to the Big Five in predicting subjective state.

Qualities of EI that might explain why people experienced better subjective states during performance of this learning task relate to many of its hypothesized facets, especially regulation of emotion (Mayer & Salovey, 1997), use of emotion (Schutte et al., 1998), and mood repair (Salovey et al., 1995). Effective emotion regulation entails awareness and understanding of one's own mood state, leading to mood repair through processes such as deliberate positive thinking. Highly emotionally intelligent individuals are also said to avoid counterproductive strategies for emotion regulation such as ruminating on problems (Salovey et al., 1999). In the performance context, adopting task-focused strategies that divert attention towards the task, as opposed to personal discomfort, may also help to maintain positive mood (Matthews, Campbell, et al., 2002). Participants in this study generally found the task distressing and fatiguing, but the higher EI individuals may have been able to mitigate these state changes through more effective mood regulation.

Applications

This study suggested that people seem to be disposed to use emotional cues in making judgments about terrorists. Although emotional and non-emotional cues were psychophysically matched for salience, learning took place only when the cue was emotional. The general failure of measures of general cognitive ability and personality to predict performance was unexpected. It seems that it is difficult to predict who will learn most rapidly in this discrimination learning task. Thus, the study highlights a potential difficulty in selecting individuals with a high degree of aptitude for security-related jobs, in such venues as police departments, airports, and counter-espionage. The conventional trait measures, which are generally effective in predicting a wide range of job proficiencies (e.g., Barrick, Mount, & Judge, 2001; Schmidt & Hunter, 2004), failed to discriminate learning ability on the present task. Given that the fastest learning was associated with the negative-emotive cue, it may be especially important to select security agents who are able to learn more subtle and counterintuitive cues that may identify suspects. On the basis of the subjective state data, it may be worthwhile selecting employees for security agent positions who can maintain task engagement during this task. The elevated alertness and task motivation associated with this state may facilitate processing of those cues that are not obviously diagnostic. However, it should be stated that deficiencies in task engagement might not present the same problem with field agents as it did with the present student sample.

Results of this study indicated that block 1 performance predicted block 4 performance. Given this finding, a shorter version of the test could be evaluated as a test for selection purposes. Selection procedures could involve a battery of tests that included a short version of this task, as well as a self-report measure of subjective state. Performance scores, combined with levels of task engagement, could identify individuals who would be more likely to respond well

to rigorous security force training. Furthermore, the task could also be used for training existing security agents in learning to give equal consideration to non-emotional cues in deciding which target individuals might pose a security threat.

With respect to optimizing the job effectiveness of security forces, subjective state data suggest giving careful consideration to the environmental conditions in which different types of tasks are performed. Suspect interrogation, for example, could be scheduled based on the task engagement level of the examining officer. Hence, it may be that some officers would be limited to questioning a suspect early in his or her work shift, while other agents could reliably perform this duty over longer durations. It may also be especially important to develop counter-measures for fatigue, such as providing coffee and/or rest breaks, and designing work schedules appropriately (cf. Rosa, 2001).

A more general issue is that emotion may capture attention to the exclusion of other potentially relevant sources of information. This suggests that when delivering a verbal message, the sender must closely guard against unintentionally leaking any emotional cues that conflict with the intended message. For instance, security officers may occasionally be required to deliver stern warnings to criminals about illicit behavior that they privately consider amusing (e.g., klutziness in wielding a firearm). In this context, it is imperative that the officer's authority be unhampered by conflicting cues.

Limitations

As this study was the first of its kind to test whether EI relates to the ability to use emotional cues in learning to judge whether animated characters were designated as terrorists or not, several issues remain to be explored in future research. First, although implicit learning has

been implicated in similar tasks (Egloff & Schmukle, 2004), it is not fully clear the extent to which learning of the task may be implicit or explicit. Observation of the reactions of some participants suggests that at least some of the participants consciously identified the critical cue, because some expressed frustration at inadvertently clicking a wrong answer. However, those cases represented a small, though salient and amusing, subset of the overall sample. Therefore, it can be presumed that explicit as well as implicit learning may have taken place; perhaps different forms of learning occurred in different participants. Results also suggested that task engagement, which is linked to voluntary attention (Matthews et al., 2000), may also have played a role in performance, supporting the involvement of explicit learning. Future research could attempt to separate explicit and implicit learning processes more clearly.

Another weakness is that no conclusion can be drawn regarding what variables might predict learning with neutral cues because no learning was demonstrated in the neutral condition of this study. In future research, it might be worthwhile to employ a longer task to provide more opportunity for learning in this difficult condition. While this could lead to ceiling effects in the emotive-cue conditions, the measurement of reaction time could be added to the criterion measures, thereby affording an incremental level of analysis.

Another consideration is that the role of attention to different cues contained within the stimuli may require further investigation. It appears that when participants are not given explicit instruction, they spontaneously focus attention on the emotional aspects of the stimuli. Different instruction sets, incorporating a prompt to, “consider the features of physical appearance as well as emotion in making a response,” would perhaps yield a different pattern of results.

Next, the failure of EI to predict learning in this task pertains only to the particular scales used in this study. As previously discussed, the scales used were representative of those used as

measures of “trait EI”, and sampled a range of relevant EI subcomponents. However, it is possible that measures of EI developed on other principles, such as the MSCEIT, might be more predictive. Another alternative would be to develop a more implicit measure of EI. It has been noted repeatedly (cf. Matthews, Zeidner, et al., 2002; Petrides & Furnham, 2003) that people are notoriously bad at evaluating themselves with respect to EI ability, and related social and occupational competencies (Dunning et al., 2004). Hence, a measure that capitalizes on implicit processing might provide more veridical EI data.

Finally, this study used a student sample performing an artificial task. It is unclear how well the results can be generalized to actual security personnel. In future research, at the very least, it would be desirable to use this task with a sample of actual law enforcement and security personnel. A marked improvement might involve incorporating the animated characters in an interactive script that simulates actual situations in which security forces are required to make such decisions in the real world.

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Appendix A SEIS

INSTRUCTIONS: Please read each statement and decide whether or not you agree with it. Please indicate how much you agree or disagree with each of these statements answer by putting a circle around the number that best shows how much you agree or disagree with each statement.

1 Completely Disagree	2	3	4	5	6	7 Completely Agree
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1. I know when to speak about my personal problems to others.	1	2	3	4	5	6	7
2. When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.	1	2	3	4	5	6	7
3. I expect that I will do well on most things I try.	1	2	3	4	5	6	7
4. Other people find it easy to confide in me.	1	2	3	4	5	6	7
5. I find it hard to understand the non-verbal messages of other people.	1	2	3	4	5	6	7
6. Some of the major events of my life have led me to re-evaluate what is important and not important.	1	2	3	4	5	6	7
7. When my mood changes, I see new possibilities.	1	2	3	4	5	6	7
8. Emotions are one of the things that make my life worth living.	1	2	3	4	5	6	7
9. I am aware of my emotions as I experience them.	1	2	3	4	5	6	7
10. I expect good things to happen.	1	2	3	4	5	6	7
11. I like to share my emotions with others.	1	2	3	4	5	6	7
12. When I experience a positive emotion, I know how to make it last.	1	2	3	4	5	6	7
13. I arrange events others enjoy.	1	2	3	4	5	6	7
14. I seek out activities that make me happy.	1	2	3	4	5	6	7
15. I am aware of the non-verbal messages I send to others.	1	2	3	4	5	6	7
16. I present myself in a way that makes a good impression on others.	1	2	3	4	5	6	7
17. When I am in a positive mood, solving problems is easy for me.	1	2	3	4	5	6	7
18. By looking at their facial expressions, I recognize the emotions people are experiencing.	1	2	3	4	5	6	7
19. I know why my emotions change.	1	2	3	4	5	6	7
20. When I am in a positive mood, I am able to come up with new ideas.	1	2	3	4	5	6	7
21. I have control over my emotions.	1	2	3	4	5	6	7
22. I easily recognize my emotions as I experience them.	1	2	3	4	5	6	7
23. I motivate myself by imaging a good outcome to tasks I take on.	1	2	3	4	5	6	7
24. I compliment others when they have done something well.	1	2	3	4	5	6	7
25. I am aware of the non-verbal messages other people send.	1	2	3	4	5	6	7
26. 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.	1	2	3	4	5	6	7
27. When I feel a change in emotions, I tend to come up with new ideas.	1	2	3	4	5	6	7
28. When I am faced with a challenge, I give up because I believe I will fail.	1	2	3	4	5	6	7

29. I know what other people are feeling just by looking at them.	1	2	3	4	5	6	7
30. I help other people feel better when they are down.	1	2	3	4	5	6	7
31. I use good moods to help myself keep trying in the face of obstacles.	1	2	3	4	5	6	7
32. I can tell how people are feeling by listening to the tone of their voice.	1	2	3	4	5	6	7
33. It is difficult for me to understand why people feel the way they do.	1	2	3	4	5	6	7

Appendix B

TMMS

INSTRUCTIONS: Please read each statement and decide whether or not you agree with it. Answer by putting a circle around the number that best shows how much you agree or disagree with each statement.

1 Completely Disagree	2	3	4	5	6	7 Completely Agree
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1. I try to think good thoughts no matter how badly I feel.	1	2	3	4	5	6	7
2. People would be better off if they felt less and thought more.	1	2	3	4	5	6	7
3. I don't think it's worth paying attention to your emotions or moods.	1	2	3	4	5	6	7
4. I don't usually care much about what I'm feeling.	1	2	3	4	5	6	7
5. Sometimes I can't tell what my feelings are.	1	2	3	4	5	6	7
6. I am rarely confused about how I feel.	1	2	3	4	5	6	7
7. Feelings give direction to life.	1	2	3	4	5	6	7
8. Although I am sometimes sad, I have a mostly optimistic outlook.	1	2	3	4	5	6	7
9. When I am upset I realize that the "good things in life" are illusions.	1	2	3	4	5	6	7
10. I believe in acting from the heart.	1	2	3	4	5	6	7
11. I can never tell how I feel.	1	2	3	4	5	6	7
12. The best way for me to handle my feelings is to experience them to the fullest.	1	2	3	4	5	6	7
13. When I become upset I remind myself of all the pleasures in life.	1	2	3	4	5	6	7
14. My beliefs and opinions always seem to change depending on how I feel.	1	2	3	4	5	6	7
15. I am often aware of my feelings on a matter.	1	2	3	4	5	6	7
16. I am usually confused about how I feel.	1	2	3	4	5	6	7
17. One should never be guided by emotions.	1	2	3	4	5	6	7
18. I never give into my emotions.	1	2	3	4	5	6	7
19. Although I am sometimes happy, I have a mostly pessimistic outlook.	1	2	3	4	5	6	7
20. I feel at ease about my emotions.	1	2	3	4	5	6	7
21. I pay a lot of attention to how I feel.	1	2	3	4	5	6	7
22. I can't make sense out of my feelings.	1	2	3	4	5	6	7
23. I don't pay much attention to my feelings.	1	2	3	4	5	6	7
24. I often think about my feelings.	1	2	3	4	5	6	7
25. I am usually very clear about my feelings.	1	2	3	4	5	6	7
26. No matter how badly I feel, I try to think about pleasant things.	1	2	3	4	5	6	7
27. Feelings are a weakness humans have.	1	2	3	4	5	6	7
28. I usually know my feelings about a matter.	1	2	3	4	5	6	7

29. It is usually a waste of time to think about your emotions.	1	2	3	4	5	6	7
30. I almost always know exactly how I am feeling.	1	2	3	4	5	6	7

Appendix C

TEIQue-EPE

INSTRUCTIONS: Please answer by putting a circle around the number that best shows how much you agree or disagree with each statement. Give high marks if you agree and low marks if you disagree. Do not think too long about the exact meaning of the statements. Work quickly, but carefully. There are no right or wrong answers.

	1 Completely Disagree	2	3	4	5	6	7 Completely Agree
1. I usually find it difficult to express my emotions the way I would like to.	1	2	3	4	5	6	7
2. Understanding the needs and desires of others is not a problem for me.	1	2	3	4	5	6	7
8. I often find it difficult to recognize what emotion I'm feeling.	1	2	3	4	5	6	7
16. I'm usually able to share my deep feelings with others.	1	2	3	4	5	6	7
17. I often find it difficult to see things from another person's viewpoint.	1	2	3	4	5	6	7
23. Just by looking at somebody, I can understand what he or she feels.	1	2	3	4	5	6	7
31. I find it difficult to speak about my intimate feelings even to my closest friends.	1	2	3	4	5	6	7
32. Imagining myself in someone else's position is not a problem for me.	1	2	3	4	5	6	7
38. I can identify an emotion from the moment it starts to develop in me.	1	2	3	4	5	6	7
46. Generally, I find it easy to tell others how much they really mean to me.	1	2	3	4	5	6	7
47. On the whole, I'm able to identify myself with others.	1	2	3	4	5	6	7
53. Generally, I find it difficult to know exactly what emotion I'm feeling.	1	2	3	4	5	6	7
61. Expressing my emotions with words is not a problem for me.	1	2	3	4	5	6	7
62. Even when I'm arguing with someone, I'm usually able to take their perspective.	1	2	3	4	5	6	7
68. I'm never really sure what I'm feeling.	1	2	3	4	5	6	7
76. I want to tell someone when I love them, but it is hard to find the right words.	1	2	3	4	5	6	7
77. I'm normally able to "get into someone's shoes" and experience their emotions.	1	2	3	4	5	6	7
83. I'm generally aware of my emotions as I experience them.	1	2	3	4	5	6	7
91. It is easy for me to find the right words to describe my feelings.	1	2	3	4	5	6	7
92. I find it difficult to understand why some people get upset with certain things.	1	2	3	4	5	6	7
98. I'm generally clear about my feelings.	1	2	3	4	5	6	7
106. Others tell me that I rarely speak about how I feel.	1	2	3	4	5	6	7
107. When I argue with someone, I can only see my point of view.	1	2	3	4	5	6	7
113. I'm able to "read" most people's feelings like an open book.	1	2	3	4	5	6	7
121. I often find it difficult to show my affection to the people close to me.	1	2	3	4	5	6	7
122. I find it difficult not to feel sad when someone tells me about something bad that happened to them.	1	2	3	4	5	6	7

127. I normally find it difficult to take notice of other people's emotions.	1	2	3	4	5	6	7
134. I'm usually able to express my emotions when I want to.	1	2	3	4	5	6	7
138. On the whole, I find it difficult to describe my feelings.	1	2	3	4	5	6	7

Appendix D

3M40

How Accurately Can You Describe Yourself?

Please use this list of common human traits to describe yourself as accurately as possible. Describe yourself as you see yourself at the present time, not as you wish to be in the future. Describe yourself as you are generally or typically, as compared with other persons you know of the same sex and of roughly your same age.

For each question, ask yourself: "does this word apply to me"? Then CIRCLE a number to indicate how accurately each adjective describes you, using the following rating scale:

1 Extremely Inaccurate (does not apply at all)	2 Very Inaccurate	3 Moderately Inaccurate	4 Slightly Inaccurate	5 Neither Accurate nor Inaccurate (or unsure)	6 Slightly Accurate	7 Moderately Accurate	8 Very Accurate	9 Extremely Accurate (applies very strongly)
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Bashful	1	2	3	4	5	6	7	8	9	Energetic	1	2	3	4	5	6	7	8	9
Moody	1	2	3	4	5	6	7	8	9	Systematic	1	2	3	4	5	6	7	8	9
Bold	1	2	3	4	5	6	7	8	9	Envious	1	2	3	4	5	6	7	8	9
Organized	1	2	3	4	5	6	7	8	9	Talkative	1	2	3	4	5	6	7	8	9
Careless	1	2	3	4	5	6	7	8	9	Extraverted	1	2	3	4	5	6	7	8	9
Philosophical	1	2	3	4	5	6	7	8	9	Temperamental	1	2	3	4	5	6	7	8	9
Cold	1	2	3	4	5	6	7	8	9	Fretful	1	2	3	4	5	6	7	8	9
Practical	1	2	3	4	5	6	7	8	9	Touchy	1	2	3	4	5	6	7	8	9
Complex	1	2	3	4	5	6	7	8	9	Harsh	1	2	3	4	5	6	7	8	9
Quiet	1	2	3	4	5	6	7	8	9	Uncreative	1	2	3	4	5	6	7	8	9
Cooperative	1	2	3	4	5	6	7	8	9	Imaginative	1	2	3	4	5	6	7	8	9
Relaxed	1	2	3	4	5	6	7	8	9	Unenvious	1	2	3	4	5	6	7	8	9
Creative	1	2	3	4	5	6	7	8	9	Inefficient	1	2	3	4	5	6	7	8	9
Rude	1	2	3	4	5	6	7	8	9	Unintellectual	1	2	3	4	5	6	7	8	9
Deep	1	2	3	4	5	6	7	8	9	Intellectual	1	2	3	4	5	6	7	8	9
Shy	1	2	3	4	5	6	7	8	9	Unsympathetic	1	2	3	4	5	6	7	8	9
Disorganized	1	2	3	4	5	6	7	8	9	Jealous	1	2	3	4	5	6	7	8	9
Sloppy	1	2	3	4	5	6	7	8	9	Warm	1	2	3	4	5	6	7	8	9
Efficient	1	2	3	4	5	6	7	8	9	Kind	1	2	3	4	5	6	7	8	9

Sympathetic	1	2	3	4	5	6	7	8	9		Withdrawn	1	2	3	4	5	6	7	8	9
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Appendix E

Letter Series Test (LS)

Directions: **Say** “I am going to show you some series of letters. Your task is to say what should be the next letter in the series. Here are two examples”. Show the participant the examples but cover the test items with a sheet of paper. **Say** “You can see that in the first example the next letter in the series would be ‘G’. In the second example the next letter would be ‘A’ because you must follow a rule that after ‘Z’ the alphabet starts again at ‘A’. Do you understand the rule and what you must do?” If the person answers “No” repeat the instructions, otherwise **say** “After each answer I want you to tell me how confident you are that you are correct. A guess corresponds closely to 0% confidence so you should give this as your rating. Absolute certainty corresponds to 100% confidence. Please make your choice from the ratings provided on the sheet. You will have four minutes to complete this test. Please work as quickly and accurately as you can”. Remove the cover sheet, start timing and record the participant’s responses on their score sheet. After four minutes **say** “Please stop now, the time limit for this test is up

Sample items

Example 1: A B C D E F ?

Example 2: U V W X Y Z ?

Item 1: J K L M N O P Q ?

Item 2: C C Z C C Y C C X C C ?

Appendix F

Esoteric Analogies Test (EA)

Directions: Show the participant the example, but cover the test items with a sheet of paper. **Say** “In this test you will be shown three words in the same manner as the example. There is always a relationship between the first two words. In the example, **LIGHT** and **DARK** are opposites. Your task is to find this relationship and then choose, from the alternatives on the right of the sheet, the word which best shares that relationship with the third word. In the example you would look for a word that was opposite to **HAPPY**. In this case the best answer would be **SAD**”. Ask the participant if they understand the procedure, if they answer "No", repeat the instructions. When the person understands, **say** “After each answer I want you to tell me how confident you are that you are correct. There are 4 alternative answers, so a guess corresponds to 25% confidence, and absolute certainty corresponds to 100% confidence. Please make your choice from the ratings provided. You will have only four minutes to complete this task, so please work as quickly and accurately as you can. There are questions on both sides of the sheet, so please turn over when you have finished the first side”. Uncover the test items, start timing and record the person's score. After four minutes have elapsed, say "Please stop now, the time limit for this test is up".

Sample items

Example: LIGHT is to DARK as HAPPY is to

GLAD SAD GAY EAGER

1. FIRE is to HOT as ICE is to

POLE COLD CREAM WHITE

2. LOVE is to HATE as FRIEND is to

LOVER PAL OBEY ENEMY

Appendix G

Pre-Task DSSQ

STATE QUESTIONNAIRE

General Instructions. This questionnaire is concerned with your feelings and thoughts at the moment. We would like to build up a detailed picture of your current state of mind, so there are quite a few questions, divided into four sections. Please answer **every** question, even if you find it difficult. Answer, as honestly as you can, what is true of **you**. Please do not choose a reply just because it seems like the 'right thing to say'. Your answers will be kept entirely confidential. Also, be sure to answer according to how you feel **AT THE MOMENT**. Don't just put down how you usually feel. You should try and work quite quickly: there is no need to think very hard about the answers. The first answer you think of is usually the best.

Before you start, please provide some general information about yourself.

Age..... (years)

Sex. M F (Circle one)

Occupation.....

If student, state your course.....

Date today.....

Time of day now.....

First, there is a list of words which describe people's moods or feelings. Please indicate how well each word describes how you feel **AT THE MOMENT**. For each word, circle the answer from 1 to 4 which best describes your mood.

1. MOOD STATE				
	Definitely	Slightly	Slightly Not	Definitely Not
1. Happy	1	2	3	4
2. Dissatisfied	1	2	3	4
3. Energetic	1	2	3	4
4. Relaxed	1	2	3	4
5. Alert	1	2	3	4
6. Nervous	1	2	3	4
7. Passive	1	2	3	4
8. Cheerful	1	2	3	4
9. Tense	1	2	3	4
10. Jittery	1	2	3	4
11. Sluggish	1	2	3	4
12. Sorry	1	2	3	4
13. Composed	1	2	3	4
14. Depressed	1	2	3	4
15. Restful	1	2	3	4
16. Vigorous	1	2	3	4
17. Anxious	1	2	3	4
18. Satisfied	1	2	3	4
19. Unenterprising	1	2	3	4
20. Sad	1	2	3	4
21. Calm	1	2	3	4
22. Active	1	2	3	4
23. Contented	1	2	3	4

24. Tired	1	2	3	4
25. Impatient	1	2	3	4
26. Annoyed	1	2	3	4
27. Angry	1	2	3	4
28. Irritated	1	2	3	4
29. Grouchy	1	2	3	4

Please answer some questions about your attitude to the task you are about to do. Rate your agreement with the following statements by circling one of the following answers:

Extremely = 4 Very much = 3 Somewhat = 2 A little bit = 1 Not at all = 0

2. MOTIVATION					
1. I expect the content of the task will be interesting	0	1	2	3	4
2. The only reason to do the task is to get an external reward (e.g. payment)	0	1	2	3	4
3. I would rather spend the time doing the task on something else	0	1	2	3	4
4. I am concerned about not doing as well as I can	0	1	2	3	4
5. I want to perform better than most people do	0	1	2	3	4
6. I will become fed up with the task	0	1	2	3	4
7. I am eager to do well	0	1	2	3	4
8. I would be disappointed if I failed to do well on the task	0	1	2	3	4
9. I am committed to attaining my performance goals	0	1	2	3	4
10. Doing the task is worthwhile	0	1	2	3	4
11. I expect to find the task boring	0	1	2	3	4
12. I feel apathetic about my performance	0	1	2	3	4
13. I want to succeed on the task	0	1	2	3	4
14. The task will bring out my competitive drives	0	1	2	3	4
15. I am motivated to do the task	0	1	2	3	4

In this section, we are concerned with your thoughts about yourself: how your mind is working, how confident you feel, and how well you expect to perform on the task. Below are some statements which may describe your style of thought **RIGHT NOW**. Read each one carefully and indicate how true each statement is of your thoughts **AT THE MOMENT**. To answer, circle one of the following answers:

Extremely = 4 Very much = 3 Somewhat = 2 A little bit = 1 Not at all = 0

3. THINKING STYLE					
1. I'm trying to figure myself out.	0	1	2	3	4
2. I'm very aware of myself.	0	1	2	3	4
3. I'm reflecting about myself.	0	1	2	3	4
4. I'm daydreaming about myself.	0	1	2	3	4
5. I'm thinking deeply about myself.	0	1	2	3	4
6. I'm attending to my inner feelings.	0	1	2	3	4
7. I'm examining my motives.	0	1	2	3	4
8. I feel that I'm off somewhere watching myself.	0	1	2	3	4
9. I feel confident about my abilities.	0	1	2	3	4
10. I am worried about whether I am regarded as a success or failure.	0	1	2	3	4
11. I feel self-conscious.	0	1	2	3	4
12. I feel as smart as others.	0	1	2	3	4
13. I am worried about what other people think of me.	0	1	2	3	4
14. I feel confident that I understand things.	0	1	2	3	4
15. I feel inferior to others at this moment.	0	1	2	3	4
16. I feel concerned about the impression I am making.	0	1	2	3	4
17. I feel that I have less scholastic ability right now than others.	0	1	2	3	4
18. I am worried about looking foolish.	0	1	2	3	4
19. My attention is directed towards things other than the task.	0	1	2	3	4
20. I am finding physical sensations such as muscular tension distracting.	0	1	2	3	4
21. I expect my performance will be impaired by thoughts irrelevant to the task.	0	1	2	3	4
22. I have too much to think about to be able to concentrate on the task.	0	1	2	3	4
23. My thinking is generally clear and sharp.	0	1	2	3	4
24. I will find it hard to maintain my concentration for more than a short time.	0	1	2	3	4
25. My mind is wandering a great deal.	0	1	2	3	4
26. My thoughts are confused and difficult to control.	0	1	2	3	4
27. I expect to perform proficiently on this task.	0	1	2	3	4
28. Generally, I feel in control of things.	0	1	2	3	4
29. I can handle any difficulties I encounter	0	1	2	3	4
30. I consider myself skillful at the task	0	1	2	3	4

This set of questions concerns the kinds of thoughts that go through people's heads at particular times, for example while they are doing some task or activity. Below is a list of thoughts, some of which you might have had recently. Please indicate roughly how often you had each thought **DURING THE LAST TEN MINUTES** or so, by circling a number from the list below.

1= Never 2= Once 3= A few times 4= Often 5= Very often

4. THINKING CONTENT					
1. I thought about how I should work more carefully.	1	2	3	4	5
2. I thought about how much time I had left.	1	2	3	4	5
3. I thought about how others have done on this task.	1	2	3	4	5
4. I thought about the difficulty of the problems.	1	2	3	4	5
5. I thought about my level of ability.	1	2	3	4	5
6. I thought about the purpose of the experiment.	1	2	3	4	5
7. I thought about how I would feel if I were told how I performed.	1	2	3	4	5
8. I thought about how often I get confused.	1	2	3	4	5
9. I thought about members of my family.	1	2	3	4	5
10. I thought about something that made me feel guilty.	1	2	3	4	5
11. I thought about personal worries.	1	2	3	4	5
12. I thought about something that made me feel angry.	1	2	3	4	5
13. I thought about something that happened earlier today.	1	2	3	4	5
14. I thought about something that happened in the recent past (last few days, but not today).	1	2	3	4	5
15. I thought about something that happened in the distant past	1	2	3	4	5
16. I thought about something that might happen in the future.	1	2	3	4	5

Appendix H

Stimulus Examples

Appendix I

Table I-1.

Messages spoken by animated characters in multi-cue discrimination learning task

Message Elements	Source
<p>Sentence Stems</p> <p>I am a:</p> <p>I'm from:</p> <p>I'm planning a trip to:</p> <p>My favorite sport is:</p> <p>My name is:</p>	<p>Experimenter chose for relevance of personal information and benign nature.</p>
Categories and Sentence Completions	
<p>Occupations</p> <p>Financial Advisor</p> <p>Pharmacist</p> <p>Security Guard</p> <p>Software Developer</p> <p>Telemarketer</p>	<p>Experimenter chose one occupation from each of the top four Browse Categories on the Yahoo! Hot Jobs website, plus an occupation from one additional category listed under the "More..." Category. Retrieved July 12, 2005 from http://hotjobs.yahoo.com/</p>
<p>Location of Residence (rank)</p> <p>Fort Worth, TX (20)</p> <p>Las Vegas, NV (30)</p> <p>Miami, FL (45)</p> <p>San Jose, CA (11)</p> <p>Seattle, WA (24)</p>	<p>Experimenter chose five cities at random from among the top 50 Cities in the U.S. by population and rank. Retrieved July 12, 2005 from http://www.infoplease.com/ipa/A0763098.html</p>
<p>Destination for Trip (rank)</p> <p>Charlotte, NC (21)</p> <p>Colorado Springs, CO (47)</p> <p>Denver, CO (26)</p> <p>Detroit, MI (10)</p> <p>El Paso, TX (22)</p>	<p>Experimenter chose five cities at random from among the top 50 Cities in the U.S. by population and rank. Retrieved July 12, 2005 from http://www.infoplease.com/ipa/A0763098.html</p>
<p>Sports (rank)</p> <p>Baseball (4)</p> <p>Basketball (3)</p> <p>Golf (1)</p> <p>Soccer (5)</p> <p>Tennis (2)</p>	<p>Experimenter chose the five most popular American spectator sports. Retrieved July 12, 2005 from http://www.snap.com/snap_frame.php?url=http%3%A%2F%2Fwww.veryhappening.com%2Ftypes%2Fsport%2F&query=most+popular+sport&rank=2</p>
<p>Names: First Name (formal; rank), Surname (rank)</p> <p>Bill (William; 5) Jones (4)</p> <p>Bob (Robert; 3) Williams (3)</p> <p>Jim (James; 1) Brown (5)</p> <p>John (2) Johnson (2)</p> <p>Mike (Michael; 4) Smith (1)</p>	<p>Experimenter chose the five most common American male names and surnames, and randomly paired the first names with the surnames. Retrieved July 12, 2005 from http://www.lifesmith.com/comnames.html</p>

Appendix J

Emotion Difference Response Sheet (Pilot Study 1 & 2)

	no difference	moderate	extreme
1	<hr/>		
2	<hr/>		
3	<hr/>		
4	<hr/>		
5	<hr/>		
6	<hr/>		
7	<hr/>		
8	<hr/>		
9	<hr/>		
10	<hr/>		
11	<hr/>		
12	<hr/>		
13	<hr/>		

	no difference	moderate	extreme
14	<hr/>		
15	<hr/>		
16	<hr/>		
17	<hr/>		
18	<hr/>		
19	<hr/>		
20	<hr/>		
21	<hr/>		
22	<hr/>		
23	<hr/>		
24	<hr/>		
25	<hr/>		

Appendix K

Post-Task DSSQ

STATE QUESTIONNAIREGeneral Instructions

This questionnaire is concerned with your feelings and thoughts while you were performing the task. We would like to build up a detailed picture of your current state of mind, so there are quite a few questions, divided into four sections. Please answer every question, even if you find it difficult. Answer, as honestly as you can, what is true of you. Please do not choose a reply just because it seems like the 'right thing to say'. Your answers will be kept entirely confidential. Also, be sure to answer according to how you felt **WHILE PERFORMING THE TASK**. Don't just put down how you usually feel. You should try and work quite quickly: there is no need to think very hard about the answers. The first answer you think of is usually the best.

First, there is a list of words which describe people's moods or feelings. Please indicate how well each word describes how you felt **WHILE PERFORMING THE TASK**. For each word, circle the answer from 1 to 4 which best describes your mood.

1. MOOD STATE				
	Definitely	Slightly	Slightly Not	Definitely Not
1. Happy	1	2	3	4
2. Dissatisfied	1	2	3	4
3. Energetic	1	2	3	4
4. Relaxed	1	2	3	4
5. Alert	1	2	3	4
6. Nervous	1	2	3	4
7. Passive	1	2	3	4
8. Cheerful	1	2	3	4
9. Tense	1	2	3	4
10. Jittery	1	2	3	4
11. Sluggish	1	2	3	4
12. Sorry	1	2	3	4
13. Composed	1	2	3	4
14. Depressed	1	2	3	4
15. Restful	1	2	3	4
16. Vigorous	1	2	3	4
17. Anxious	1	2	3	4
18. Satisfied	1	2	3	4
19. Unenterprising	1	2	3	4
20. Sad	1	2	3	4
21. Calm	1	2	3	4
22. Active	1	2	3	4
23. Contented	1	2	3	4
24. Tired	1	2	3	4
25. Impatient	1	2	3	4

26. Annoyed	1	2	3	4
27. Angry	1	2	3	4
28. Irritated	1	2	3	4
29. Grouchy	1	2	3	4

Please answer the following questions about your attitude **to the task you have just done**. Rate your agreement with the following statements by circling one of the following answers:

Not at all = 0 A little bit = 1 Somewhat = 2 Very much = 3 Extremely = 4

2. MOTIVATION AND WORKLOAD					
1. The content of the task was interesting	0	1	2	3	4
2. The only reason to do the task is to get an external reward (e.g. payment)	0	1	2	3	4
3. I would rather have spent the time doing the task on something else	0	1	2	3	4
4. I was concerned about not doing as well as I can	0	1	2	3	4
5. I wanted to perform better than most people do	0	1	2	3	4
6. I became fed up with the task	0	1	2	3	4
7. I was eager to do well	0	1	2	3	4
8. I would be disappointed if I failed to do well on this task	0	1	2	3	4
9. I was committed to attaining my performance goals	0	1	2	3	4
10. Doing the task was worthwhile	0	1	2	3	4
11. I found the task boring	0	1	2	3	4
12. I felt apathetic about my performance	0	1	2	3	4
13. I wanted to succeed on the task	0	1	2	3	4
14. The task brought out my competitive drives	0	1	2	3	4
15. I was motivated to do the task	0	1	2	3	4

16. Please rate the MENTAL DEMAND of the task: How much mental and perceptual activity was required?									
low									high
1	2	3	4	5	6	7	8	9	10
17. Please rate the PHYSICAL DEMAND of the task: How much physical activity was required?									
low									high
1	2	3	4	5	6	7	8	9	10
18. Please rate the TEMPORAL DEMAND of the task: How much time pressure did you feel due to the pace at which the task elements occurred?									
low									high
1	2	3	4	5	6	7	8	9	10
19. Please rate your PERFORMANCE: How successful do you think you were in accomplishing the goals of the task?									
low									high
1	2	3	4	5	6	7	8	9	10
20. Please rate your EFFORT: How hard did you have to work (mentally and physically) to accomplish your level of performance?									
low									high
1	2	3	4	5	6	7	8	9	10
21. Please rate your FRUSTRATION: How discouraged, irritated, stressed and annoyed did you feel during the task?									
low									high

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

In this section, we are concerned with your thoughts about yourself: how your mind is working, how confident you feel, and how well you believed you performed on the task. Below are some statements which may describe your style of thought during task performance. Read each one carefully and indicate how true each statement was of your thoughts **WHILE PERFORMING THE TASK**. To answer circle one of the following answers:

Not at all = 0 A little bit = 1 Somewhat = 2 Very much = 3 Extremely = 4

3. THINKING STYLE					
1. I tried to figure myself out.	0	1	2	3	4
2. I was very aware of myself.	0	1	2	3	4
3. I reflected about myself.	0	1	2	3	4
4. I daydreamed about myself.	0	1	2	3	4
5. I thought deeply about myself.	0	1	2	3	4
6. I attended to my inner feelings.	0	1	2	3	4
7. I examined my motives.	0	1	2	3	4
8. I felt that I was off somewhere watching myself.	0	1	2	3	4
9. I felt confident about my abilities.	0	1	2	3	4
10. I was worried about whether I am regarded as a success or failure.	0	1	2	3	4
11. I felt self-conscious.	0	1	2	3	4
12. I felt as smart as others.	0	1	2	3	4
13. I was worried about what other people think of me.	0	1	2	3	4
14. I felt confident that I understood things.	0	1	2	3	4
15. I felt inferior to others.	0	1	2	3	4
16. I felt concerned about the impression I was making.	0	1	2	3	4
17. I felt that I had less scholastic ability than others.	0	1	2	3	4
18. I was worried about looking foolish.	0	1	2	3	4
19. My attention was directed towards things other than the task.	0	1	2	3	4
20. I found physical sensations such as muscular tension distracting.	0	1	2	3	4
21. My performance was impaired by thoughts irrelevant to the task.	0	1	2	3	4
22. I had too much to think about to be able to concentrate on the task.	0	1	2	3	4
23. My thinking was generally clear and sharp.	0	1	2	3	4
24. I found it hard to maintain my concentration for more than a short time.	0	1	2	3	4
25. My mind wandered a great deal.	0	1	2	3	4
26. My thoughts were confused and difficult to control	0	1	2	3	4
27. I performed proficiently on this task.	0	1	2	3	4
28. Generally, I felt in control of things.	0	1	2	3	4
29. I was able to handle any difficulties I encountered	0	1	2	3	4
30. I consider myself skillful at the task	0	1	2	3	4

This set of questions concerns the kinds of thoughts that go through people's heads at particular times, for example while they are doing some task or activity. Below is a list of thoughts, some of which you might have had recently. Please indicate roughly how often you had each thought during **THE LAST TEN MINUTES** (while performing the task), by circling a number from the list below.

1= Never 2= Once 3= A few times 4= Often 5= Very often

4. THINKING CONTENT					
1. I thought about how I should work more carefully.	1	2	3	4	5
2. I thought about how much time I had left.	1	2	3	4	5
3. I thought about how others have done on this task.	1	2	3	4	5
4. I thought about the difficulty of the problems.	1	2	3	4	5
5. I thought about my level of ability.	1	2	3	4	5
6. I thought about the purpose of the experiment.	1	2	3	4	5
7. I thought about how I would feel if I were told how I performed.	1	2	3	4	5
8. I thought about how often I get confused.	1	2	3	4	5
9. I thought about members of my family.	1	2	3	4	5
10. I thought about something that made me feel guilty.	1	2	3	4	5
11. I thought about personal worries.	1	2	3	4	5
12. I thought about something that made me feel angry.	1	2	3	4	5
13. I thought about something that happened earlier today.	1	2	3	4	5
14. I thought about something that happened in the recent past (last few days, but not today).	1	2	3	4	5
15. I thought about something that happened in the distant past.	1	2	3	4	5
16. I thought about something that might happen in the future.	1	2	3	4	5

Next, please answer some questions about the task. Please indicate what you thought of the task while you were performing it. Please try to rate the task itself rather than your personal reactions to it. For each adjective or sentence circle the appropriate number, on the six point scales provided (where 0 = not at all to 5 = very much so).

Threatening	0	1	2	3	4	5		Enjoyable	0	1	2	3	4	5
Fearful	0	1	2	3	4	5		Exhilarating	0	1	2	3	4	5
Worrying	0	1	2	3	4	5		Informative	0	1	2	3	4	5
Frightening	0	1	2	3	4	5		Challenging	0	1	2	3	4	5
Terrifying	0	1	2	3	4	5		Stimulating	0	1	2	3	4	5
Hostile	0	1	2	3	4	5		Exciting	0	1	2	3	4	5

The task was a situation:

Which was likely to get out of control	0	1	2	3	4	5
In which you were unsure of how much influence you have	0	1	2	3	4	5
In which somebody else was to blame for difficulties	0	1	2	3	4	5
In which you had to hold back from doing what you really want	0	1	2	3	4	5
Which you could deal with effectively	0	1	2	3	4	5
In which efforts to change the situation tended to make it worse	0	1	2	3	4	5
In which other people made it difficult to deal with the problem	0	1	2	3	4	5
Which was just too much for you to cope with	0	1	2	3	4	5

Finally, think about how you dealt with any difficulties or problems which arose while you were performing the task. Below are listed some options for dealing with problems such as poor performance or negative reactions to doing the task. Please indicate how much you used each option, specifically as a **deliberately chosen way of dealing with problems**. To answer circle one of the following answers:

Not at all = 0 A little bit = 1 Somewhat = 2 Very much = 3 Extremely = 4

6. DEALING WITH PROBLEMS					
1. I worked out a strategy for successful performance	0	1	2	3	4
2. I worried about what I would do next	0	1	2	3	4
3. I stayed detached or distanced from the situation	0	1	2	3	4
4. I decided to save my efforts for something more worthwhile	0	1	2	3	4
5. I blamed myself for not doing better	0	1	2	3	4
6. I became preoccupied with my problems	0	1	2	3	4
7. I concentrated hard on doing well	0	1	2	3	4
8. I focused my attention on the most important parts of the task	0	1	2	3	4
9. I acted as though the task wasn't important	0	1	2	3	4
10. I didn't take the task too seriously	0	1	2	3	4
11. I wished that I could change what was happening	0	1	2	3	4
12. I blamed myself for not knowing what to do	0	1	2	3	4
13. I worried about my inadequacies	0	1	2	3	4
14. I made every effort to achieve my goals	0	1	2	3	4
15. I blamed myself for becoming too emotional	0	1	2	3	4
16. I was single-minded and determined in my efforts to overcome any problems	0	1	2	3	4
17. I gave up the attempt to do well	0	1	2	3	4
18. I told myself it wasn't worth getting upset	0	1	2	3	4
19. I was careful to avoid mistakes	0	1	2	3	4
20. I did my best to follow the instructions for the task	0	1	2	3	4
21. I decided there was no point in trying to do well	0	1	2	3	4

Appendix L

Emotion Discrimination Response Sheet

1	Positive	Negative	11	Positive	Negative
2	Positive	Negative	12	Positive	Negative
3	Positive	Negative	13	Positive	Negative
4	Positive	Negative	14	Positive	Negative
5	Positive	Negative	15	Positive	Negative
6	Positive	Negative	16	Positive	Negative
7	Positive	Negative	17	Positive	Negative
8	Positive	Negative	18	Positive	Negative
9	Positive	Negative	19	Positive	Negative
10	Positive	Negative	20	Positive	Negative

Appendix M

Table M-1.

Correlations between emotional intelligence and subjective state in each experimental condition measured before and after the multi-cue discrimination learning task

	Subjective State (DSSQ ¹)					
	Pre-task			Post-task		
	Worry	Engage	Distress	Worry	Engage	Distress
TMMS ² Attention to Emotion						
happy	.173	.129	-.214	.134	.138	.047
sad	.031	.224	-.250	.265*	.148	-.187
neutral	-.059	.150	-.241	-.062	.139	.127
TMMS Clarity of Emotion						
happy	-.113	.257*	-.341**	.017	.003	-.117
sad	-.267*	.346**	-.499***	.080	.045	-.349**
neutral	-.214	.167	-.474***	-.223	.094	-.365**
TMMS Emotion Repair						
happy	-.070	.283*	-.534***	.177	.099	-.197
sad	-.112	.474***	-.456***	.137	.204	-.237
neutral	-.168	.269*	-.565***	-.147	.047	-.263*
EPE ³ Expression of Emotion						
happy	.003	.227	-.476***	-.021	.015	-.146
sad	-.066	.153	-.242	.190	.161	-.169
neutral	-.156	.125	-.226	-.051	.086	-.184
EPE Perception of Emotion						
happy	.100	.320*	-.349**	.123	.078	-.213
sad	-.124	.294*	-.492***	.176	.056	-.400**
neutral	-.234	.208	-.466***	-.247	.140	-.285*
EPE Empathy						
happy	.317*	.228	-.187	.203	.104	.007
sad	-.057	.296*	-.212	.082	.343**	-.116
neutral	-.308*	.292*	-.365**	-.280*	.011	-.135
SEIS ⁴ Expression of Emotion						
happy	.266*	.146	-.317*	.214	-.024	-.104
sad	-.107	.297*	-.445***	.108	.300*	-.297*
neutral	-.145	.184	-.431**	-.157	-.017	-.217
SEIS Regulation of Emotion						
happy	.169	.265*	-.447***	.432**	.109	-.244
sad	-.129	.488***	-.500***	.067	.166	-.252
neutral	-.082	.249	-.633***	-.164	.038	-.420**
SEIS Use of Emotion						
happy	.299*	.264*	-.366**	.298*	.019	-.216
sad	-.006	.399**	-.400**	.155	.165	-.281*
neutral	-.024	.352**	-.498***	.000	.227	-.087
SEIS Total						
happy	.299*	.212	-.422**	.358**	-.009	-.175
sad	-.104	.426**	-.530***	.122	.252	-.339*
neutral	-.112	.276*	-.590***	-.146	.060	-.296*

¹ Dundee Stress State Questionnaire (Matthews et al., 1999); ² Trait Meta-Mood Scale (Salovey et al., 1995); ³ Trait EI Questionnaire (Petrides et al., 2003); ⁴ Schutte EI Scale (Schutte et al., 1998)

* $p < .05$; ** $p < .01$; *** $p < .001$

Appendix N

Table N-1.

Correlations between emotional intelligence and coping styles in each experimental condition measured after the multi-cue discrimination learning task

	DSSQ ¹ Coping Styles		
	Task-Focused	Emotion-Focused	Avoidance
TMMS ² Attention to Emotion			
happy	.066	.092	.067
sad	.186	.142	.096
neutral	.270*	.066	.005
TMMS Clarity of Emotion			
happy	.228	-.136	-.071
sad	.251	-.098	-.093
neutral	.194	-.318*	-.125
TMMS Emotion Repair			
happy	.200	.064	-.257*
sad	.113	-.061	.111
neutral	.117	-.140	-.024
EPE ³ Expression of Emotion			
happy	.090	-.052	-.090
sad	.207	.064	-.242
neutral	.077	-.232	-.186
EPE Perception of Emotion			
happy	.133	-.114	-.171
sad	.193	-.167	-.004
neutral	.136	-.303*	-.209
EPE Empathy			
happy	.095	.021	-.178
sad	.174	.050	.055
neutral	.176	-.294*	-.338**
SEIS ⁴ Expression of Emotion			
happy	-.044	-.014	-.058
sad	.262*	-.118	-.045
neutral	.156	-.169	-.129
SEIS Regulation of Emotion			
happy	.178	.098	-.098
sad	.284*	-.128	-.003
neutral	.176	-.260*	-.015
SEIS Use of Emotion			
happy	.188	.207	.106
sad	.150	-.054	.156
neutral	.394**	.041	-.087
SEIS Total			
happy	.056	.110	.040
sad	.296*	-.125	.001
neutral	.243	-.179	-.094

¹ Dundee Stress State Questionnaire (Matthews et al., 1999); ² Trait Meta-Mood Scale (Salovey et al., 1995); ³ Trait EI Questionnaire (Petrides et al., 2003); ⁴ Schutte EI Scale (Schutte et al., 1998)

* $p < .05$; ** $p < .01$; *** $p < .001$