THE EFFECTS OF EMOTIONAL INTELLIGENCE ON VISUAL SEARCH OF EMOTIONAL STIMULI AND EMOTION IDENTIFICATION

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Emotional intelligence (EI) refers to competencies in processing and managing emotion that may be important in security settings; facial emotions may betray criminals and terrorists. This study tested the hypothesis that high EI relates to superior detection and processing of facial emotion, in relation to two tasks: controlled visual search for designated facial emotions, and identification of micro-expressions of emotion. Participants completed scales for EI, as well as cognitive intelligence, personality, and coping. EI failed to predict performance on either task, contrary to the initial hypothesis. However, performance related to higher cognitive intelligence, the personality trait of openness, and use of task-focused coping. These measures related to faster visual search, and to greater accuracy in detecting facial micro-expressions. Practical considerations suggest selecting security agents who are high in conventional rather than emotional intelligence, and training use of task-focused coping. However, EI may be useful for selecting stress-tolerant agents.

INTRODUCTION

The security climate presently existing in the U.S. requires that security forces be proficient at identifying, and subsequently neutralizing, those individuals who pose a threat of violence or destruction. For example, agents may need to monitor the massive crowds that attend sporting events such as the World Series or the Super Bowl in order to detect people whose emotions may signal nefarious intentions. Indeed, a recent study (Fellner, Matthews, Warm, Zeidner, & Roberts, 2006) has shown that the ability to discriminate terrorists based upon emotional cues improved over time when feedback information was provided.

Emotional intelligence (EI) refers to many psychological functions frequently linked to personality, such as self-awareness, sensitivity to others, coping with stress, and more positive emotional experiences (Matthews, Zeidner, & Roberts, 2002). Theories of EI claim that individuals high in EI can identify facial emotions more quickly, and handle stressful encounters more successfully. However, to date, few studies have tested whether scales for EI are capable of predicting objective performance, although one study related EI to speed of detecting facial expressions (Petrides & Furnham, 2003). Even so, it is unclear whether measurement of EI offers the optimal strategy for assessment of emotion-processing competencies. Conventional intelligence may be equally predictive of processing emotional stimuli (Austin, 2005), as may standard personality traits, such as the “Big Five” (Saucier, 2003).

There are two psychometric obstacles to EI assessment also. First, EI may be operationalized as either an ability, typically measured by “right-or-wrong” items, or as a trait akin to personality, measured by questionnaire (Pérez, Petrides, & Furnham, 2005). Ability and trait measures fail to converge. Second, since measures of EI often overlap with personality and intelligence, it is important to control for these potential confounds in studies investigating the effect of EI on performance of cognitive tasks involving emotional stimuli (Petrides, Pérez-González, & Furnham, 2007).

Fellner et al. (2006) investigated how EI might affect the ability of security personnel to gauge the relevance of emotional cues in determining whether a suspect is a terrorist or not. 180 participants first completed a battery of tests of EI, personality, and cognitive ability. Subjective state was assessed pre- and post-task. 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. Results showed faster learning with emotive cues. While EI and personality failed to predict performance, EI did predict subjective state, which in turn predicted the rate of learning with emotive cues. This study suggests that practical techniques for security personnel should focus on how subjective states may impact attention to potentially relevant emotional cues that may reveal the status of a suspect.

The aim of the current study was to extend the Fellner et al. (2006) findings by investigating two additional features of emotional information-processing that might be important in a security setting. At issue was whether EI could predict performance on these emotion processing tasks independently of personality and intelligence. One task involved performing a visual search for a designated emotional (faces expressing various emotions) or non-emotional (a variety of common nuts) target stimulus. A “controlled” visual search paradigm was used; it is believed that controlled search requires an increasing allocation of attentional resources as search demands increase (Fisk & Schneider, 1983; Matthews, Davies, Westerman, & Stammers, 2000). At issue is whether high EI persons may have more resources available to attend to emotional stimuli. If so, EI should relate to processing face stimuli but not non-emotional (i.e., nut) stimuli.

Another task consisted of detecting short-lived micro-expressions (i.e., lasting 200 ms) in viewing video clips of facial emotions. Identifying facial emotion is a key competency allowing skilled evaluators to detect deceit based upon the inadvertent leakage of negative emotions (Ekman, Friesen, & O'Sullivan, 1988). Ekman (2003) has developed a program for training this competency; perhaps persons high in EI should show more rapid learning.

It was predicted that participants higher in EI would perform better at tasks with emotional stimuli (i.e., visual search for facial emotion, and detection of micro-expressions) even with cognitive ability and personality controlled. As a secondary aim, the study investigated subjective stress responses to performing the battery of cognitive tasks. It was predicted that emotionally intelligent individuals would be less vulnerable to states of stress.

METHOD

Participants

A total of 129 psychology students (79 women) aged 18-38 participated in this study. Participants were required to have normal or corrected-to-normal vision, and speak English as their primary language. Participants were treated ethically according to guidelines of the American Psychological Association (APA; 1992).

Design

This experiment consisted of a visual search task (Task 1) and an emotion identification task (Task 2). Task 1 used a 2×2×2 within-subjects factorial design (cue type × type of trial × display size). Cue types were nuts and facial emotions; types of trial were positive and negative; and display sizes were 1 and 4. The dependent variable was the response time on correct trials.

Task 2 used a one-factor repeated measures design, with three levels of practice. The dependent variable was the number of correct identifications of the micro-expression of emotion.

Apparatus, Materials, and Procedure

A test battery was administered prior to performance of Tasks 1 and 2. Self-reported EI was measured using a battery of questionnaires: selected scales from the Trait Emotional Intelligence Questionnaire (TEIQue; Pérez et al., 2005), the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995), and the Wong-Law Emotional Intelligence Scale (WLEIS; Wong & Law, 2002). These measures assess "trait EI", referring to EI as an element of personality (Petrides & Furnham, 2003). Additional scales included an adjectival measure of the Big Five personality traits (Saucier, 2003), and two scales of general intelligence, Esoteric Analogies and Letter Series (Stankov, 2000). Pre- and post-task subjective state (i.e., task engagement, distress, and worry) was assessed using the Dundee Stress State Questionnaire (DSSQ; Matthews, Campbell, et al., 2002). The post-task DSSQ also evaluates coping strategies (i.e., task-focused, emotion-focused, and avoidance coping).

A PC with a 16″ (40.64 cm) monitor was used for all tasks. For Task 1 the stimuli were 180 × 180 pixel images of five different types of nut (almond, cashew, hazelnut, peanut, pecan; non-emotional stimuli) and five different facial emotions (anger, fear, happiness, sadness, surprise; emotional stimuli). Positive and negative trials were presented within the same condition, thus yielding four conditions: nuts or faces with display size 1 or 4 (i.e., Nut 1, Face 1, Nut 4, Face 4). Each condition consisted of 20 practice trials on which response feedback was given, plus 100 test trials. Stimulus order was randomized for each participant. On each trial, a verbal category label was presented (e.g., PEANUT or ANGER) followed by a display containing either one image in the center of the screen, or four images in a 2 × 2 matrix in the center of the screen. The tasks required "controlled" search, in that S-R mappings were varied across trials. The participant pressed the 1 key if an instance of the category was found among the images or the 0 key if no category instance was found. Response time (RT; in ms) and accuracy of response were recorded.

Stimuli for Task 2 were facial images from the Micro-Expression Training Task (METT; Ekman, 2003) which briefly displayed (for 200 ms) one of seven emotions (anger, contempt, disgust, fear, happiness, sadness, surprise). Accuracy of detection was assessed at three stages. First, the participant's initial ability to recognize these emotions was tested. Next, the participant was shown short, slow motion video clips that demonstrated critical changes in the face for specific emotions, followed by practice at emotion recognition. This was followed by another series of slow motion demonstration video clips. Finally, the participant was retested on new facial images. Each level consisted of 14 facial stimuli.

After completing Tasks 1 and 2, participants completed the post-task DSSQ, to assess their subjective state and coping during performance. This protocol was approved by the Institutional Review Board of the University of Cincinnati.

RESULTS

Predictors of Performance

Effects of task parameters. For Task 1, a 2 (cue type) × 2 (positive vs. negative trial) × 2 (display size) repeated measures ANOVA was conducted on median reaction times (RTs) for correct trials. Significant main effects were found for all factors. Nuts were identified faster than facial emotions,

F (1, 116; Box-corrected df) = 846.89, $p < .001$; target stimuli were identified faster on positive trials, F (1, 116) = 432.14, $p < .001$; and target stimuli were identified faster with the smaller display size, F (1, 116) = 1043.66, $p < .001$. In addition, all 2-way and 3-way interactions were significant (ps < .001). As shown in Figure 1, these results indicate that task manipulations produced a pattern of results similar to those found in previous studies of controlled visual search tasks. RTs were faster with smaller displays and on positive trials (implying self-terminating search). Additionally, RTs were faster for non-emotional cues.

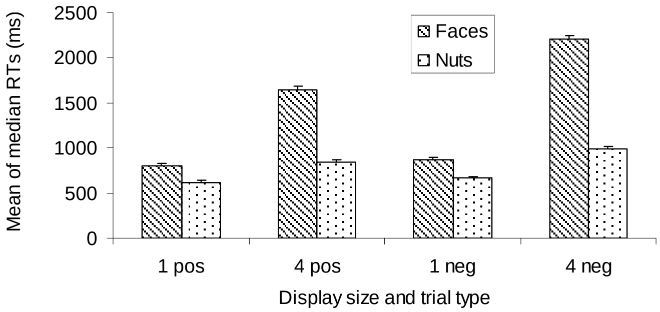

Figure 1. Effects of emotional and non-emotional stimuli on reaction times (RTs) for display size and trial type. Error bars represent condition-specific standard error of the mean.

For Task 2, a one-factor repeated measures ANOVA revealed a significant main effect for period, F (1.91, 244.79; Box-corrected df) = 62.37, $p < .001$. Post-hoc paired sample t-tests confirmed significant improvement in each successive period of measurement $t_{pretest\text{-}practice}(128) = -7.57$, $p < .001$; $t_{practice\text{-}posttest}(128) = -3.45$, $p < .01$ (see Figure 2).

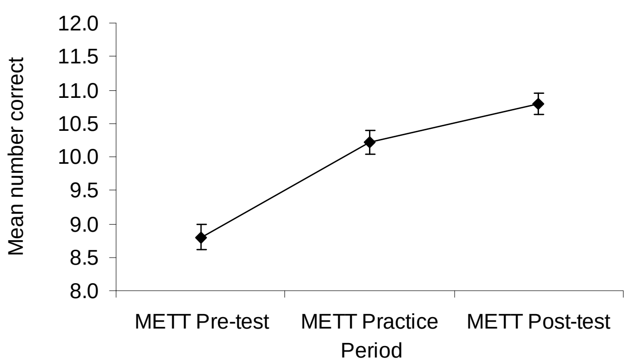

Figure 2. Mean number of correct emotion identifications by period. Error bars represent period-specific standard error of the mean.

Derivations of performance measures. RTs on positive and negative trials of each version of Task 1 were highly correlated (rs = .563-.911, ps < .001), so median RTs were averaged for the four combinations of stimulus type (nut, face) and display size (1, 4; i.e., Nut 1, Nut 4, Face 1, Face 4).

Correlates of performance: Personality and intelligence. EI failed to predict performance on either task. However, faster RTs on the visual search task, and greater accuracy on the emotion identification task (METT) were predicted consistently by Openness and Intelligence, especially the Esoteric Analogies subscale (see Table 1).

Table 1. *Correlations between performance tasks by condition, and personality and intelligence.*

	Openness	Letter Series	Esoteric Analogies
Visual Search (RT)			
Display size (1)			
Faces	-.183*	-.288**	-.266**
Nuts	-.203*	-.318**	-.284**
Display size (4)			
Faces	-.097	-.238**	-.211*
Nuts	-.181*	-.165	-.282**
METT (accuracy)			
Pre-test	.339*	.101	.242**
Practice	.089	.132	.279**
Post-test	.206*	.172	.221*

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

Correlates of performance: Coping strategy and subjective state. DSSQ task-focused coping was associated with faster RTs on the visual search task and greater accuracy on the emotion identification task (METT). Avoidance coping was associated with slower RTs on the visual search task (see Table 2). Emotion-focused coping was not correlated with performance. DSSQ post-task engagement was related to faster RTs in two visual search conditions (F1, N4), and a pattern of increasing accuracy on the METT.

Table 2. *Correlations between performance tasks by condition; and coping strategy, and post-task engagement.*

	Coping Strategy		
	Task-focused	Avoidance	Post-task Engagement
Visual Search (RT)			
Display size (1)			
Faces	-.240**	.277**	-.319**
Nuts	-.186*	.210*	-.127
Display size (4)			
Faces	-.068	.218*	-.139
Nuts	-.306**	.227*	-.198*
METT (accuracy)			
Pre-test	.194*	-.150	.102
Practice	.219*	-.131	.138
Post-test	.284**	-.120	.178*

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

EI and Subjective State

A secondary aim of this study was to test whether the EI measures would predict subjective state during task performance. The subscales of the EI measures used in this study were substantially intercorrelated. Consequently, for the purposes of this paper, scales from the TEIQue (Petrides & Furnham, 2003) will be used to illustrate patterns of association between EI and subjective state. All TEIQue subscales were fairly consistently related to lower worry and distress both pre- and post-task. In addition, the EI scales were reliably associated with emotion-focused and avoidance coping. Controlling for the Big Five reduced correlation magnitudes, but several associations between EI and state remained significant (see Table 3).

DISCUSSION

This study investigated whether emotional intelligence (EI) was related to the ability to quickly search for emotional stimuli, and to identify micro-expressions of facial emotions. Effects of task parameters were as expected for both tasks. In the visual search task, smaller display size and positive trials both yielded faster RTs. Likewise, non-emotional stimuli produced faster RTs. In the METT task, identification of fleeting emotions improved with training and practice. This finding is consistent with evidence that law enforcement officers improved at deceit detection following training (Ekman et al., 1988).

Table 3. *Correlations between EI and pre- and post-task subjective states and coping strategy, with Big Five controlled.*

	Emotion Expression	Emotion Perception	Empathy
Pre-task subjective state			
Worry	-.184*	-.248**	-.272**
Engagement	.166	.281**	.254**
Distress	-.281**	-.481**	-.374**
Post-task subjective state			
Worry	-.188*	-.288**	-.292**
Engagement	-.020	.127	.056
Distress	-.165	-.349**	-.308**
Coping strategy			
Emotion-focused	-.183*	-.252**	-.269**
Task-focused	.012	.038	-.034
Avoidance	-.235**	-.222**	-.300**

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

Self-reported EI failed to predict any of the performance indices, calling into question the utility of these scales for predicting individual differences in emotional processing (Fellner et al., 2006). The independence of the TEIQue emotion perception scale from METT performance adds to doubts about whether people can accurately report their own perception abilities (see Matthews, Zeidner, et al., 2002). While self-reported EI did not directly predict performance, it was related to both emotion-focused and avoidance coping, and to subjective states indicative of lower stress during task performance. It is unclear whether a less subjective EI measure would yield a different pattern of results.

By contrast, conventional intelligence and the personality trait Openness predicted most of the performance indices. The participants' choice of coping strategy also appeared to impact performance; task-focus was more effective than avoidance. Task engagement also predicted several performance indices. Notably, correlates of processing faces and nuts were similar. Thus, performance may reflect attentional factors, rather than facility in processing emotion per se. Data are consistent with previous findings, including studies of sustained attention, visual search (Matthews, Davies, & Lees, 1990) and emotion-processing (Fellner et al., 2006), that suggest task engagement provides an index of resource availability. The present data add to evidence that task engagement (and related coping strategies) may predict performance on a wide range of attentionally demanding tasks.

Intelligence may also relate to efficiency of attentional processes, and choice of coping strategy may influence how effectively attentional resources are deployed (Matthews et al., 2000).

The pattern of performance results observed between the emotional and non-emotional stimuli in the visual search task gives rise to speculation about the reason for that pattern. It might be that the emotional stimuli took longer to identify or find simply because faces, especially emotion-laden ones contain a much greater number of elements to be searched (Wickens & Hollands, 2000). Identifying facial emotions may require the observer to evaluate multiple facial elements, such as mouth, eyes, and facial musculature (Ekman, 2003). Future research could explore individual differences in performance with emotional and non-emotional stimuli whose visual complexity has been psychometrically matched (Marks, 1991).

The practical implication of the findings of this study is that it may be more important that individuals chosen for security agent jobs be higher in conventional intelligence rather than emotional intelligence. It may also be important to train or select these individuals for their strategy of coping and task engagement during mentally demanding work.

Results of this study also substantiate Fellner et al.'s (2006) conclusion that vulnerability to stress may adversely impact the agent's well-being. Indeed, discovering the nature of the effects of stress experienced in one's occupation has been a major focus of the National Institute for Occupational Safety and Health (NIOSH; 1999). EI measures might be used as an additional selection tool for personnel filling high-stress security jobs. In this study, EI measures including the TEIQue showed incremental validity in relation to the Big Five traits in predicting subjective state (cf., Fellner, Pérez, Emo, & Matthews, 2005; Pérez et al., 2005; Pérez-González, Sánchez-Ruiz, Matthews, & Petrides, 2007).

Another implication for this research is that the tasks themselves might also be used in training security agents to quickly scan crowds for individuals displaying emotions that are incongruent with the situation, as Ekman (2003) advocates. The METT results clearly indicate that explicitly specifying critical facial changes that are associated with various emotions immediately affects the ability to recognize those changes, even when they last only 200 ms.

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