An Exploratory Study of Personality Differences in Eyewitness Memory

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The current study was conducted to examine the relationship between personality and eyewitness memory. Undergraduates were exposed to a live male target and subsequently viewed either a target present or target absent photographic lineup. Subjects were randomly assigned to see the target under low, moderate or high levels of arousal. The Eysenck Personality Inventory was employed to assess the two personality variables of interest: extraversion and neuroticism. Arousal had a facilitating effect on identification accuracy for subjects who were classified as emotionally stable, but arousal had a debilitating effect on identification accuracy of neurotics. This result is explained by extending optimal level theory to situations that induce differences in limbic system arousal.

A number of studies have examined the hypothesis that eyewitness memory may be influenced by individual differences in arousal (Nowicki, Winograd, & Millard, 1979; Siegel & Loftus, 1978; Zanni & Offermann, 1978). Although these studies have demonstrated weak to moderate relationships between trait anxiety or emotional stability and facial recognition, the forensic relevance is limited because of the paradigm that was employed. Subjects were typically *not* exposed to a

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live target and were tested on some measure other than a live or photographic lineup. In addition, these studies have not typically examined the interaction between manipulated arousal and individual differences in susceptibility to arousal (Clifford & Scott, 1978; Deffenbacher, 1985). Such an interaction is specified in most contemporary definitions of stress (e.g., Lazarus, 1966; Spielberger, 1966). Eysenck's (1977) optimal level theory provides one theoretical framework that may be employed to guide research efforts in this area.

M.W. Eysenck (1977) has proposed optimal level theory to account for differences in accuracy of recall between introverts and extraverts in verbal learning studies. His theory is based on the Yerkes-Dodson Law (1908) that states that for any task of real complexity, arousal and performance are curvilinearly related: performance is enhanced by arousal up to an optimal level beyond which performance is impaired (Deffenbacher, 1985).

Whipple (1915, p. 233) extended the Yerkes-Dodson Law to eyewitness memory: "excitement improves observation and memory of a witness up to a given point (variable for different persons) and impairs it beyond that point." According to Eysenck (1977), introverts and extraverts experience the same level of arousal to a particular stressor, but they have different optimal levels. Introverts have a lower optimal level than extraverts. Hence, increasing levels of arousal will result in memory deficits among introverts before similar deficits are observed among extraverts. It is not clear whether optimal level theory also applies to differences between neurotics and stables (Deffenbacher, 1985).

A recent experiment (Deffenbacher, 1985) provides indirect support for an extension of optimal level theory to eyewitness memory. Deffenbacher exposed introverts and extraverts to a slide series that depicted a staged wallet snatching. Half of the subjects were forewarned of the subsequent recall test (higher arousal condition) while the other half were not (lower arousal condition). The data revealed that introverts exhibited more accurate recall in the lower arousal condition than in the higher arousal condition; the pattern was reversed for extraverts.

Deffenbacher argued that the results supported optimal level theory. Forewarning had apparently resulted in below or at optimal level arousal for extraverts, but in arousal beyond the optimal level for introverts. Neuroticism did not interact with arousal. Instead, neurotics were slightly less accurate than stables in both the lower and higher arousal conditions, replicating a negative correlation between arousal and episodic recall reported earlier by Zanni and Offermann (1978).

The current study was conducted to increase the external and ecological validity of the tests of optimal level theory. To enhance forensic relevance, subjects were exposed to live target person and

subsequently tested on a photographic lineup. The Eysenck Personality Inventory was employed to assess extraversion and neuroticism. Based on data reported by Deffenbacher (1985) two effects were expected: 1) Introverts should perform better than extraverts on the photographic lineup task at lower levels of arousal, while extraverts should perform better than introverts at higher levels of arousal, and 2) stables should perform better than neurotics at all levels of manipulated arousal.

METHOD

Subjects

Sixty-seven females and 61 males from the introductory psychology pool at Florida State University participated in the experiment.

Procedure

Each subject completed the Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1968) and Spielberger's State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch & Lushene, 1970). Then a female confederate in a white lab coat manually took their pulse. Subjects were randomly assigned to one of three levels of manipulated arousal. The moderate and high conditions completed an informed consent form. The form gathered information that could be used to exclude individuals who might be physically endangered by the manipulation (i.e., persons with coronary problems, epileptic seizures, or high or low blood pressure).

Subjects then were escorted to an adjacent room. They were seated at a cleared table (low arousal condition), at a table on which an empty syringe package lay (moderate arousal condition), or at a table on which an unused syringe in a sealed package lay (high arousal condition). Subjects waited for 15 sec while the confederate left to get the experimenter. The confederate returned and informed subjects that the experimenter was not ready and took their pulse again.

After pulse rate had been assessed the second time, the experimenter (target) appeared and presented subjects with Spielberger's (1979) State-Trait Personality Inventory (STPI). The experimenter remained in the room 15 sec to give directions for completing the questionnaire. After subjects completed the STPI, the confederate administered additional questionnaires to provide a delay between exposure and retrieval. The interval was 20 min. for all subjects.

Next, subjects completed a description checklist regarding physical characteristics of the experimenter, such as height, weight, age, eye color, hair color, etc. (Pigott & Brigham, 1985). Upon completion of the checklist, subjects were exposed to either the target present or target absent lineup. The lineup had a functional size (Wells, Leippe, & Ostrom, 1979) of 6.00 and effective size (Malpass, 1981) of 4.15.[1] They

were told that the experimenter might or might not be in the lineup and asked to decide if he was. Following the lineup decision, subjects were asked how confident they were in their decision.

Before they were debriefed, subjects were asked if they had been told about the experiment and if they had seen the experimenter before. All answers to these questions were negative. They also were asked what the perceived probability of receiving a shot was on a scale from 0 to 100. Finally, subjects were debriefed and dismissed.

RESULTS

Manipulation Checks

As intended, subjects in the high arousal condition (M=.39) gave higher probability ratings of receiving an injection than subjects in the moderate arousal condition (M = .25), $t(61) = 1.96$, $p<.05$. Subjects in the low arousal condition did not make these probability judgments. The manipulation had a significant effect on pulse rates, $F(2,115) = 25.56$, $p<.001$, and state anxiety scores, $F(6,228) = 2.50$, $p<.05$. This effect did not interact with gender, extraversion, or neuroticism. The manipulation did not have a significant effect on state curiosity or state anger scores. One tailed t-tests revealed a difference between low (M = 71.9) and moderate (M = 77.8) arousal group pulse rate means, $t(124) = 5.26$, $p<.001$, but not between moderate and high (M = 79.4) arousal group pulse rate means, $t(124) = 1.44$, ns. There was not a significant difference between low (M = 17.7) and moderate (M = 18.8) group state anxiety means, $t(124) = 1.22$, ns., but there was a difference between moderate and high (M = 21.2) group state anxiety means, $t(124) = 2.26$, $p<.05$.

Personality and Arousal

Subjects were classified as neurotics or stables and as extraverts or introverts based on a median split of EPI scores. Subjects scoring at the median were excluded.

Multiple contingency analysis was used to examine the effects of

[1] *Functional and effective size are measures of the similarity of the target to the decoys and thus provide estimates of fairness. The functional size (Wells et al., 1979) of a lineup is defined as the inverse of the proportion of subjects who choose the target person from a lineup when given only a general description of that person. Functional size can range from 1.00 (meaning every subject chose the confederate) to infinity (meaning none of the subjects chose the confederate). The effective size (Malpass, 1981) of a lineup involves consideration of the frequency with which each lineup member is chosen as well as its deviation from nominal chance expectation. Effective size can range from 1.00 (meaning every subject chose the same lineup member) to 6.00 (meaning that subjects' choices were evenly distributed across all members of a 6-person lineup). Functional and effective size are mathematically and conceptually related, but are not identical measures of lineup fairness.*

TABLE 1 Effects of Manipulated Arousal and Neuroticism on Identification Accuracy[a]

	Neuroticism	
Manipulated Arousal	*Low*	*High*
Low	50% (20)	68% (16)
Moderate	62% (21)	68% (19)
High	75% (16)	32% (19)

[a]*Ns are in parentheses.*

manipulated arousal and personality on identification accuracy. The dependent variable was dichotomous: subjects' responses to the lineup were coded as either correct or incorrect. A 3 (arousal) x 2 (neuroticism) analysis of variance revealed a significant interaction between manipulated arousal and neuroticism X^2 (2, n = 111) = 7.97, $p < .05$ (see Table 1). As arousal level increased, stables became increasingly more accurate on the photographic lineup but neurotics became increasingly less accurate. No significant effects were revealed by a 3 (arousal) x 2 (extraversion) multiple contingency analysis.

The second set of analyses examined the effects of manipulated arousal and personality on facial recall. A facial recall scale was created from subjects' responses to the description checklist. Facial recall scores ranged from 0 to 13 based on the sum of correct responses to 13 facial feature items (e.g., hair color, eye color, eye shape, face shape, etc.). Correct responses were those that a group of students who had an unlimited amount of time to observe the target endorsed most frequently.

A 3 (arousal) x 2 (neuroticism) analysis of variance revealed no significant effects on facial recall. A 3 (arousal) x 2 (extraversion) analysis of variance also revealed no significant effects on facial recall.

The third set of analyses examined the effects of manipulated arousal and personality on eyewitness confidence. Confidence was assessed on a scale that ranged ranged from 1 (not at all confident in the lineup decision) to 7 (very confident that the decision was correct). A 3 (arousal) x 2 (neuroticism) analysis of variance revealed a main effect of arousal $F(2, 105) = 3.23$, $p < .05$, $\eta^2 = .05$ and a main effect of neuroticism $F(1, 105) = 4.13$, $p < .05$, $\eta^2 = .03$ (see Table 2).

TABLE 2 Effects of Manipulated Arousal and Neuroticism on Eyewitness Confidence[a]

	Neuroticism		
Manipulated Arousal	*Low*	*High*	*Totals*
Low	4.50 (20)	4.31 (16)	4.42 (36)
Moderate	5.10 (21)	4.05 (19)	4.60 (40)
High	3.94 (16)	3.63 (19)	3.77 (35)
Totals	4.56 (57)	3.98 (54)	4.28 (111)

[a]*Ns are in parentheses.*

Confidence at the high arousal level was significantly lower than confidence at the low arousal level $t(105) = 2.00$, $p < .05$. In addition, neurotics were significantly less confident in their lineup decision than were stables.

A 3 (arousal) x 2 (extraversion) analysis of variance revealed the arousal main effect again $F(2, 102) = 4.08$, $p < .05$, $\eta = .07$ and a main effect of extraversion $F(1, 102) = 5.30$, $p < .05$, $\eta = .03$ (see Table 3). The second finding refers to the observation that extraverts were more confident in their lineup decisions than introverts were.

Facial Recall and Confidence

The final set of analyses examined the relationship between facial recall and identification accuracy and the relationship between confidence and identification accuracy as a function of personality differences. The relationship between facial recall and identification accuracy was nonsignificant and did not vary as a function of personality (all *rs* < .21). The overall relationship between facial recall and identification was weak and nonsignificant, $r(125) = .05$, ns. The overall relationship between confidence and identification accuracy was small but significant, $r(125) = .24$, $p < .05$. The association between confidence and identification accuracy was stronger among introverts, $r(56) = .32$, $p < .05$, than among extraverts $r(52) = .03$, ns. Finally, the association between confidence and identification accuracy was stronger among neurotics, $r(54) = .38$, $p < .01$, than among stables, $r(57) = .04$, ns.

TABLE 3 Effects of Manipulated Arousal and Extraversion on Eyewitness Confidence[a]

	Extraversion		
Manipulated Arousal	*Low*	*High*	*Totals*
Low	4.22 (18)	4.44 (18)	4.33 (36)
Moderate	4.45 (22)	4.92 (13)	4.63 (35)
High	3.44 (16)	4.10 (21)	3.81 (37)
Totals	4.09 (56)	4.42 (52)	4.25 (108)

[a]*Ns are in parentheses.*

DISCUSSION

The data did not reveal the expected interaction between manipulated arousal and extraversion. Extraverts did not differ from introverts in either identification accuracy or facial recall. Instead, an interaction between manipulated arousal and neuroticism was observed. As level of arousal increased, stables became increasingly more accurate in their lineup decisions while neurotics became increasingly less accurate. A similar interaction was not obtained for facial recall. Because the facial recall measure did not correlate with identification accuracy this study provided further support for the independence of facial recognition and facial recall. (See Pigott & Brigham, 1985, for a discussion of this issue.)

The interaction between manipulated arousal and neuroticism on identification can be explained by an extension of optimal level theory. When limbic system arousal is increased, neurotics may demonstrate memory deficits before stables. That is, they may reach their optimal level of performance before stables do. In the current study, the effects of arousal on state anxiety and pulse rates were similar for both neurotics and stables. Although they both evidenced similar increases in arousal as a function of the manipulation, the effects of the manipulation on identification accuracy were different for the two groups. Stables apparently never reached their optimal performance level. Conversely,

very small increases in arousal had strong consequences for neurotics. Deffenbacher (1985) did not observe this interaction possibly because his manipulation evoked RAS (reticular activating system) arousal rather than limbic system arousal. When RAS arousal is increased, differences along the extraversion continuum may appear.

The effects of the manipulation on confidence judgments were unanticipated but are interesting. Confidence in a lineup decision declined at the high arousal level. Apparently, minimal increases in arousal during encoding can lead a witness to attenuate confidence. Personality differences also emerged. Extraverts were more confident in their decisions than introverts and stables were more confident than neurotics. The increased sense of confidence among stables and extraverts, if it exists during actual proceedings, could be dangerous because there was not a significant relationship between confidence and accuracy among stables and extraverts. Hence, stables and extraverts might be particularly inclined to endorse a misidentification with a high level of confidence.

The current research demonstrated that personality differences in identification accuracy and eyewitness confidence may occur at moderate arousal levels when the recognition test is given shortly after initial exposure. Generalizability of the research findings to eyewitness memory in the real world is difficult because in most of the cases arousal is much greater than the level achieved in this study. Further, a photographic lineup is typically not viewed until weeks or even months after the crime.

These results might say something about a limited number of moderately arousing situations in which the witness' memory is tested shortly thereafter with a mugshot album. Consider for example an individual who notices a burglar emerging from a neighbor's window with a stereo receiver and who is asked to view a mugshot album at the police station shortly thereafter. Consider also a person who witnesses a group of young men running out of a convenience store with several six packs of beer. In these cases, we might expect neurotics to be less accurate in their initial identification of a suspect from a mugshot album than stables. In more arousing situations, we would expect most neurotics and most stables to have a weak recollection of the appearance of the perpetrator. Finally, in some cases, such as when the sole witness is the victim of an armed robbery, situational factors, like the presence of a weapon, might be more important than differences in trait or state anxiety.

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