

Sensation Seeking Characteristics and Neuroendocrine Responses to an Acute Psychological Challenge for Undergraduates with Career Interests in Forensic Sciences

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Citation

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Abstract

This study examined various characteristics of 29 (20 females and 9 males) undergraduate participants interested in forensic identification. Participants completed a basic demographics questionnaire, History of Psychosocial Stressors (HPS: Scotti, 1992, 1999), the Sensation Seeking Scale (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978) and Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman, Kuhlman, Joirement, & Kraft, 1993). Salivary cortisol samples and perceived distress were assessed before and during exposure to an acute psychological challenge. Participants self-reported having had moderate experience with psychosocial stressors. Compared to published normative data on the SSS-V and ZKPQ, males had lower scores on disinhibition, boredom susceptibility, impulsive sensation seeking, aggression-hostility, and sociability. Females had lower scores on the scales of disinhibition, impulsive sensation seeking, and sociability and higher on activity. No significant differences were found between males and females participants on the SSS-V or the ZKPQ, with the exception of the neurotic-anxiety subscale. Assessing salivary cortisol responses, main effects for time and gender but no main effect for sensation seeking or interactional effects were found. Participants had high anticipatory salivary cortisol and lowered salivary cortisol during exposure to the acute psychological challenge. Furthermore, no relation existed between self-reported levels of perceived distress and salivary cortisol responses. Associations with pre-exposure salivary cortisol and experience seeking and exposure salivary cortisol with experience seeking and impulsive sensation seeking were found for males. These findings are a primer for future studies that assess individuals interested in stimulating, novel, and challenging career choices.

INTRODUCTION

Each profession has a set of occupational demands and duties that an individual in that occupation must manage. Many occupations provide interesting and stimulating activities and duties as part of the daily work routine. One non-conventional occupation that has stimulating, novel, challenging, and nonrisky activities is forensic identification. Forensic identification is a scientific occupation focused on documenting, collecting, analyzing criminal evidence (Baldwin, 2002; DeLucia & Doyle, 1998; ICSIA, 2002). Scientifically collecting and analyzing evidence that develops a criminal case involves a broad range of responsibilities for forensic identifiers. These responsibilities range from the preliminary collection and analysis of criminal evidence to presenting the evidence in a court of law for the defense or prosecution.

Learning these skills requires specialized educational training and backgrounds emphasizing scientific methods

(Dillon, 1999; Furton, Hsu, & Cole, 1999; Stinchcomb, 1996). In addition, to educational experiences in an academic setting, most training includes an aspect of hands on experience or fieldwork (Gaensslen & Lee, 1988). These field experiences are generally provided because of cooperation between forensic science laboratories (Lee & Gaensslen, 1988). Employment in many organizations requires an educational background with extensive training in the scientific fields such as chemistry and biology (Siegal, 1988). Additionally, coursework in psychology, mathematics, and statistics and training in the usage of complex instruments for analyzing evidence is required. Lastly, forensic identifiers must have good oral and written communication skills to prepare written reports and provide expert testimony to the judicial system.

Occupations, including forensic identification, that are nonconventional, stimulating, and novel attract individuals with certain preferences and interests (Zuckerman, 1994).

Sensation seeking is a normal dimension of personality that encompasses both risky and non-risky aspects of behaviors, attitudes, and preferences (Zuckerman, 1979a, 1979b, 1991b, 1994). Certain personality traits such as sensation seeking may be advantageous or adaptive for the set demands in a chosen occupation. Research supports that certain occupations provide the stimulation necessary for sensation seekers (Best & Kilpatrick, 1977; Biersner & LaRocco, 1983; Kish & Donnenwerth, 1969; Oleszkiewicz, 1982; Waters, Ambler, & Waters, 1976; Zaleski, 1984). In the primary example of forensic identification, individuals with certain personality traits may prefer an occupation with demands that are novel, challenging, and nonrisky.

A variety of psychobiological research indicates that personality traits are related to certain hormones (e.g., dopamine and testosterone) in humans. In particular, certain sensation seeking preferences are related to various hormones (Zuckerman, 1994). One major neuroendocrine hormone is cortisol. Cortisol is released via a cascade of chemical reactions in the hypothalamic-pituitary-adrenal axis when stressed either physically (e.g., exercise or bodily injury) or psychologically (e.g., occupational demands, natural disaster, or loss of a spouse). Few attempts have been made to determine the relation between cortisol levels and sensation seeking (Ballenger et al., 1983). Furthermore, little is known about what role sensation seeking plays in reducing (buffering) the negative effects of stressful events.

One potential function of sensation seeking is its ability to reduce the effects of stressful situations and experiences. Past research has indicated that individuals with a preference for sensation seeking do not perceive highly stressful and demanding situations as stressful (Franken, et al., 1992; Horvath & Zuckerman, 1993). Therefore, individuals with a preference for sensation seeking may handle the psychological and physiological demands of an occupation such as forensic identification with reduced reactivity. This heightened resiliency and coping ability to handle stress may be an adaptive mechanism for forensic identifiers.

The reduced reactivity to stressors by high sensation seekers may be adaptive for reducing the harmful effects of chronic stress. Cortisol responses are directly related to psychological stress in various forms (Smyth et al., 1998). Lower levels of circulating cortisol are related to better modulation of stress and therefore, less stress symptoms. As the profession of forensic identification has high occupational demands and duties that are often stressful

(Yura, 1999), the trait of sensation seeking may be adaptive and beneficial to these individuals. Determining the neuroendocrine response to a psychological challenge similar to that experienced by forensic identifiers warrants investigation.

PURPOSE OF THE STUDY

Up to this point little is known about undergraduates interested in becoming a forensic identifier. The purpose of this study was threefold: (1) to examine demographic characteristics and scores on personality inventories; (2) to examine experience with psychosocial stressors; (3) and to examine neuroendocrine responses and perceived distress to an acute psychological challenge. Results gathered from this study will be beneficial in expanding our knowledge of undergraduates entering careers in forensic identification.

METHOD

PARTICIPANTS

Undergraduate participants were recruited from a required academic course in a Forensic Identification Program at a major land grant university. To this date, this academic program is the first of its kind to offer multi-disciplinary research and education collaboration in areas related to forensic sciences. Participants had to be majors in the Forensic Identification Program. No participant was eliminated from the study based on gender, race, or ethnicity. Out of possible 30 participants solicited for the study, all but one expressed an interest in completing the study. Twenty-nine participants completed the study. The sample consisted of 20 Caucasian participants and 9 African American participants. Nine males (31 %) participated in the study. The mean age of the male participants was 25.2 (SD = 7.6, range = 20 to 43 years). Twenty females (69 %), with a mean age of 21.8 (SD = 3.6, range = 20 to 36 years) participated in the study. Participants were at various levels of completing the program. The majority of the sample, 22 participants (75.9 %), were majors (juniors and seniors) in the program.

On average, males and females had completed the same number of college credits (103 hours and 102 hours, respectively). The mean grade point average (GPA) was similar for males (3.31) and females (3.39). Females completed 4.9 forensic identification core courses and males completed 2.8. Additionally, females indicated that they had been in the program 2.9 years and males to be in the program 2.0 years.

INSTRUMENTS

DEMOGRAPHIC QUESTIONNAIRE

Participants were given an informed consent document to read and then sign if they agreed to participate. All participants completed a basic demographic questionnaire that assessed age, gender, college major, GPA, and total number of credit hours complete.

HISTORY OF PSYCHOSOCIAL STRESSORS (HPS)

The History of Psychosocial Stressors (HPS; Scotti, 1992, 1999) is a 59-item checklist of potentially traumatic events (e.g., natural disaster, motor vehicle accident, sexual assault). Participants indicate their experience with various psychosocial stressors. If participants do indicate experience with psychosocial stressors, they indicate how distressing is the event to them in the past week.

SENSATION SEEKING SCALE (SSS-V)

The Sensation Seeking Scale currently is the most widely used form of the sensation seeking scale with the largest volume of normative data supporting it (Zuckerman, 1994). The normative sample (age range of 17-23 years) for the SSS-V consisted of 410 male and 807 female undergraduate students from the University of Delaware (Zuckerman, 1994). The SSS-V is a 40-item, forced-choice inventory developed to measure individual differences in stimulation and arousal preferences. The SSS-V includes four 10-item subscales: Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility. The total scale score is the sum of the subscales scores. Cronbach's alpha reliability coefficients ranged from .85 to .90 for all scales.

ZUCKERMAN-KUHLMAN PERSONALITY QUESTIONNAIRE (ZKPQ)

The Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman et al., 1993) is an "alternative five factor" model of personality traits that emerged from psychobiological research (Zuckerman, 1983a, 1991a). The questionnaire was constructed based on written items from older versions of the sensation seeking scale and various personality inventories. The personality factors were determined using principal components and a varimax rotation. The ZKPQ was normed with 1144 males and 1825 females undergraduate students at the University of Delaware. Ages of the participants ranged from 17-23 (Zuckerman et al., 1993). Lastly, the ZKPQ is not considered a general measure

of personality.

The ZKPQ is a 99-item true or false inventory measuring five dimensions of personality: Impulsive Sensation Seeking, Neuroticism-Anxiety, Aggression-Hostility, Activity, and Sociability. Lastly, there are 10 items (infrequency subscale) that are a measure of the participants who have haphazardly answered the items on the questionnaire. Only 4% of the participants score higher than a three, and this can be used as a cut-off for records of questionable validity. Cronbach's alpha reliability coefficients ranged from .87 to .93 for all scales.

EIA SALIVARY CORTISOL ASSAY PROCEDURES

Detection of free circulating stress hormones was done by obtaining multiple salivary cortisol samples. Salivary cortisol samples were obtained by participants using a Salivette and analyzed using a commercially available immunoassay kit (Salimetrics HS-Cortisol), which is specifically designed for the quantitative measurement of salivary cortisol. The intra-assay (within procedure) and inter-assay (between procedure) variation of this procedure is less than 8%. Additional information concerning the procedures in this salivary cortisol assay may be obtained from Salimetrics.

SUBJECTIVE UNITS OF DISTRESS SCALE (SUDS)

Self-reported measurement of the participant's distress level was obtained by means of SUDS. During the viewing of the autopsy video, participants were asked to mark their perceived level of distress. Additionally, the participant was asked to mark the percentage of the video they watched every ten minutes.

PROCEDURES

SESSION 1: ADMINISTERING SURVEYS AND QUESTIONNAIRES

Each participant was given an informed consent document to read and sign. Participants were told that the experimenter was interested in various characteristics of individuals interested in forensic identification. Participants were told that these characteristics would be assessed via self-reported measurement and additionally through exposure to an acute psychological challenge. Participants were not given explicit information about the videocassette's content.

During the first session, the Sensation Seeking Scale V

(SSS-V; Zuckerman et al., 1978), the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman et al., 1993), and the demographics questionnaire were administered. At least one week separated the first and second sessions. Initial information about the inventories was ambiguous and they were labeled with general titles (e.g., Interest and preference test for the SSS-V) occurred. To reduce the chance of participant expectancy effects and social desirability, participants were told that the results of this study would not affect his or her standing in the program. All participants completed the written instruments in less than one hour.

SESSION 2: ACUTE PSYCHOLOGICAL CHALLENGE

The second session consisted of the participants watching an autopsy videocassette with salivary cortisol samples collected and measurements of perceived distress. After the inventories were administered in the first session, the participants were invited to sign up for a time to view the autopsy video between 11 a.m. and 2 p.m. on a day in the following two weeks. This time interval was utilized because the diurnal cycle and the circadian rhythm of individuals can interfere with cortisol levels (Kirschbaum & Hellhammer, 1994).

Participants were given a handout during the first session listing activities that interfere with the accuracy of salivary cortisol levels (e.g., brushing teeth, using drugs, smoking, drinking alcohol or caffeine, or engaging in exercise; Kirschbaum & Hellhammer, 1994). Participants were asked questions about current usage of psychotropic medications and over the counter medications, history of psychiatric illness, eating disorders, and potential medical histories that may confound cortisol levels. No participants were excluded based on the results of these questions. No females indicated to be using oral contraceptives (OC) in the current study. There has been research to support that females using OC have mildly attenuated cortisol responses to psychological stressors (Kirschbaum, Platte, Pirke, & Hellhammer, 1996). Also, cortisol concentrations differ based on menstrual phase for females after exposure to stressors. Females were screened based on the phase of the menstrual and were completed the second phase of the study when they were in luteal phase.

For the second session participants arrived at a designated classroom and were instructed to rest for 20 minutes. The participants had access to magazines and were asked to rest quietly. After 20 minutes, the participants were presented with the acute psychological challenge: viewing a full-length

(40 minute) non-homicide autopsy videocassette, "Through the Eyes of Death's Detectives: Voices of Death" (Kriegsman, Kriegsman, & Lewis, 1999). This autopsy was selected to serve as the acute psychological challenge because of its graphic content and dead bodies similar to the natural disasters and crime scenes found in the occupation of forensic identifiers. Past exposure to similar stimuli should not greatly affect cortisol levels with current stimuli for certain individuals (Kirschbaum, Prüssner, et al., 1995).

In the classroom (20 feet x 14 feet) was a television and videocassette player/recorder (VCR). The participant was instructed to sit in a chair positioned in front of the television (approximately 4 feet away). The videocassette of the autopsy lasted for 40 minutes – beginning with a complete autopsy and ending with an analysis of the decedent's precise cause of death. During this time, the participant had the option to stop the videocassette and terminate participation in the study without penalty. Additionally, participants were asked to refrain from discussing the content of the videocassette after completion of the study.

To examine the effects of the acute psychological challenge on the neuroendocrine system, multiple salivary cortisol measurements were obtained at seven different intervals (-20, -10, 0, +10, +20, +30, and +40 minutes). Saliva samples were taken at 20 minutes and 10 minutes (-20, and -10 minutes) before exposure to the autopsy video. Thereafter salivary cortisol measures were taken at the start of the autopsy video (0 minutes) and then at +10, +20, +30, and +40 minutes. It has been found that cortisol will peak at 20-30 minutes after the start of an acute psychological stressor (Kirschbaum & Hellhammer, 1994). Multiple samples of saliva were gathered because unbound cortisol levels are associated with anticipated and actual exposure to acute psychological stressors (Smyth et al., 1998). Salivary samples were obtained individually from the participants during the specified times using a plain (non-citric acid) cotton Salivette manufactured by Sarstedt (Rommelsdrf, Germany). During the analysis process, the researcher followed the manufacturer's recommended assay procedures and protocols for data reduction. Salivary cortisol collection is a reliable and valid technique for measuring unbound cortisol (Kirschbaum & Hellhammer, 1994; Riad-Fahmy, Read, Walker, & Griffiths, 1982). In addition, during the second session, measurements of perceived distress were assessed with the subjective units of distress scale (SUDS). Participants self-reported their SUDS level at the same

intervals that salivary cortisol samples were gathered.

RESULTS

EXPERIENCE WITH PSYCHOSOCIAL STRESSORS

Participants were asked to provide information about their experience with various psychosocial stressors (Table 1). The majority of the sample indicated to have had experience (happened to or witnessed the psychosocial stressor) with more than five psychosocial stressors. Sixty two percent of the participants reported involvement in a transportation accident. Of those participants, 47.8 % were involved in that accident over a year ago. Additionally, participants indicated that it was not causing distress within the last week ($M = 1.3$; distress level ranged from 1 to 5; 1 = none and 5 = extreme). Fifty one percent of participants indicated that they had a death of someone close to them. For most of the participants, this event had occurred over a year ago (72.7 %), and was causing little distress within the last week ($M = 1.5$). Lastly, 41.4 % of the participants reported finding, seeing, or handling a dead body. This stressor was the only one that had occurred with 1 month to a year ago for the largest percent of participants. The average distress level ranging from 1 (none) to 5 (extreme) was low ($M = 1.2$).

Figure 1

Table 1: Percentage of Participants Exposed to Various Psychosocial Events or Stressors, When it Occurred, and Average Distress Level

Events	Occurrence ¹			When it Occurred ²			Mean Distress Level (SD) ³
	1	2	3	1	2	3	
Transportation accident	20.7	62.0	17.2	21.7	30.4	47.8	1.3(1.0)
Natural disaster	69.8	28.7	10.3	--	11.1	88.9	1.1(1.3)
Technological accident	69.8	13.8	17.2	22.2	33.3	44.4	1.4(1.7)
View zone	--	100	--	--	--	--	--
Living in a high crime area	79.3	20.7	--	16.7	16.7	66.7	1.2(1.4)
Emergency response	65.5	26.8	3.4	--	50.0	50.0	1.2(1.4)
Finding/seeing/handling a dead body	58.8	41.4	--	--	58.3	41.7	1.2(1.3)
Abortion or miscarriage	69.7	6.9	3.4	--	33.3	--	1.0(1.0)
Severe injury/illness	68.8	24.1	6.9	--	22.2	77.8	1.4(1.0)
Death of someone close to you	41.4	51.7	6.9	17.6	5.9	76.5	1.5(1.2)
Divorce or separation	62.1	26.8	6.9	18.2	--	81.8	1.5(1.2)
Eviction of spouse	62.1	37.9	--	18.2	8.1	73.7	1.6(1.1)
Physical abuse/assault	66.2	13.8	--	--	--	100.0	1.9(1.5)
Sexual abuse/assault	66.2	13.8	--	--	--	100.0	1.3(1.0)
Other	62.8	17.2	--	--	20.0	80.0	1.6(1.0)

¹Occurrence: 1 = Did not happen, 2 = Happened to you, 3 = I witnessed it happen.
²When it Occurred: 1 = Happened in last month, 2 = Happened 1 month to 1 year ago, 3 = Happened more than 1 year ago.
³Distress level ranged from 1 to 5, 1 = None, 5 = Extreme

PERSONALITY INVENTORY SCORES

Participants' scores on SSS-V and ZKPQ were assessed for potential differences from published normative data (Table 2). A Fisher's z test revealed that males scored significantly lower on the subscale of Disinhibition and Boredom Susceptibility, while females scored significantly lower on the subscale of Disinhibition when compared to published normative data. Differences between participants and published normative data also emerged on scores obtained from the ZKPQ. Male participants scored significantly lower than males in the normative sample on the subscales of

Impulsive Sensation Seeking, Aggression-Hostility, and Sociability. Female participants also had lower scores on the subscale of Impulsive Sensation Seeking, and Sociability when compared to females in the normative sample. Furthermore, females had high scores on the subscale of Activity compared to the normative sample.

Figure 2

Table 2: Means and Standard Deviations: Males and Females in the Forensic Identification Program and Published Normative Data on the SSS-V and ZKPQ

	Males		z score	Females		z score
	Normative	Normative		Normative	Normative	
SSS-V ¹						
SS Total	19.3(6.8)	22.7(5.3)	-2.48	19.4(5.9)	20.4(6.8)	-1.22
Thrill & Adventure	7.9(1.7)	7.7(2.2)	.22	6.9(2.6)	6.6(2.6)	.30
Impulsive Seeking	4.7(2.5)	5.0(2.3)	-.49	5.4(1.7)	5.2(2.2)	.30
Disinhibition	3.3(2.1)	6.2(2.4)	-3.64*	3.7(2.2)	6.5(2.5)	-3.07*
Boredom Susceptibility	2.4(1.9)	3.7(2.0)	-3.11*	2.7(1.7)	3.2(2.2)	-.96
ZKPQ ²						
Impulsiveness-Sensation Seeking	6.9(4.3)	10.9(3.0)	-3.18*	7.0(2.9)	9.7(4.2)	-2.88*
Neuroticism-Anxiety	5.0(3.4)	7.2(4.2)	-1.77	6.3(3.5)	15.5(4.5)	-2.17
Aggression-Hostility	6.7(3.2)	8.8(3.7)	-3.13*	6.5(3.6)	7.9(3.6)	-1.72
Activity	6.6(3.1)	7.7(3.5)	-.73	10.0(5.4)	7.3(3.7)	4.26*
Sociability	6.4(3.3)	9.9(3.8)	-2.74*	7.6(3.6)	10.3(3.8)	-3.15*

* $p < .01$. ** $p < .001$.
¹Sensation Seeking Scale = 410 (males) 807 (females).
²Zuckerman-Kuhlman Personality Questionnaire = 1144 (males) 1825 (females)

Multivariate analysis of variance (MANOVA) was conducted to assess overall differences between male and female participants on the subscales of the SSS-V. An omnibus two group MANOVA with gender (male and female) as the between subjects factor and the four subscales from the SSS-V serving as the dependent variables was conducted. There was no difference between the males and females when compared on the four subscales of the SSS-V, Wilks' $\lambda = .86$, $F(4, 24) = 1.0$, $p = .420$. A multivariate effect size revealed a large effect size ($\eta^2 = .144$) and low power (.182). An omnibus two group MANOVA with gender (male and female) as the between subjects factor and the four subscales from the ZKPQ serving as the dependent variables revealed no difference between the males and females on the four subscales of the ZKPQ, Wilks' $\lambda = .72$, $F(5, 23) = 1.76$, $p = .162$. A multivariate effect size revealed a large effect size, $\eta^2 = .276$, power = .499. Because of the exploratory nature of this study, univariate tests were conducted despite the lack of a multivariate effect with no differences between males and females on the subscales of Impulsive-Sensation Seeking, Aggression-Hostility, Activity, and Sociability. Yet, females scored higher than males on the subscale of Neurotic-Anxiety, $F(1, 27) = 5.60$, $p = .025$.

NEUROENDOCRINE RESPONSES

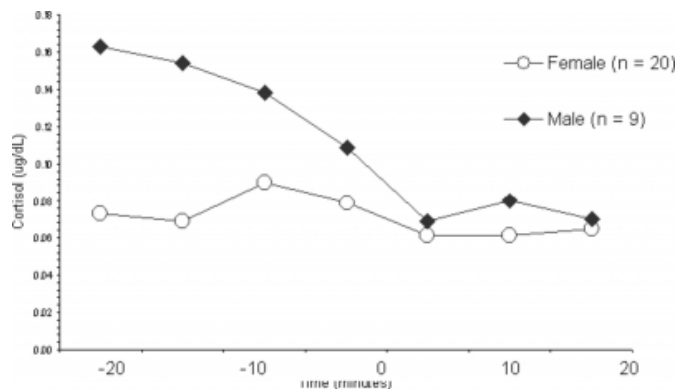
To evaluate participants' neuroendocrine responses to the acute psychological challenge, a three way repeated measures ANOVA with two between subjects factors (high/low sensation seekers and male/female) and one within subjects factor (Time) was conducted. The within subjects

factor of Time had seven levels (-20, -10, 0, 10, 20, 30, and 40 minutes). Salivary cortisol measures served as the dependent variable. The sphericity assumption (sphericity requires that the variances of the differences for all pairs of repeated measures are equal) was evaluated and was not violated, Greenhouse-Geisser, $g = .394$; therefore, no adjustment to the degrees of freedom was necessary. The repeated measures ANOVA revealed a significant within subjects main effect for Time, $F(6, 150) = 3.48, p < .003$, a significant Time x Gender interaction, $F(6, 150) = 2.38, p < .032$, a non significant Time x Sensation Seeking interaction, and a non significant Time x Sensation Seeking x Gender interaction effect. Furthermore, between subjects analyses revealed a non-significant main effect for Gender, Sensation Seeking, and Gender x Sensation Seeking interaction.

Figure 1 illustrates the Time x Gender interaction effect. Following up the significant Time x Gender interaction effect, the simple main effects of Gender at each Time and Time for each Gender were examined with Duncan's Multiple Range Test ($p < .05$) using the within subjects error term (mean square error = 0.004779, $df = 150$). The simple main effect of time for the female participants was non significant; none of the mean cortisol levels across the seven measurement points differed from each other. For the males, however, at -20 minutes they had a significantly higher cortisol level than all other measurement points except -10 minutes, and -10 minutes was higher than 20, 30, and 40 minutes; zero minutes through 40 minutes did not differ from each other. In looking at the simple main effects of gender for each measurement time, only two significant differences were revealed. Males had higher mean cortisol levels than females at both -20 minutes and -10 minutes; the genders did not differ at any other time points.

Figure 3

Figure 1: Salivary cortisol responses for males and females to an acute psychological challenge.



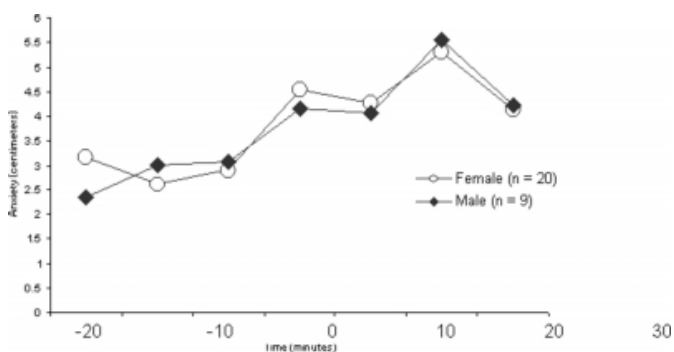
Consistent with the previous findings, additional analyses revealed males and females to a lesser degree had higher salivary cortisol responses during the pre-exposure measurements than during the exposure to the acute psychological challenge. For females, no significant difference was found, $t(19) 1.47, p = .181$, between the arithmetic mean of the three pre-exposure salivary cortisol measurements, $M = .0774 \text{ ug/dL}, SD = .1053$, and the arithmetic mean of the four exposure cortisol measurements, $M = .0667 \text{ ug/dL}, SD = .0991$. Males revealed a significant difference between the arithmetic mean of the three pre-exposure measurements, $M = .1528 \text{ ug/dL}, SD = .2829$, and the arithmetic mean of the four exposure cortisol measurements, $M = .0820 \text{ ug/dL}, SD = .1482, t(8) 1.69, p = .008$.

Figure 2 illustrates perceived distress levels for males and females at each collection time. A three way repeated measures ANOVA with two between subjects factors (high/low sensation seekers and male/female) and one within subjects factor (time) was conducted. The within subjects factor of time had seven levels (-20, -10, 0, 10, 20, 30, and 40 minutes). Distress level served as the dependent variable. The sphericity assumption was evaluated and was not violated, Greenhouse-Geisser, $g = .378$; therefore, no adjustment to the degrees of freedom was necessary. The repeated measures ANOVA revealed a significant within subjects main effect for Time, $F(6, 150) = 7.40, p < .001$, and non significant interaction effects for Time x Gender, Time x Sensation Seeking, and Time x Gender x Sensation Seeking. Furthermore, the repeated measures ANOVA revealed a non significant between subjects main effects for Gender, Sensation Seeking, and Gender x Sensation Seeking interaction effect. Analyses reveal that as time went on,

distress levels increased for both males and females. Following up on the significant time main effect for reported distress levels, Duncan's Multiple Range Test ($p < .05$) revealed that the distress levels were stable and did not significantly differ from each other for -20, -10, and 0 minutes (pre-exposure). Distress levels significantly increased following the beginning of the video at 10 and 20 minutes. These results indicated that males and females did not exhibit differences in perceived distress.

Figure 4

Figure 2: Self-reported anxiety level for males and females to an acute psychological challenge.



To explore if there was a relation between perceived distress and salivary cortisol measurements a Pearson product moment correlation matrix was created. No significant correlations between the seven salivary cortisol samples and the seven self-reported levels of distress were found. Lastly, for males only, the arithmetic mean of pre-exposure salivary cortisol measurements was associated with the SSS-V subscale of Experience Seeking, $r(9) = .672, p < .05$ and two associations were found between the exposure arithmetic mean and the SSS-V subscale of Experience Seeking, $r(9) = .772, p < .01$, and the ZKPQ subscale of Impulsive Sensation Seeking, $r(9) = .724, p < .05$. No significant associations for females were found on scores of the personality inventories and salivary cortisol.

DISCUSSION

DEMOGRAPHIC CHARACTERISTICS

This study identifies demographic characteristics, experience with psychosocial stressors, personality characteristics, and neuroendocrine responses to an acute psychological challenge of undergraduates enrolled in a forensic identification program. A large majority of the sample consisted of females. In the past, females interested in gender non-traditional careers that were novel, stimulating, and non-conventional had limited choices (Shukla &

Chauhan, 1987). Best and Kilpatrick (1977) cite one example of a stimulating occupation for females as counseling rape victims. Yet, most stimulating and novel occupations in the past were generally limited to males (Zuckerman, 1994). Interests in stimulating vocations are seen as a reflection of personality and positive outcomes result when educational or occupational environments adequately allow for the expression of personality traits, resulting in maximum congruence (Holland, 1985) or correspondence (Dawis & Lofquist, 1984). As such, forensic identification may be an attractive vocational option for females with scores on personality inventories indicating mildly elevated thrill and adventure and low impulsive sensation seeking, aggression-hostility, and sociability.

EXPERIENCE WITH PSYCHOSOCIAL STRESSORS

Participants reported exposure to a moderate number of psychosocial stressors in the past, and the past stressors were currently non-distressing. The largest percent had direct exposure with a transportation accident, the death of someone close, and finding/seeing/handling a dead body. Finding, seeing, or handling a dead body is a common component of training in forensic identification. Various studies have investigated the relation between both handling psychosocial stressors with high and low sensation seekers. Zuckerman (1994) summarized mixed findings, indicating that high and low sensation seekers handle stressful situations with varying ability. Previous findings indicate that high sensation seekers do not perceive their interactions with psychosocial stressors as threatening and potentially leading to negative outcomes such as danger and fear (Franken et al., 1992). Additionally, the more experience that high sensation seekers have with a risky activity, the less they perceive the situation as risky and thus rate their ability to avoid negative outcomes as better (Horvath & Zuckerman, 1993). Having moderate exposure with certain psychosocial stressors may be a function of participants' preference for thrill and adventure seeking activities.

PERSONALITY INVENTORY SCORES

Scores on the SSS-V and ZKPQ revealed that male participants scored significantly lower on the subscales of Disinhibition and Boredom Susceptibility and females scored significantly lower on the subscale of Disinhibition. This was consistent with scores on the ZKPQ, indicating significantly lower Impulsive Sensation Seeking than published normative data. As for the other subscales on the

ZKPQ, males had low preference for Impulsive-Sensation Seeking, Aggression-Hostility, and Neurotic-Anxious behaviors. Participants also endorsed having a limited social network and preferring solitary activities. Similarly, females had lower scores on the subscale of Impulsive-Sensation Seeking, Aggression-Hostility, and Sociability. Females preferred activities that included challenging hard work and endorsed being impatient and restless when there is nothing to do.

Taken as a whole, these findings suggest that males and females in the Forensic Identification Program are very homogenous in preferences for sensation seeking activities and behaviors. With the exception of moderate interest in Thrill and Adventure Seeking, participants do not engage in a wide variety of sensation seeking behaviors and in most cases less so than normative findings. Based on scores obtained from the SSS-V and ZKPQ, participants have a strong sense of self, are not disinhibited, are self-reliant, plan before acting, do not have many interpersonal concerns, have limited social networks, are very active, and enjoy staying busy with challenges.

Various explanations are possible for the current findings regarding sensation seeking preferences. One possible explanation stems from Zuckerman's (1994) Optimal Level Arousal (OLA) Theory. OLA proposes that individuals seek situations and circumstances that provide an optimal level of arousal. Low sensation seeking scores with the exception of thrill and adventure seeking could be attributed to the fact that arousal needs are being met and no additional forms of arousal are necessary. Interest in novel, challenging, and stimulating occupational demands provides a pro-social form of arousal. In addition, intensive academic endeavors to complete this program could be associated with the low scores on scales of boredom susceptibility and disinhibition. The fact that participants indicate low boredom may be related to the academic demands adequately preventing boredom. Further, future planning and knowledge that their professional endeavors will require high responsibility and conduct is reflected in their very low disinhibition scores. Disinhibited behaviors such as drinking, using recreational drugs, and criminal activity will limit their employment opportunities. Most participants will seek employment with state or federal agencies that require employees to take a polygraph examination, have no criminal background or record, and not use illicit substances.

Another possible explanation for low sensation seeking

preferences is that additional attitudes, behaviors, and preferences may not be accounted for by scales on the SSS-V. For example, D'Silva, Harrington, Palmgreen, Donohew, and Lorch (2001) suggest that individuals with high sensation seeking engage in a broad range of activities. It could be that many of the stimulating activities that take place in this program, such as intellectual stimulation, tolerance for complexity and ambiguity, novel visual stimulation, and complex problem solving may not be represented on items of the SSS-V. The scores on the SSS-V may not have accurately reflected the participant's current interaction with varied, novel, complex, and intense experiences.

NEUROENDOCRINE FINDINGS

Assessing the neuroendocrine responses and perceived distress to an acute psychological challenge was an important aspect of this study. Results revealed there was an overall within effect for Time and a Time x Gender interaction effect. Although, non-significant, participants with high total sensation seeking scores had elevated anticipatory stress responses and quicker reduction of salivary cortisol after exposure to the challenge than those with lower scores on the total sensation seeking scale. No previous studies have been conducted investigating the relation between sensation seeking and neuroendocrine responses to a psychological challenge, making comparison with prior findings difficult. Current results may reflect that elevated cortisol responses in anticipation to the psychological challenge may represent a normal homeostatic response. Additionally, low cortisol responses during exposure and quick recovery illustrates excellent coping with the situation and normal functioning of the HPA axis (Cohen et al, 1995).

As for male and female participants, a Time x Gender interaction effect indicated that males had an overall higher anticipatory levels of salivary cortisol when compared to females. Salivary cortisol levels decreased 2-fold for males from the baseline level (-20 minutes) to 20 minutes after the initial exposure to the acute psychological stressor. Males exhibited a peak cortisol concentration during the baseline phase (-20 minutes), whereas females had a peak cortisol concentration at the start of the stressor (0 minutes). Elevated salivary cortisol for males in anticipation to a psychological challenge was consistent with findings by Kirschbaum, Wüst, et al (1992) and Smyth et al. (1998). Interestingly, Smyth et al (1988) found that affect mediates

secretion of cortisol with exposure to stressors. In regards to the current findings, it may suggest that females are using coping strategies, which may have an affective component, to confront psychological challenges.

How undergraduates interested in this profession will handle repeated exposure to psychological stress is unknown. Yet, given the fact that the current sample had low salivary cortisol in response to this psychological challenge, may give some indication of future neuroendocrine responses to psychological challenges in the field. Past findings indicate that individuals in occupations with high psychological demands (e.g., ambulance drivers) had an upregulated HPA (stress) system (Sluiter, Frings-Dresen, van der Beek, Meijman, & Heisterkamp, 2000). Additionally, it has been found that males exhibit persistent cortisol responses to repeated psychological stress (Kirschbaum, Prüssner, et al., 1995). Additionally, factors such as momentary negative mood in various workers (Hanson, Maas, Meijman, & Godaert, 2000) and depressive and posttraumatic symptoms (Aardal-Eriksson, Eriksson, Holm, Lundin, 1999) in rescue workers are related with elevated cortisol responses. Individuals with low cortisol responses have higher self-concept, less depressed mood, and less health physical health concerns than high responders.

In addition to salivary cortisol responses, perceived distress level to the acute psychological challenge was assessed. Perceived distress did change as a function of time – it was lowest before exposure to the stressor and then increased significantly during exposure for the entire sample, peaking at 30 minutes post exposure. Furthermore, the greatest increase in perceived distress was from 10 minutes before the start of the video to 10 minutes during exposure. Lastly, results revealed no significant relation between perceived distress and salivary cortisol responses to the acute psychological challenge. Low perceived distress may suggest that participants have a strong internal locus of control. De Brabander, Helleman, Boone, and Gerits (1996) found that internal locus of control and preference for thrill and adventure seeking was related to low responses to psychological and physical stress. Although locus of control was not assessed in the current study, participants did endorse a stronger preference for thrill and adventure seeking versus any other form of sensation seeking.

It is important to examine the relation between salivary cortisol responses and subscale scores on the SSS-V and ZKPQ. Only males had meaningful positive correlations

between both pre-exposure and exposure measures of salivary cortisol and the SSS-V subscale of Experience Seeking and the ZKPQ Impulsive Sensation Seeking subscale. These findings are consistent with Dellu et al (1996) who found that rats that seek novelty, variety, and emotional stimulation in experimental situations had elevated stress hormones. Experience seeking rats exposed to a novel environment had a prolonged secretion of corticosterone. Because stress hormones are being released for an extended period in response to novel environments, it may suggest that stress hormones such as cortisol have reinforcing properties.

Current findings were inconsistent with Ballenger et al. (1983) who found that a non-stress induced single sample of CSF cortisol (and not serum and urinary cortisol samples) was negatively associated with disinhibition scores on the SSS-V. Rosenblitt, Soler, Johnson, and Quadagno (2001) found that subscales on the SSS-V correlated inversely with cortisol levels in males. Other findings indicate that sensation seeking traits are not correlated with stress induced (Kirschbaum, Bartussek, et al., 1992) or non-stress induced cortisol levels (Gerra et al., 1999). Inconsistent findings could be attributed to methodological differences in the limited number of samples obtained, utilization of non-stress induced responses, or the existence of high variability in peripheral sources. Current findings utilizing a psychological challenge are opposite of those in which the stressor was a serotonergic challenge (5-HT receptor agonist). Netter et al (1996) found that individuals with elevated experience seeking scores had blunted cortisol responses to the serotonergic challenge. Furthermore, Ruegg et al (1997) found that those with high harm avoidance had elevated cortisol to a serotonergic challenge. Physiological challenges, unlike psychological and physical challenges, induce increased cortisol responses for those with high sensation seeking.

STRENGTHS AND WEAKNESSES

This study represents an initial attempt to examine undergraduates interested in forensic identification. Information was gathered from multiple modalities (e.g., questionnaires, self-report, and adrenocortical responses) regarding personality, experience with psychosocial stressors, perceived distress and neuroendocrine responses to an acute psychological challenge. In addition, the graphic and grotesque nature of the videocassette may be similar to what is encountered on a crime scene. Furthermore,

participants viewed the videocassette when salivary cortisol was most stable, and by viewing the video on an individual basis potential distractions were eliminated.

On the other hand, several limitations must be kept in mind. The first being the relatively small sample, which was limited by the number of participants enrolled in the Forensic Identification Program. The small sample size may have reduced the possibility of finding significant results in the study, thus reducing the capability to reject false null hypotheses. This is especially the case with data obtained on the personality inventories and results related to the personality characteristics should be viewed as a primer for future research in relating personality to interest in novel, stimulating, and nonconventional careers. Because the power to detect differences was very low in many of the statistical procedures utilized, the certainty if a difference existed is narrow. Future studies that examine individuals interested in forensic identification should utilize larger samples with a control sample to further substantiate the current findings.

Although the sample size was small for examining differences obtained on the personality inventories, the sample size used to explore repeated sampling of salivary cortisol responses was within a typical range (Kirschbaum & Hellhammer, 1994). Additionally, all participants followed cortisol collection procedures correctly and samples were collected and analyzed following previously mentioned procedures. Therefore, results obtained about salivary cortisol differences should be reliable indicators of adrenocortical functioning.

The acute psychological challenge used in this study was similar but not exactly what might be encountered in the field. Because the stressor was used in a laboratory setting verses more naturalistic setting, salivary cortisol responses may be attenuated. Various extraneous variables were beyond the control of researcher. Self-selection of participants in the study, the potential for participants to not adhere to instructions for salivary cortisol obtainment (even though all self-reported to do so), and the lack of a comparison sample may be limitations in this study. Lastly, the reader should be reminded that these results were gathered with a sample of participants enrolled in a forensic identification program. These participants are still receiving training in and are not yet employed in the occupation of forensic identification. Caution is warranted when generalizing these results with individuals currently employed as forensic identifiers.

FUTURE RESEARCH AND CLINICAL IMPLICATIONS

Because of the paucity of information known about undergraduates interested in forensic identification, several lines of future research exist. It may be helpful to explore characteristics such as self-concept, positive and negative emotionality, constrain, state/trait anxiety, and locus of control. Many of the previously mentioned characteristics are associated with safety conscious employees (Forcier, Walters, Brasher, & Jones, 2001). Individuals with characteristics such as extraversion, aggression, deviant socialization, impulsiveness, neuroticism, and external locus of control have a higher probability of being a work related accident (Hansen, 1991). Lastly, burnout is a major concern in the workplace. Forensic identifiers have multiple competing occupational demands that can lead to burnout: long work hours, exposure to graphic and grotesque stimuli, pressure to for total accuracy, and high concentration for detail. Individuals with similar duties and demands have been found to have high early morning cortisol after awakening in the morning, a precursor to burnout (Schulz et al., 1998). Because burnout and chronic work overload could be potential problems in this occupation, future research in this area is warranted. Additionally, neuroendocrine responses can be affected by social support (Kirschbaum, Klauer, et al., 1995) and self-esteem (Pruessner et al., 1999). Therefore, employers would benefit from studies focusing on these issues to assist in tailoring training programs that address appropriate management of work related stress, and monitor behavior and provide feedback.

Studying those who are currently employed in the field may lend itself to more complete analysis of both personality and stress responses to work demands. As was found in this study, anticipatory stress reactions were higher for males than actual exposure to the challenge. It would be beneficial to examine how individuals in the field handle anticipatory stress to actual crime scenes. Do they handle it with relative ease or do they have mental, emotional, and physical symptoms characteristic of low stress tolerance? Behavioral observation, self-report, and adrenocortical activation pre and post exposure to crime scenes may shed light on the employee's ability to handle occupational demands. Sluiter et al. (2000) found that the nature of work (physical, mental, or a mixture) and work characteristics are related to neuroendocrine levels. That is, the higher the combination of mental and physical demands, the higher the cortisol of the worker. If the HPA axis is consistently being activated

frequent exposure to stressors, it could result in higher circulating levels of cortisol and slower returns to normal after a stressor is absent. It may be advantageous to examine the stress responses of individuals in this occupation over time.

Previous findings have indicated that personality and job characteristics (e.g., dynamic vs. non-dynamic, autonomous vs. non-autonomous, external vs. internal, and structured vs. non-structure) have effects on job experiences (Van Den Berg & Feij, 1993). Van Den Berg and Feij (1993) found that sensation seeking and extraversion predicted job induced tension and a greater likelihood to quit employment in structured and non-autonomous jobs. Additionally, high sensation seeking and low emotional stability was related to more job-induced tension in dynamic jobs. Lastly, future research should include a measure of vocational interest, such as the Self Directed Search (SDS) or the Vocational Preference Inventory (VPI). This may be helpful in creating Holland typologies for individuals working in the career of forensic identification.

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