



Attenuated subjective ratings and skin conductance responses to neutral and negative pictures in non-psychopathic mentally disordered offenders with various diagnoses

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ABSTRACT

Altered autonomic arousal in relation to offending behavior has mainly been investigated in subjects with varying degrees of psychopathic traits. The present study sets out to investigate subjective ratings and skin conductance responses (SCRs) in mentally disordered offenders with various diagnoses but without psychopathy, specifically recruited from the forensic psychiatric system. Two subgroups were investigated; an antisocial group with antisocial personality disorder (APD) or antisocial traits ($n=16$) and a non-antisocial group with various diagnoses ($n=25$), in relation to a healthy non-criminal control group ($n=20$). All participants were male. SCRs and subjective ratings of arousal and valence were measured for neutral and negative pictures from the International Affective Picture System (IAPS). The offenders showed significantly lower SCRs and subjective ratings than the control group. Moreover, there was no significant difference between antisocial and non-antisocial offenders, indicating that antisocial behavior might not be a differential factor. Thus, attenuated emotional responses may be a characteristic shared by mentally disordered offenders overall.

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1. Introduction

Autonomic arousal, which is an important biological correlate for antisocial and criminal behavior (Raine et al., 1990; Raine et al., 1999; Babcock et al., 2005) has mainly been investigated in subjects with varying degrees of psychopathic traits (Schalling et al., 1973; Patrick et al., 1994; Birbaumer et al., 2005; Verschuere et al., 2005) in the context of fear-related stimuli processing (Patrick et al., 1994; Herpertz et al., 2007) and fear conditioning (Herpertz et al., 2001; Birbaumer et al., 2005; Glenn et al., 2007). Although the findings are mixed (Lorber, 2004), studies have generally shown sympathetic and parasympathetic under-arousal in criminal as well as non-criminal antisocial populations (Raine et al., 2000; Lorber, 2004; Verschuere et al., 2007).

The present study investigated subjective ratings and skin conductance responses (SCRs) in mentally disordered offenders with various diagnoses but without psychopathy as defined by Hare (1991, 2003). Moreover, in contrast to the majority of earlier studies, where the participants have been non-incarcerated community

volunteers or prison detainees (e.g., Raine et al., 2000; Dinn and Harris, 2000; Verschuere et al., 2007), the offenders in the present study were recruited when undergoing a court-ordered major forensic psychiatric assessment in Stockholm, Sweden. According to the Swedish Criminal Code, forensic psychiatric assessments are undertaken in order to investigate whether a severe mental disorder² was present at the time of the offence and at the time of the assessment. Psychopathy is not considered a severe mental disorder and, therefore, offenders with psychopathy are not usually sent to undergo major forensic psychiatric assessments. However, to ensure that no psychopaths were included in our sample, a file-based retrospective rating with the psychopathy checklist revised, PCL-R (Hare, 1991, 2003) was conducted by two independent raters. The offenders were divided into (1) an antisocial subgroup – where the subjects had antisocial traits or fulfilled the criteria for APD (DSM-IV) and (2) a non-antisocial subgroup with various diagnoses. We hypothesized that the offenders would show reduced SCRs in relation to the controls and moreover that the antisocial subgroup would show lower SCRs in relation to the non-antisocial subgroup.

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² All psychotic states, severe depression with strong intention to commit suicide, severe personality disorders/neuropsychiatric disorders combined with marked impulsivity with psychotic features and in a few cases severe dementia and severe mental retardation.

2. Methods

2.1. Subjects

The sample consisted of male subjects between 19 and 57 years of age; 41 offenders and 20 healthy non-criminal control subjects. The mean age of the offenders was 35 years, (S.D. 11.5) and the mean age of the controls was 35.6 years (S.D. 7.6), offenders and controls being matched on gender. The offenders were further divided into two subgroups: (I) an antisocial subgroup ($n = 16$, mean age 31.1 years and S.D. = 7.8) consisting of subjects leading an antisocial lifestyle, who had antisocial traits or fulfilled the criteria for antisocial personality disorder (DSM-IV) and (II) a non-antisocial subgroup ($n = 25$, mean age 37.4 years and S.D. = 12.9) consisting of subjects with various psychiatric diagnoses, not leading an antisocial life style. An ANOVA of age showed no significant differences among the three groups [$F(2, 58) = 1.6, P = 0.2$]. A separate t -test of the mean age difference between the two offender groups was not significant ($t(39) = 1.78, P = 0.08$, unequal variances assumed).

The controls consisted of healthy students and staff from the Department of Forensic Psychiatry and they were screened for psychiatric and neurological disorders using the manual SF-36 (Sullivan et al., 2002). The offenders were recruited from the Department of Forensic Psychiatry in Stockholm, National Board of Forensic Medicine, Sweden, while undergoing presentence forensic psychiatric assessment. In Sweden, a forensic psychiatric assessment includes a Structured Clinical Interview for DSM-IV, (SCID I), (First et al., 1997) with the aim to confirm and/or exclude diagnoses according to DSM-IV (American Psychiatric Association, 1994, 2000). Furthermore, the assessment includes the Wechsler Adult Intelligence Scale-Revised, WAIS-R (Wechsler, 1981), performed by a psychologist. When applicable, a PCL-R rating according to Hare (1991, 2003) is also performed. Due to restrictions in interference with the ongoing forensic psychiatric assessment, it was not possible to conduct a prospective PCL-R rating. However, to ensure that the sample did not contain any psychopathic offenders; two independent raters conducted a file-based retrospective PCL-R rating (Hare, 1991, 2003), which has been shown reliable in earlier studies (Grann et al., 1998). The rating was conducted based on the forensic psychiatric assessment records, which comprise the final report from all team members; a forensic psychiatrist, a psychologist, a forensic social worker, and nursing staff. Exclusion criteria for participation in the study were difficulties in reading and understanding Swedish, acute state of psychosis, or acute compulsory psychiatric treatment at the time of assessment, or heavily sedating medication. The study was approved and conducted in accordance with the ethical guidelines established by the Regional Ethical Committee in Stockholm. The subjects were informed (orally and in writing) about the aim and procedure and a written informed consent was obtained before participation.

The following descriptive factors were collected from the forensic psychiatric assessment records: substance abuse, medication, education (completion of elementary school or not), and intellectual capacity (below average, average, or above average) according to the WAIS-R test (Wechsler, 1981), as presented in Table 1. Furthermore,

Table 1
Demographic information on offender groups.

| | Antisocial subgroup #offenders ($n = 16$) | Non-antisocial subgroup #offenders ($n = 25$) |
|--|--|--|
| Main diagnosis | | |
| - Psychotic disorder | 0 | 6 |
| - Neuropsychiatric disorder | 0 | 6 |
| - Personality disorder | 11 | 5 |
| - Other | 5 | 8 |
| Index crime | | |
| - Violent offence ^a | 10 | 20 |
| - Sexual offence | 1 | 4 |
| - Non violent offence | 5 | 1 |
| Educational level ^b | | |
| - Not completion of elementary school | 4 | 5 |
| - Completion of elementary school or higher degree | 12 | 18 |
| Intellectual capacity ^b | | |
| - Below average | 4 | 6 |
| - Average or above average | 12 | 17 |
| Current medication | | |
| - Yes | 9 | 14 |
| - No | 7 | 11 |
| Substance abuse ^c | | |
| - Yes | 13 | 11 |
| - No | 3 | 14 |
| Number of previous convictions ^d | Median 9,5 (range 1–35) | Median 2 (range 0–43) |
| Mean age (S.D.) | 31,1 (7,8) | 37,4 (12,9) |

^a Including arson and robbery.

^b Value missing in 2 subjects.

^c $P = 0.018$ Chi-square test.

^d $P = 0.001$ Mann Whitney.

main diagnosis, index crime, and number of earlier convictions were collected, as presented in Table 4 (Supplementary material). For a complete list of medications, see Table 5 (Supplementary material).

2.1.1. PCL-R score

Inter-rater reliability was computed for 22 of the 41 offenders by using the intraclass correlation coefficient (ICC; Shrout and Fleiss, 1979). The ICC was calculated using a two-way mixed effects model. The single measure ICC was 0.79 (95% CI = 0.56–0.91, $n = 22$) for the total score of the PCL-R. The correlation for Factor 1 was 0.81 (95% CI = 0.61–0.92, $n = 22$) and for Factor 2, the correlation was 0.89 (95% CI = 0.75–0.95).

Three separate two-tailed t -tests showed significant differences between the two offender groups (antisocial versus non-antisocial); for total PCL-R scores ($t = 4.39$, $df = 39$, $P < 0.001$), Factor 1 ($t = 2.39$, $df = 39$, $P = 0.022$), and for Factor 2 ($t = 4.50$, $df = 39$, $P < 0.001$). For mean scores, see Table 6 (Supplementary material).

2.2. Procedure

Fifty pictures (25 neutral and 25 negative) were selected based on their normative valence and arousal ratings from the International Affective Pictures System (IAPS; Lang et al., 1999; Lang et al., 2005).

The experiment took place in an observation room at the Department of Forensic Psychiatry, Karolinska Institutet, Stockholm. The participants were seated in a comfortable chair at a distance of approximately 0.4 m from a computer screen (View sonic Professional series P225f). The pictures were presented in a fixed randomized order during a time frame of 6 s each. Following each picture, the subject was instructed to rate the pictures on a 1–9 scale according to arousal and valence. Arousal was rated with respect to experienced emotional intensity, from very calm (score 1) to very excited (score 9). Valence was rated from very unpleasant (score 1) to very pleasant (score 9). The ratings were done verbally and written down by the experimenter, in order to eliminate the distracting effects of having to use a keyboard.

SCRs were collected by a pair of silver/silver chloride electrodes (8 mm diameter), filled with electrode cream (Minograf electrode cream, SIEMENS-ELEMA AB), placed on the hypothenar eminence of the non-dominant hand, using sticky electrode collars. SCRs were measured during stimulus presentation and registered with Pyslab SC5, in combination with Pyslab Stand Alone Monitor, SAM instruments (www.pyslab.com). The system constantly delivered 0.5 V and measured SCR with a sampling rate of 40 Hz. With PYSLAB, SCRs can be collected either by i) allowing the program to automatically choose the responses or ii) manually, that is by going through the data and selecting the responses. In the present study, responses were scored manually in order to avoid multiple SCRs being registered for each picture and they were defined as the maximum increase of the first uninterrupted SCR starting within 1–4 s after picture onset.

2.3. Statistical analysis

To investigate group effects on SCRs and subjective ratings, we used 2×2 (neutral and negative pictures \times controls and offenders) ANOVA, and 2×3 (neutral and negative pictures \times controls, antisocial and non-antisocial offenders) ANOVA. Considering the general importance of age in SCRs and rating measurements, corresponding ANCOVAs with age variance were performed. Results of the ANCOVAs were highly similar to the ANOVAs and the significant findings did not change, thus only the results from the ANOVAs are reported.

To reduce skewness, SCRs on individual trials were square-root transformed before averaging. Two measures of SCRs were performed; magnitude which includes all responses across stimuli, and amplitude which excludes non-responses (Dawson et al., 2000), here defined as responses below 0.01 μ S. In order to rule out group differences based on differences in actual responses, the analyses based on magnitude were repeated with amplitude measurement of the SCRs (i.e., excluding non-responses). The outcome was similar to the findings based on magnitude responses, subsequently; the analyses for amplitude were excluded from the result section. To reduce the inter-individual error variance of SCRs magnitude, a range correction was performed, where each participant's response was expressed as a proportion of that participant's largest response, which was given the value 1 (Lykken, 1972). All 61 participants performed arousal and valence ratings. Due to technical problems, the SCR data of one offender were lost.

At the time of the assessment, the offenders used a variety of medications (cf. Table 5 in Supplementary material). For statistical analysis, medication was coded as a dichotomous variable. T -tests of the difference in mean SCRs (magnitude) for neutral and negative pictures showed no significant differences between participants. In addition, separate mixed 2×2 ANOVAs of ratings and SCRs with picture category as within-subject factor and medication and offender group as between-subject factors, controlling for age, showed no significant effects ($F_s < 1$). Therefore, medication was eliminated from further analyses.

Categorical data are presented as numbers and/or percentage. Age and PCL-R scores are presented as mean (S.D.), and number of previous convictions is presented as median (range). Demographic variables were tested with chi-square test, Fisher's exact test and Mann-Whitney test. Main diagnosis was used to divide the subgroups and therefore it automatically differed between the two groups. The confidence interval was set at 95% and the level of statistical significance of differences was $P < 0.05$.

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