

Chapter 7

Classical conditioning, arousal, and crime: A biosocial perspective

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1. INTRODUCTION

The pleasure in contributing to the Festschrift of one of the world's leading psychologists is particularly heightened by the fact that Hans Eysenck played a major role in my very first publication. This first publication in turn has shaped my entire research career, and the research focus I have today (the biosocial bases of crime and violence) is a direct result of this publication. The publication was in itself based on the very first public talk I gave, a talk that I shall never forget. It took place at the British Psychophysiology Society meeting at the Institute of Psychiatry, London, in December 1980 while I was a graduate student under Peter Venable (himself a former graduate student of Hans Eysenck) at York University.

The talk was a source of immense anxiety for me not only because it was my very first public speech, but also because my results failed to support Eysenck's primary prediction (that antisocials condition poorly), and instead indicated a biosocial interaction such that antisocials from good homes are bad conditioners, whilst antisocials from bad homes are paradoxically good conditioners. My concern was that I would be totally humiliated by a deluge of criticism from the master theorist on his home ground. I felt somewhat better when I looked round just before my talk and could see no sign of Professor Eysenck, and was most relieved to stumble through the talk and follow-up questions from non-Eysenckians. Imagine my horror however when, walking from the podium up the steps of the main auditorium in the Institute of Psychiatry for the afternoon tea-break, I saw Professor Eysenck lying in wait for me at the top of the stairs. Imagine my shock when, having reached the top

of the stairs, he introduced himself, congratulated me on the paper, and suggested that I might consider submitting it to *Personality and Individual Differences* for potential publication!

It is hard to convey what a profoundly exhilarating boost this very first meeting with Hans Eysenck gave to a young unpublished student greatly lacking in confidence, and how much inspiration it gave to my future work. Nevertheless, what I hope I will be able to convey in this chapter is an academic sense of what Eysenck's theorizing on crime and conditioning has been, to what extent his theory has received empirical support, how Eysenck has advocated a more sophisticated biosocial perspective on understanding crime, and where this approach will take us in the future.

In doing so I hope to convey some of the brilliance and genius behind Eysenck's thinking, which was very much ahead of its time. I hope nevertheless that the more important lesson which I learnt from Hans Eysenck on that day, that of senior scientists giving encouragement to young researchers, is not forgotten in the process. To my mind, the extent of Eysenck's contributions lie not just with his own work, but also with the larger scientific corpus that he has stimulated in others with his own generous encouragement.

2. EYSENCK'S CONDITIONING THEORY OF CRIME

Eysenck's influential theory of criminal behavior rests on the notion that criminals and other antisocials are deficient with respect to classical conditioning (Eysenck, 1964; 1977; Eysenck & Gudjonsson, 1989). He argued that classical conditioning is fundamental to the whole process of socialization whereby the individual learns to withhold antisocial responses. It is argued that the crucial mechanism that stops most of us from committing criminal and antisocial acts is the concept of conscience; a well-developed conscience is what holds many of us back from not stealing even in those situations when we are almost certain of getting away with the theft undetected. Eysenck argues that what we call "conscience" is, in effect, a set of classically-conditioned emotional responses. The greater the individual's ability to develop and form classically-conditioned emotional responses, the greater the conscience development, and the less likely will be the probability of becoming antisocial. Conversely, poor conditionability will result in poor conscience development and undersocialized, antisocial behavior.

Classical conditioning involves learning that an initially neutral event (a conditional stimulus, CS), when closely followed in time by an aversive event (unconditional stimulus, UCS), will develop the properties of this UCS. In the classic case of Pavlov's dogs, a bell (CS) was paired with the presentation of food (UCS). Food to hungry dogs automatically elicits an unconditional response (UCR), in this case salivation. After a sufficient number of pairings of

the bell with the food, the bell by itself will come to elicit the UCR—or salivation. Although conditioning has often been viewed as reflecting automatic, reflexive processes, experiments in human autonomic classical conditioning support the notion that complex cognitive processes are involved in this form of learning (see e.g., Dawson & Schell, 1985).

In concrete terms, the way classical conditioning is hypothesized by Eysenck to relate to socialization is as follows. Taking the scenario of a small child stealing a cookie (CS) from the kitchen, punishment by the parent (scolding or physical punishment—UCS) elicits an unconditional response (UCR) whereby the child is upset and feels uncomfortable. After a number of similar “learning trials,” the sight of the cookie (or even the thought of stealing the cookie) will elicit an uncomfortable feeling in the child (conditional response—CR) which acts to avert the child from enacting the “theft.” Similar “conditioned emotional responses” developed relatively early in life in varying situations combine, in Eysenck’s view, to represent what we call “conscience.”

In this analysis, socialized individuals develop a feeling of uneasiness at even contemplating a criminal act (robbery, assault) presumably because such thoughts elicit representations or “unconscious” memories of punishment early in life for milder but related misdemeanors (theft, behaving aggressively). In this context the common response of socialized individuals to crimes committed by others such as “I could never even think of doing such a thing” becomes understandable. Socialized individuals do not even contemplate such events because even the thought of such acts elicits CRs involving discomfort.

Eysenck’s theory of crime involves more concepts than just conditioning. He argues that crime has a genetic basis, and that genetic differences lead to individual differences in CNS and ANS functioning which in turn shape personality and behavior. Central to such differences are individual differences in arousal. These differences in arousal levels result in differing degrees of both extraversion and conditionability, with low levels of arousal predisposing to poor conditionability and high levels of extraversion. Because of links between extraversion and both arousal and conditionability, Eysenck (1964, 1977) went on to argue that criminals would be extravert, and also developed predictions concerning high neuroticism and psychoticism (H. J. Eysenck & S. B. G. Eysenck, 1978; H. J. Eysenck, 1987).

2.1 Evidence for poor classical conditioning in antisocials

Eysenck’s predictions concerning personality have generated a great deal of research, and reviews of findings may be found in Bartol (1991), Eysenck (1987, in press), Farrington, Biron, and LeBlanc (1982), and Passingham (1972). In general, the findings support the predictions, particularly with respect to Neuroticism in adult samples, Extraversion in juvenile samples, and Psychoticism in both adult and juvenile samples (Eysenck, in press).

Nevertheless, the central idea in Eysenck's theory is that criminals and antisocials will be characterized by poor classical conditioning. This prediction has received less empirical attention, probably because it is much easier to assess personality than conditionability. Classical conditioning has most frequently been assessed using skin conductance: a neutral tone (CS) is presented to the subject, followed a few seconds later by either a loud tone or an electric shock (UCS). The key measure derived from this paradigm is the size of the skin conductance (SC) response elicited by the CS after a number of CS-UCS pairings. The lower the SC amplitude, the poorer the degree of conditioning. On occasions however, eye-blink classical conditionability has been assessed in which a neutral stimulus is followed by an air-puff to the eye which elicits an eye-blink (UCR)—the measure here is the magnitude of the eye-blink to the CS alone after a number of CS-UCS pairings.

The last systematic review of conditionability was reported by Hare (1978). Of the 14 studies reported by Hare covering classical conditioning and what is termed "quasi-conditioning" (see below), 12 indicated that psychopaths, criminals, delinquents, and antisocials showed poorer SC conditioning than control groups. In one of the remaining two studies, significantly poorer conditioning was observed for a subgroup of psychopaths (those with low scores on the Socialization scale). The remaining study failed to observe overall significant effects, and instead observed that younger psychopaths gave larger responses than older psychopaths. Overall, therefore, this review indicates general support for the notion of poorer conditionability in antisocial groups.

In order to assess whether this general conclusion remains true, findings from conditioning studies conducted since 1978 have been assessed by Raine (1993). These six studies and their key findings are noted in Table 7.1. SC conditioning in these studies is assessed either by SCRs occurring to the conditional stimulus (what has been termed the conditioned "A" response) or by the SCR occurring in between the CS and the unconditional stimulus (the conditioned "B" response). In two of the studies (Hare, 1982; Tharp,

Table 7.1. Key findings from studies since 1977 on classical conditioning in antisocials, criminals, and psychopaths as measured by skin conductance

Authors' significant findings	Subjects	Finding
Ziskind et al. (1978)	Psychopathic gamblers	Poor differential conditioning but verbal awareness
Aniskiewicz et al. (1979)	Primary psychopaths	Poor vicarious conditioning
Tharp et al. (1980)	Psychopathic gamblers	Less anticipatory responding
Raine and Venables (1981)	Conduct disorder	Poor conditioning in high social class antisocials
Hemming (1981)	Criminals from good homes	Less conditioned discrimination in extinction
Hare (1982)	Psychopaths	Less anticipatory responding

Maltzman, Sydulko, & Ziskind, 1980) the paradigm consists of a “count-down” procedure in which the subject awaits the onset of an aversive stimulus whose onset is signaled several seconds beforehand—a paradigm referred to by Hare (1978) as “quasi-conditioning.” All six of these studies showed some evidence indicating significantly poorer SC conditionability in antisocials. Not all of these studies provide unequivocal evidence for poor conditioning however. Hemming (1981) found group differences for conditioned discrimination in extinction, but not for conditioning discrimination during acquisition. Similarly, Raine and Venables (1981) found poor conditioning specifically in antisocial children from higher social class, but not in those from lower social classes, an issue that will be referred to in more detail later.

2.2 Assessment of conditioning studies

The findings outlined in Table 7.1 are unusual in that, in one way or another, they all find significant group differences even though there are wide variations in these studies. For example, paradigms varied from a classical CS–UCS paradigm (e.g., Hemming, 1981) to vicarious conditioning where subjects watching others receive electric shocks following a CS (Aniskiewicz et al., 1979) to quasi-conditioning count-down procedures (e.g., Tharp et al., 1980). Subjects ranged from uninstitutionalized antisocial children (e.g., Raine & Venables, 1981) to adult criminals (Hemming, 1981) to institutionalized psychopaths (Tharp et al., 1980) to psychopathic gamblers (Ziskind, Sydulko, & Maltzman, 1978). The fact that all studies showed significant effects in the predicted direction would indicate that poor conditioning is related to the general development of antisocial behavior.

Several of these paradigms do not control for factors such as sensitization. However, it is likely that the SC conditioning measures obtained are a strong correlate of true SC conditioning, since one would expect that those who sensitize easily also condition easily.

There are several interesting aspects to some of these studies. Ziskind et al. (1978) demonstrated that while psychopaths were able to verbalize the contingency between the CS and UCS (i.e. they know that the warning tone was followed by the aversive tone), they did not show conditioning. This finding suggests that conditioning deficits in antisocials are not merely a reflection of a cognitive, conscious process involving understanding the link between the CS and UCS, but may involve more deep-seated, “unconscious” or pre-attentive processes.

The study by Hemming (1981) is of interest in that the subject population consisted of criminals from relatively good social backgrounds. It has previously been argued that biological predispositional variables may have greater explanatory power in antisocials from relatively benign homes where the “social push” towards antisocial behavior is low; if individuals become

antisocial therefore, it may be more for biological than social reasons (Mednick, 1977; Raine & Venables, 1981). Hemming's findings are consistent with this analysis. An early finding by Lykken (1955) also appears to be consistent with this approach. Lykken observed that primary psychopathic inmates showed poorer SC conditioning to an electric shock than neurotic psychopaths. In commenting on Lykken's subject selection procedures, Siddle and Trasler (1981) point out that in this study subjects were excluded if they came from a "markedly sociopathic or deviant" family background (Lykken, 1955, p. 111a). As such, SC conditioning deficits were found in psychopaths from relative good home backgrounds. This issue is an important one and it leads to the notion that the social environment may mediate antisocial-conditioning relationships.

3. EYSENCK'S BIOSOCIAL THEORY OF CRIME AND CONDITIONING

Throughout his career, Eysenck has been repeatedly and mistakenly accused of being a radical biotrope who rigidly espouses a genetic and biological approach to human behavior. Paradoxically, quite the opposite has been the case. Eysenck has always acknowledged the important role of the environment in shaping human behavior, while at the same time making it clear that genetics and biology do play a significant role. This perspective is especially true of Eysenck's approach to crime. Indeed, he viewed the interaction between environmental and biological factors as absolutely critical to the development of crime.

Surprisingly, this biosocial perspective has not received the attention that it deserves, yet Eysenck made his biosocial perspective quite clear. In discussing the hypothetical case of a child who, instead of having law-abiding parents, has a mother who is a prostitute and a father who is a thief:

Clearly the exact opposite of what we have posited heretofore will take place. Now it will be the introverted child, the child who conditions well, who will condition to the precepts emerging from this "Fagin's kitchen." Instead of becoming conditioned to be a good and law-abiding citizen, we now have our introvert being conditioned to be a "good" law-breaking thief or prostitute. (Eysenck, 1977, pp. 150-151)

Eysenck (1977) therefore argued that children who are highly conditionable and who have antisocial parents will become "socialized" into their parents' antisocial habits, whereas children who condition poorly will, at least in this environment, paradoxically avoid becoming antisocial.

Eysenck's biosocial prediction was tested by Raine and Venables (1981). In this study 101 schoolboys were assessed on skin conductance conditioning while their antisocial behavior was assessed by (1) teacher ratings of antisocial school behavior (Quay & Parsons, 1970), and (2) a factor of self-report

antisocial personality with high loadings from several antisocial scales such as Socialization ($-.72$ loading), Unsocialized–Psychopathic (.79), as well loadings from personality variables such as Psychoticism (.62), Impulsivity (.59), and Neuroticism (.58). The conditioning paradigm was designed to test Eysenck's theory and features included partial reinforcement, a relatively weak UCS, and short interstimulus interval which are viewed as favoring introverts (see Raine & Venables for more details). Social class was used to assess quality of home environment, with low social class being a proxy for a relatively more criminogenic home environment.

The expectation stemming from Eysenck's theory would be that antisocials from good home environments would show the expected conditioning deficit, while antisocials from bad home environments would show good conditionability. This conclusion is indicated by the fact that antisocial measures correlated significantly and negatively with conditioning in the high social class group, but in the positive direction in the low social class group.

To illustrate the findings graphically, subjects were dichotomized into "antisocial" and "prosocial" groups on the basis of a median split on the antisocial measures. Results of this analysis are illustrated in Figure 7.1. A significant interaction was observed between social class and antisocial grouping in relation to conditioning ($p < .04$). As illustrated in Figure 7.1, Eysenck's predictions were supported. Antisocials from benign homes showed

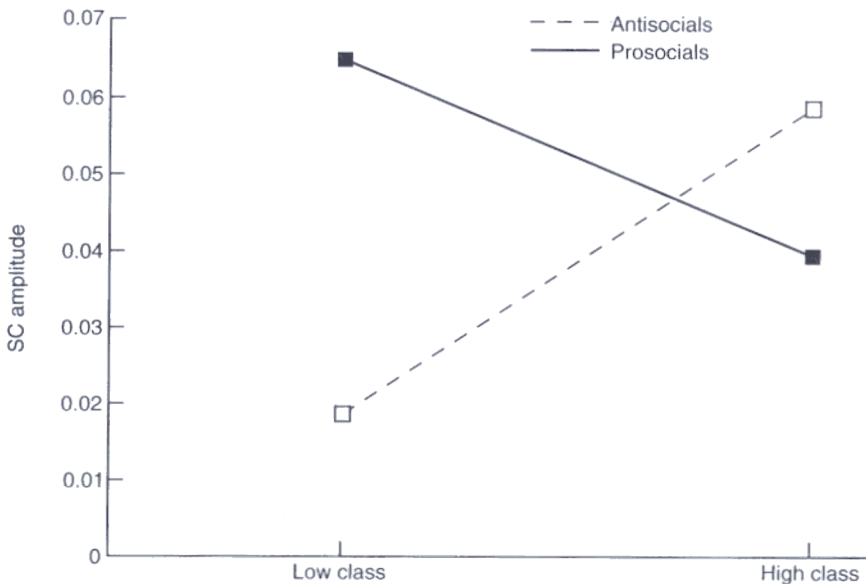


Figure 7.1. The interaction between social class and antisocial behavior in relation to skin conductance classical conditionability (Raine & Venables, 1981).

poor conditioning, while antisocials from negative home backgrounds showed good conditionability. Although it appears that the effect is stronger in low than high social classes, the correlational analyses indicated equal strength of findings in the two social class groups.

Poorer SC conditioning was observed in children from higher social classes. One finding from this study which does not fit so easily with this perspective is that antisocials from lower social classes showed relatively good conditioning (see Figure 7.1). This specific finding may be more easily explained by the process of "antisocialization." If low social class indirectly reflects a relatively criminogenic environment, then the stronger conditionability in children from low social classes found in Raine and Venables (1981) would be consistent with this analysis.

Although this study supports Eysenck's biosocial theory of crime, there are clear limitations. First and foremost, low social class is at best an indirect measure of criminogenicity of the home environment. Better studies which more directly assess antisocial processes in subject's homes and peer groups in conjunction with conditionability are needed to confirm Eysenck's hypothesis. Nevertheless, the important point to make is that conditionability may interact with social factors in important ways to explain antisocial behavior, a fact which provides some encouragement for a biosocial perspective on crime.

4. NEW FINDINGS SUPPORTING THE BIOSOCIAL PERSPECTIVE

New findings which provide some additional support for Eysenck's biosocial perspective are derived from initial analyses of the Mauritius longitudinal study. In assessing these findings, it is important to bear in mind that they constitute provisional and initial analyses. The dependent variable in this case is not conditionability per se but skin conductance orienting, a measure of conceptual relevance to conditioning (see below). In brief, subjects consist of 1795 male and female children who were psychophysiologicaly tested at age 3 years (Venables, 1978). 51% are male and 49% are female. The two main ethnic groups consist of Indian (69%) and Creole (29%).

All 1795 subjects were assessed on SC orienting and resting heart rate at age 3 years (see Venables, 1978 for full details). Inhibited versus disinhibited temperament was assessed at age 3 years (see Scarpa, Raine, Venables, & Mednick, 1995 for full details). Out of the total of 1795, 1213 were assessed by teachers at age 11 years on the Achenbach scale (Achenbach & Edelbrock, 1979). Analyses below focus on two key subscales of this checklist, Aggression and Delinquency. Two limitations of the Achenbach measures are that (1) scales for males and females are somewhat different, and (2) the "Aggression" scale contains many items with no aggression component, while the "delinquency" scale contains aggression items. To provide purer indices of

Aggression and Non-Aggressive Delinquency subscales common to both sexes, two new scales were constructed. Coefficient alpha for the Aggression scale were 0.72 (boys) and 0.72 (girls), with slightly lower reliabilities found for Delinquency (0.64 for boys, 0.68 for girls).

The key psychosocial variable to be considered in the analyses below was socioeconomic status (SES). This was taken at age 3 years, and consisted of a factor score based on a factor analysis of a variety of social variables which produced one major factor. Variables loading on this factor included number of years of education of the parents, parental occupation, additional educational training of the parents, appearance of the home, number of rooms per person, and number of rooms in the house. Data were available on 1321 of the subjects. Upper and lower quartile splits were used to divide subjects into high and low Aggression, Delinquency, total Antisocial, and Disinhibited groups. High and low SES groups were then formed on the basis of a median split.

The ANOVA on frequency of SC orienting responses produced a significant Aggression SES interaction, $F(1183) = 6.5, p < .01$. The interaction is illustrated in Figure 7.2. It can be seen that in the high SES group, Aggressives tend to give fewer orienting responses than Non-Aggressives, whereas this effect is reversed in the lower SES group where Aggressives showed greater orienting. As such, the effect is in the same direction as for the conditioning SES interaction observed by Raine and Venables (1981).

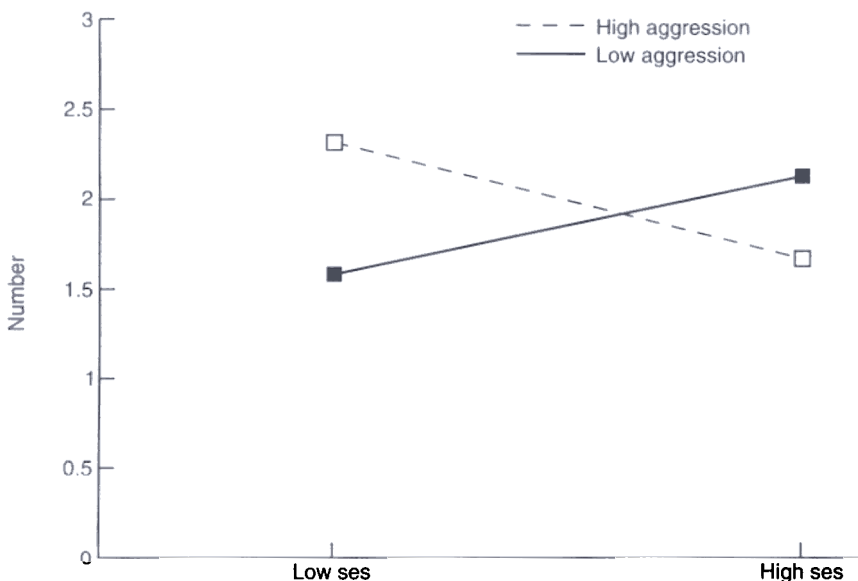


Figure 7.2. The interaction between social class and aggression in relation to skin conductance orienting (Raine et al., in press).

This biosocial effect was not specific to aggressive behavior as the same interaction effect was observed for nonaggressive Delinquency ($F(1125) = 4.3$, $p < .04$), with the same pattern of results emerging. No interactions were observed with either sex or ethnicity.

4.1 Interpretation of new findings

The biosocial effect for orienting is of significance in that it mirrors the effect observed by Raine and Venables (1981) for SC conditioning. It takes that previous support for Eysenck's biosocial theory four steps further by showing (1) orienting and SES prospectively collected at age 3 years predicts to aggression at age 11 years, (2) the effects for males also hold for females, (3) the effects generalize across ethnic groups, and (4) the effects appear to apply to delinquency as well as aggression.

These orienting results can be interpreted in the way that Raine and Venables (1981) interpreted their conditioning data along the lines of Eysenck's biosocial theory, that is, in terms of the benign homes effect (poor conditioning characterizes antisocials from benign home backgrounds) and the antisocialization effect (good orienting characterizes antisocials from poor home backgrounds). SC orienting is a sensitive measure of information processing (Dawson, 1990; Dawson, Schell, & Filion, 1991). Poor orienting is thought to reflect a fundamental deficit in the ability to allocate attentional resources to environmental events. As such, poor orienting in antisocials from benign homes may reflect an attentional deficit which could be expected to retard classical conditioning and the ability to form associations between signals of punishment and the punishment itself. Good orienting in aggressives from poor homes may reflect good attention and more proficient learning of antisocial habits in more criminogenic homes.

4.2 Extensions of Eysenck's biosocial theory to brain imaging findings

Increased SC orienting has been associated with better prefrontal functioning (Hazlett et al., 1993) and increased area of the prefrontal cortex (Raine, Reynolds, & Sheard, 1991). Furthermore, classical conditioning is associated with increased cerebral blood flow in the prefrontal cortex (Hugdahl et al., 1995). As such, poorer orienting and conditioning are associated with prefrontal deficits. Because antisocials from good home backgrounds have been shown above to have poor orienting and poor conditioning, we might expect these individuals to represent a subgroup of violent criminals who are particularly characterized by prefrontal deficits. Conversely, antisocials from negative home backgrounds would not be expected to show these deficits, or may even have good prefrontal functioning.

We have recently tested this prediction using data from a brain imaging study of murderers (Stoddard, in press). We had previously found that murderers, compared to age and sex-matched normal controls, have selective reductions in glucose metabolism in the prefrontal region of the brain. Glucose metabolism was assessed using positron emission tomography (PET) and using the continuous performance task to challenge the prefrontal cortex. To test the above biosocial hypothesis, murderers were divided into those with and without a home background characterized by psychosocial deprivation (e.g., physical and sexual abuse, neglect, extreme poverty, severe family conflict).

Results of the analysis are shown in Figure 7.3. It can be seen that the lowest prefrontal functioning was observed in murderers who lacked psychosocial dysfunction. This group had left prefrontal metabolic rates which were significantly lower than both controls and murderers with psychosocial deficits ($p < .05$), and right prefrontal rates that were significantly lower than controls. These findings are consistent with Eysenck's theory that would predict that criminals from benign home backgrounds are most likely to exhibit biological deficits. However, the biosocial theory is not fully supported because

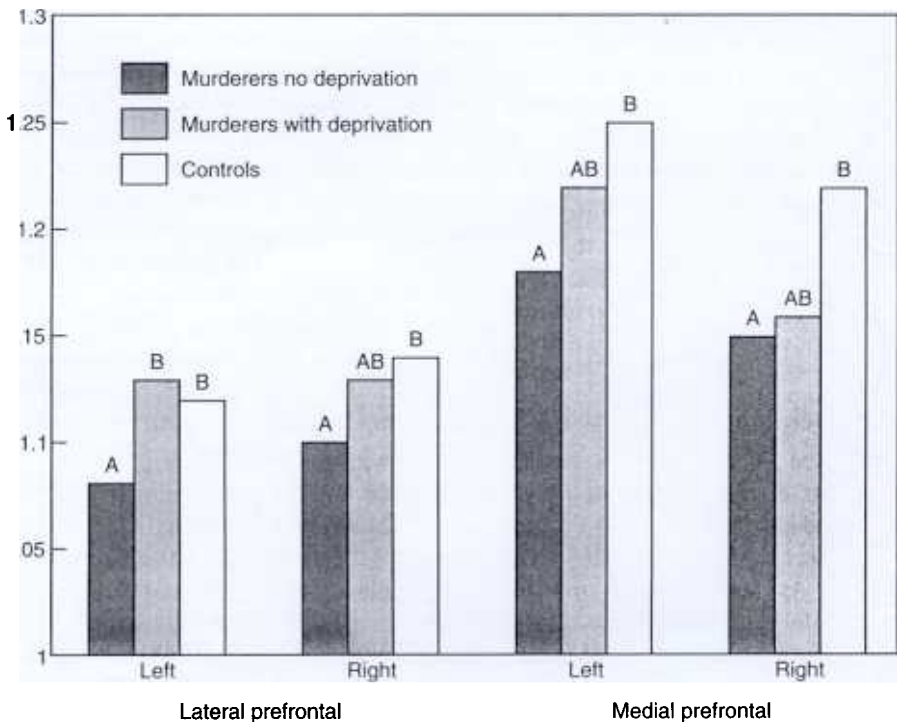


Figure 7.3. Low prefrontal glucose metabolism in murderers who lack psychosocial deficits (Stoddard, in press).

murderers with psychosocial deficits did not have significantly higher prefrontal values than controls. This may be because the sample is weighted towards those with negative home backgrounds and lacking violent offenders from completely trouble-free homes. Despite this caveat, extrapolating from conditioning to orienting to prefrontal functioning does provide some limited support for Eysenck's biosocial hypothesis.

4.3 Underarousal and antisocial behavior

The focus of this chapter has been on classical conditioning because it is the crucial process in Eysenck's theory of crime. Mention should also be briefly made of the other psychophysiological process of underarousal. Eysenck (1977) also invoked this construct because he believed that low arousal is associated with extraversion, poorer conditioning, and hence antisocial behavior. There has been surprisingly good support for this prediction, particularly with respect to autonomic arousal (see Raine, 1993, for a full review). Particularly important are positive findings from three prospective longitudinal studies because they allow for temporal ordering of variables, and hence a better test of causality.

One problem with many of these studies, both cross-sectional and longitudinal, is that evidence is based on only one measure of arousal. A nine-year prospective study of crime by Raine, Venables, and Williams (1990) has shown, however, that HRL, NSF's, and excessive theta EEG measured at age 15 years in normal unselected schoolboys predicted criminal behavior at age 24 years. These three measures correctly classified 74.7% of all subjects as criminal/noncriminal, a rate significantly greater than chance (50%). In the total population the three arousal measures were statistically independent; the fact that they all independently predicted criminal behavior indicates strong support for an arousal theory of criminal and antisocial behavior (although this finding also cautions against the use of a simplistic, unitary arousal concept in explaining crime). Group differences in social class, academic ability, and area of residence were not found to mediate the link between underarousal and antisocial behavior. This is the first study providing evidence for Eysenck's underarousal perspective of crime which uses all three psychophysiological response systems.

4.4 Psychophysiological protective factors against crime development

One of the hallmark's of Eysenck's theoretical contribution to psychology is that he has the unusual creative ability to pose simple, powerful questions which are rarely asked. For example, rather than asking the question "why do children become antisocial," he has asked "why don't all children become antisocial"? This simple yet challenging question provided the basis of

Eysenck's conditioning and personality theory of socialization and crime (Eysenck, 1977). All psychophysiological research to date has attempted to ask the question "what psychophysiological factors predispose to crime?," and consequently has focused exclusively on risk factors for crime development. Following Eysenck's lead, a potentially more important question to be posed, however, is "what factors *protect* a child predisposed to crime from becoming criminal?" Understanding biological protective factors against crime development may be of critical conceptual importance because it can more directly inform intervention and prevention of antisocial behavior. Though this seems an obvious line of thinking, it has not been pursued in biological research on crime until very recently. These new data provide support for what Eysenck himself might have predicted, that is, high arousal, orienting, and conditionability characterize those who desist from crime.

Raine, Venables, and Williams (1995) report on a 14-year prospective study in which autonomic and CNS measures of arousal, orienting, and classical conditioning were taken in 101 unselected 15-year-old male schoolchildren. Of these, 17 adolescent antisocials who desisted from adult crime (Desistors) were matched on adolescent antisocial behavior and demographic variables with 17 adolescent antisocials who had become criminal by age 29 (Criminals) and 17 nonantisocial, noncriminals (Controls). Desistors had significantly higher heart rate levels, higher SC arousal (measured by nonspecific SC responses—see Figure 7.4), and higher SC orienting, better SC conditioning, and faster half-recovery time of the SC response (thought to reflect an open attentional stance to the environment) relative to Criminals (see Figure 7.5). Findings suggest that individuals predisposed to adult crime by virtue of showing antisocial behavior in adolescence may be protected from crime by heightened levels of autonomic arousal and reactivity.

Good conditioning and fast fear dissipation/open attentional stance may protect against criminal behavior because they help facilitate the development of learning processes (specifically, classical conditioning and passive avoidance learning) which have been theoretically viewed by Eysenck as underpinning the process of socialization (Eysenck, 1977). Such an advantageous psychophysiological profile does not, however, explain why Desistors were antisocial in adolescence. It seems feasible that this subgroup were predisposed to antisocial behavior for more transient, nonbiological reasons, such as negative peer influences (Blumstein, Cohen, Roth, & Visher, 1986), which may not carry over into adulthood. Developing further Eysenck's biosocial perspective on crime, emphasizing an interaction between biological processes and social processes, may nevertheless yield some clues. For example, Moffitt (1993) has argued that antisocial behavior during adolescence is actually normative social behavior arising as a response to the contemporary secular context. It is conceivable that good conditioners are well-behaved in the prevailing prosocial environments they experience in early development, but may for a temporary

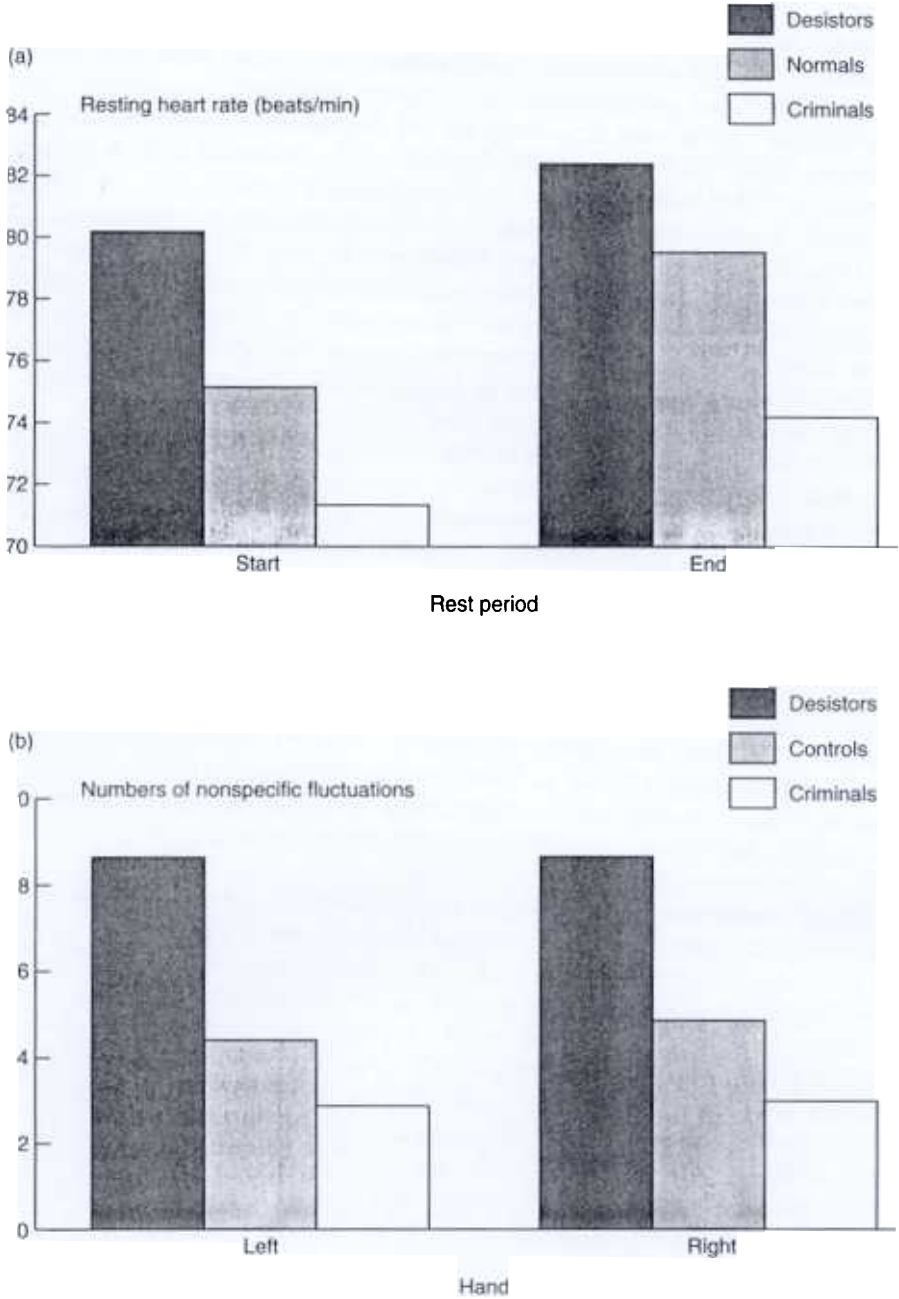


Figure 7.4. High resting (a) heart rate and (b) skin conductance characterized antisocial adolescents who desist from crime in adulthood (Raine et al., 1995).

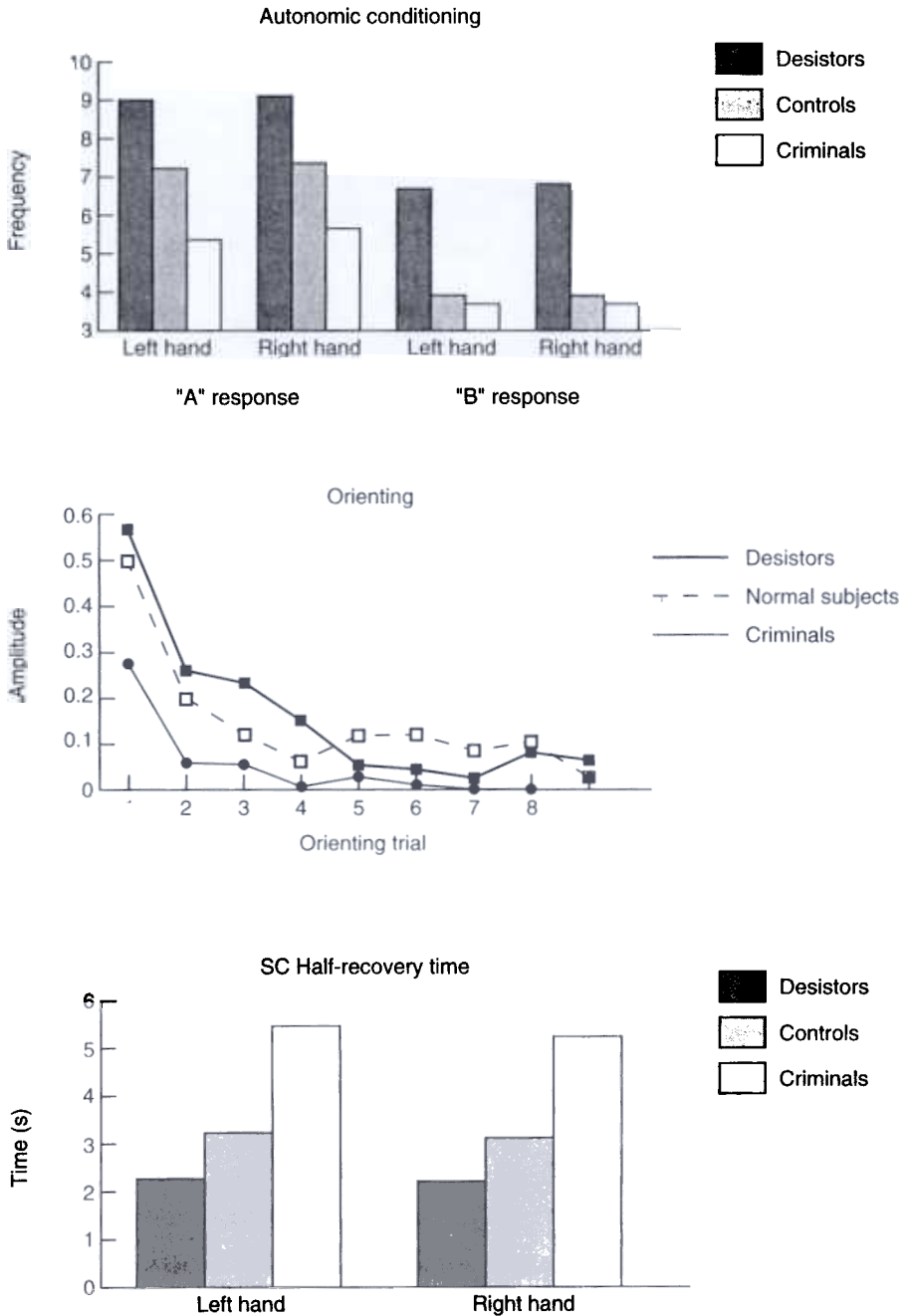


Figure 7.5. Better classical conditioning and orienting, and faster half-recovery times in antisocial adolescents who desist from crime in adulthood (Raine, Venables, & Williams, 1996).

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period become easily conditioned into the antisocial mores that predominate only during adolescence (Moffitt). A change back to prosocial behavior may occur as the good conditioner leaves these antisocial peers and becomes influenced by a different set of reinforcement contingencies and a more prosocial life norm (e.g., starting work, marriage, having children, setting up a home). Moffitt has argued that adolescent-limited antisocial behavior may be more under the control of reinforcement and punishment contingencies; heightened classical conditionability in the Desistor group may in turn make this adolescent subgroup particularly susceptible to the prevailing reinforcement schedules.

5. IMPLICATIONS OF EYSENCK'S EARLY THEORIZING FOR A NEW GENERATION OF CRIME RESEARCH

Eysenck was decades ahead of his time in suggesting a biosocial approach to crime, for it is only now that this approach is beginning to be embraced by a wider scientific community. In what ways can future research build on the solid foundation laid down by Eysenck? If Eysenck was starting his career again in 1997, what would his blueprint be for tackling the growing problem of crime and violence in society?

At one level I suspect several features of his theorizing would remain intact. He would still argue that it is critical to discover the genetic and biological underpinnings to crime and violence, and part of this would still involve key aspect of his personality theory. He would still emphasize a biosocial approach which attempts to integrate these individual difference trait variables with social and situational influences. He would still argue that we need to apply what we have learnt from scientific inquiry to tackle crime in society directly.

While these issues may remain fundamental, one suspects there may be both a theoretical and methodological shift in his approach. In terms of methodology, he might argue for a molecular genetic approach to furthering our understanding of the basic biological, temperamental, and personality predispositions to crime. He might advocate a discordant twin approach to attempting to understand what environmental factors help protect a monozygotic twin genetically predisposed to crime (by virtue of the co-twin being criminal) from becoming criminal.

The recent technical advances brought about by brain imaging would certainly result in suggestions about using functional magnetic resonance imaging (MRI) to assess arousal and conditionability more directly. The increase in our knowledge of brain functioning might have led Eysenck to speculate more on dysfunction to specific brain mechanisms which may underlie deficits in arousal, conditioning, and emotion regulation, and the neural networks that subserve antisocial and aggressive behavior. For example,

the prefrontal cortex is involved in the regulation of arousal, and dysfunction to this structure has been implicated in violent offenders (Raine et al., 1994). Nevertheless, one suspects that he would still advocate the use of autonomic psychophysiology to understanding crime, because while brain imaging techniques are excellent tools to understand arousal and cognition in the CNS, skin conductance and heart rate are still state-of-the-art measures for obtaining a handle on autonomic functions which must be central to any theory of crime which focuses on emotional responding.

At a conceptual level one suspects that there would be a greater focus on the role of Psychoticism in his personality theory of crime. Again, Eysenck was ahead of his time in developing a scale which assesses the interface between schizophrenia/psychoticism and crime. Linking crime with schizophrenia has been strongly resisted for decades, and it is only very recently that the larger scientific community have accepted a link between these conditions. It may be that criminals with schizotypal-like features differ in terms of underlying etiology relative to criminals lacking such characteristics, and future research may usefully explore further the contribution of Psychoticism to the etiology of crime.

Most importantly of all, I suspect Eysenck would develop further his notions on the biosocial bases of crime. Not only does the social environment moderate the relationship between conditioning/arousal and antisocial behavior, but also it is quite possible that early environmental processes can lead to changes in autonomic functioning which may then predispose to crime along the lines suggested by Eysenck. For example, Wadsworth (1976) showed that children who come from homes broken by divorce or separation before the age of 4 years are more likely to have low heart rates at age 11 years, while those who have high heart rates at age 11 years are more likely to become violent criminal offenders in early adulthood. Such environmental influences on biological influences may give important pointers for future intervention and prevention research.

These are some of the possible ways that one imagines a born-again Hans Eysenck would reshape the field of crime research. Yet these are just guesses, and clearly there are more future developments that stem from Eysenck's seminal theory of crime. Perhaps any additional speculations are best left to Hans Eysenck himself!

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