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Mednick, Sarnoff A.: Autonomic Nervous System (ANS) Theory

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Sarnoff A. Mednick, who received his Ph.D. in psychology from Northwestern University in 1954, is a well-known scholar with a background in sociobiology and methods of learning. Much of his earlier work focuses on how students interact and efficiently comprehend information in class. Since the initial stages of his career, he has promoted interdisciplinary cooperation, especially among the social and biological sciences. It was this multifaceted approach that led him to concentrate on how biological, environmental, and learning traits all were capable of explaining antisocial behavior for certain members of the general population.

Beginning in the 1970s and continuing into the early 1990s, Mednick's research sought out a series of biological and heritable traits that correlated with criminal behavior. It was his intention to bring to the forefront biological facts from his Danish adoption and schizophrenia studies and merge them with positivistic theories of criminal behavior. His focus, as it is for all modern biosocial criminologists, was not to seek out one specific criminal "gene" or "trait" as the Classical School researchers had done, but rather to uncover more generalized genetic anomalies and assess how they relate to antisocial, and more specifically, criminal behavior.

Mednick's Autonomic Nervous System (ANS) Theory of Crime

Original research from Copenhagen in which Mednick was centrally involved prompted him to develop a socio-biological theory of criminal behavior that focuses on physiological characteristics and, most specifically, on the autonomic nervous system (ANS). Briefly, the autonomic nervous system is the regulatory sector of the central nervous system and is largely responsible for controlling arousal and one's ability to adapt to the surrounding environment. Mednick's construct is a "theory which suggests how autonomic nervous system (ANS) responsiveness may play a role in the social learning of law-abiding behavior" (Brennan et al., 1995, p. 84). The ANS theory assumes that law-abiding behavior is a learned trait (Mednick, 1977). Individuals learn to act in a social manner through proper primary caregiver interaction in childhood, most often through their rearing parents. Parental rearing is conjured to teach the child

passive avoidance, a learned personality trait that acts as a protective factor in the person's decision-making process.

Passive avoidance is a characteristic that does not develop immediately but rather builds upon [p. 603 ↓] itself over multiple stages. The first stage occurs when a child commits an aggressive act and is punished for it by the primary caregiver. At a later time, the child will likely be presented with a situation in which that prior action would be of some use to gain something, but instead the child refrains from the act because he or she has been punished before for the same behavior. ANS theory premises that within this contemplation the youth is overcome with a fear of punishment, causing the normal child to be deterred from the action, which dissipates the fear.

The dissipation of fear is crucial to the ANS theory. If a child experiences a very quick reduction in fear of primary caregiver punishment, the person will be rewarded by a swift reinforcement—not being scared anymore, which in turn reinforces the inhibition of antisocial behavior. However, if the youth is incapable of reducing his or her level of fear of punishment quickly, then there is no significant reinforcing element for refraining from the behavior in the future. The implication is that those individuals who are completely incapable of reducing any fear of punishment will have no inhibiting factors that will restrain them from antisocial behavior and thus cannot learn the notion of passive avoidance.

Operant conditioning clearly is at work within Mednick's fear dissipation notion, which reflects on his background in learning. Mednick points out that fear, whether it is fear of punishment or fear for one's life, is a powerful psychological element that operates through the ANS. One is characterized by having a properly functioning ANS if he or she dissipates fear quickly, thus offering an immediate relaxation. Adversely, someone with a slowly recovering ANS is incapable of reducing this fear and is in no way reinforced, leaving the pathway open for future antisocial behavior of this form again.

Mednick also proposes a method through which the ANS construct can be tested—the common polygraph exam. The polygraph test measures three elements: heart rate, blood pressure, and electrodermal conductance (how much electrical current is carried through the skin). The most typical form of measure implemented to test the theory is by utilizing an electrodermal recovery (EDRec) test.

The EDRec is a timed measure that records the length (in fractions of a second) it takes someone to relax after presented with unpleasant stimuli. The procedure of the test typically requires the administrator to place sensors on the ends of one finger of each hand that measure the conductivity of the electrical currents within one's skin. The participant is then asked to relax while initial readings are taken. The subject is then presented with unpleasant stimuli, which ranges from electric shock, as used by D. T. Lykken, to simply a scenario-based recording to which a person listens, as in Mednick's work. Upon the point in the scenario where there should be a release of built-up fear, the diodes record the amount of time it takes the person's skin conductance to reach the normal levels that were present in the relaxed state.

Therefore, one with a quickly recovering EDRec is deemed to have a properly functioning ANS and thus is theorized to not be biologically predisposed to criminal behavior. However, Mednick (1997, p. 4) predicts that the “slower the recovery, the more serious and repetitive the asocial behavior” will become for an individual. Those marked with slow ANS recovery are also deemed to show *hyporesponsiveness*, a term used to indicate that while their ANS levels do return to normal, it takes more time to do so (also termed *half-recovery*).

ANS theory is purported to best explain the behavior of the 1 percent of the general population that is responsible for nearly half of all criminal convictions. It is these chronic recidivists, Mednick argues, that display the most dangerous form of the ANS—one that either is marked by extreme hyporesponsiveness or complete nonresponsiveness. Mednick (1977, p. 1) hypothesizes, “Most offenders are convicted of having perpetrated only one, two or three relatively minor offenses. These offenders are doubtless instigated by socio-economic and situational forces.” However, those individuals that so frequently return to the courtroom are the individuals that this theory is stated to best explain.

Mednick offers an additional distinct claim in the proposal of the ANS theory of crime. While having a slow EDRec does place someone at risk for criminal activity, this trait can be controlled with proper child-rearing, social learning, and environmental factors. With this point emphasized, Mednick claims that a slow EDRec is a heritable trait that is passed along through a faulty ANS. His central assertion is that “criminal fathers [p. 604 ↓] would have children with slow EDRec” at a rate much higher than the general

population would (Mednick, 1977, p. 5). To test this, as he emphasizes, longitudinal data are needed.

Evidence regarding ANS Theory

Given that there are several different elements of the ANS theory (EDRec, hereditary transmission, and learning), it can be argued that many different tests of these elements can garner partial support to the construct. However, there have been more direct tests of the theory, typically yielding mixed results. In 1977, Mednick and colleagues tested electrodermal recovery for fathers and their sons in Copenhagen, hypothesizing that a fast EDRec time would serve as a protective factor on the offspring's criminal behavior. Four groups were created, consisting of criminal father/criminal son, noncriminal father/criminal son, criminal father/noncriminal son, and noncriminal father/noncriminal son. Although "the criminality of the sons and fathers is interdependent" (p. 16), the researchers did find that the criminal son/criminal father group was marked by a fast EDRec, except in the lower-middle and middle classes. This left open the possibility that there could have been a spurious relationship through socio-economic status.

Because this 1977 research by Mednick and colleagues had a small sample size in that it was only a pilot study, it was expanded to represent the entire country of Denmark by Mednick and colleagues in 1984. Criminal conviction and hospital records were gathered on a large cohort of adoptees, their adoptive parents, and their biological parents. Interestingly, the strongest concordance in criminality was between the biological parents and their offspring (24.5 percent of children of criminal biological fathers were convicted) and not between adoptive parents and their adopted children (20 percent of children of criminal adoptive parents were convicted). While this difference is somewhat minute, the authors concluded, "Adoptive parent criminality was not found to be associated with a statistically significant increment in the son's criminality, but the effect of biological parent criminality was" (p. 892). This provides support for the ANS construct's claim that criminality could be passed on genetically. Similar results were found by Mednick and colleagues in 1987.

Other studies have provided positive results for the claims of ANS. Bell and colleagues tested ANS's delayed EDRec hypothesis and found that identical twins consistently had

stronger correlations in recovery time than fraternal twins did, indicating that there may be a partial genetic factor in the ANS's ability to return to a normal state. However, the ability to generalize this study should be interpreted cautiously because this finding was observed on measurements of the left hand, but not the right hand. A 1981 study by Mednick and colleagues tested brain wave patterns through an electroencephalogram (EEG), a device that measures brain activity through electrodes placed on the occipital, frontal, temporal, and parietal lobes. Testing a cohort of 11-year-olds to predict their criminality 6 years later, researchers found that alpha brain waves, which affect arousal and are produced by the ANS, were significantly slower for children that would become criminally charged. Overall, findings such as these have been replicated across different cultures and in both laboratory and natural settings, thus lending support to the construct.

Critiques of ANS Theory

However, ANS theory is not without its critics. Mednick has recognized this fact throughout his career as he “has been told to burn data which implicate genetic factors among the causes of crime” (Buikhuisen & Mednick, 1988, p. 6). He also notes that “it should be clear that partial genetic causation need not imply pessimism regarding treatment or prevention” (Mednick, 1987, p. 5) but that rather “a number of environmental mediators have been shown to actually protect the biologically at-risk child against long-term deviant or less than optimal outcomes” (Baker & Mednick, 1984, p. 144).

The most prominent academic critics of Mednick's work are Michael Gottfredson and Travis Hirschi. They note that there are multiple methodological problems with Mednick's research that are potentially severe enough to alter findings. For instance, the authors note that the same participants in Mednick's pilot study were also included in his national sample, indicating that the samples are not independent of each other which “is essential to the interpretation of replication research” (Gottfredson & Hirschi, 1990, p. 55).

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Another criticism Gottfredson and Hirschi have is that the measures of the independent variables changed from the pilot to the national study. The measure of parental criminality in the pilot was the biological father's police contact and citations, while in the Denmark sample it is measured by biological parents' (mother's and father's) criminal *convictions*. The authors concluded that by adding criminal mothers into the sample for the national data, Mednick's results are inflated to significance when they should not be. Furthermore, they note that studies that Mednick cites as supportive of his work are seriously methodologically flawed (e.g., Cloninger & Gottesman, 1987; Crowe, 1975).

Conclusion

Despite these criticisms, there has been some support garnered for ANS theory. Evidence has been gathered for the construct across nations and in natural and laboratory designs. In adoption studies, the best predictor of an offspring's criminality is whether their biological parents were criminal, which lends support to the construct's claim that a delayed ANS can be passed on intergenerationally. Brain waves generated by the ANS have been shown to be delayed in children that later became criminal, lending additional support to the ANS construct. Further, a delayed EDRec response has also been demonstrated to predict criminality in middle-class populations. Although it does have critics, it appears that a delayed or stunted ANS response could in fact be a predictor of criminal behavior in certain populations. Due to repeated, supportive findings, it appears that this socio-biological construct is of use to the field, as at some level it does seem to be predictive of criminal behavior.

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See also

- [Fishbein, Diana H.: Biosocial Theory](#)
- [Neurology and Crime](#)
- [Psychophysiology and Crime](#)
- [Wilson, James Q., and Richard J. Herrnstein: Crime and Human Nature](#)

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