H. J. Eysenck's Contribution to the Causal Bases of Personality

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From the beginning of his academic career, Hans Eysenck sought to develop a conceptual framework for explaining individual differences in personality and psychopathology that was based on sound scientific procedures and evidence. To this end, he persistently advocated the unification of the correlational and experimental approaches in the study of personality. During his lifetime, he was a major contributor to the determination of the fundamental dimensions of personality description and of their heritability. He was a witness to the growing acceptance of these achievements. Establishing the causal bases of individual differences in personality was a research objective that commanded his constant interest and attention. Although some progress on this objective has been made, it remains as largely unfinished business. This paper highlights HJE's contribution to the causal bases of personality (more specifically the extraversion dimension) that resulted from his excitation-inhibition and arousal theories.

It is fitting that the last publication of HJE in the Journal of Personality and Social Psychology (Eysenck, 1997) was a plea for the unification of the correlational and experimental study of personality. Advocacy of the union of the descriptive and causal bases of personality and intelligence was a familiar refrain in many of his books and papers throughout his career. Indeed, some regard the call to advance the understanding of personality through the integration of the methods and models of differential and experimental psychology as his fundamental insight.

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Early in his career, he proposed to unite two lines of inquiry to the study of personality, the dimensional description of personality using psychometric measurement and the explanation of personality drawing on constructs from contemporary psychology, notably Pavlovian conditioning theory. With this vision, a framework was conceived for investigation of all aspects of social and psychiatric behaviours. To a large extent, this vision has been realized. The dimensional framework that he proposed has been widely endorsed, and extended in the five factor typology of personality. Research demonstrating the heritability of the major factors of personality that he initiated has been convincingly replicated. And the personality typology that he developed has been applied to a rich variety of topics, including occupational choice and satisfaction, sexual activity, criminality, politics, interpersonal relations, hypnotic suggestibility, marital happiness, moods and madness and all major psychiatric categories.

From my perspective, the landmarks for Eysenck's contribution to the causal bases of personality stand in three texts 1) *The Scientific Study of Personality*, first published in 1952. This text presented a prescription for the scientific study of personality 2) *The Dynamics of Anxiety and Hysteria*, first published in 1957. This text outlined a theory of introversion and extraversion in the context of contemporary learning theory and 3) *The Biological Bases of Personality*, first published in 1967. This text outlined a theory of introversion and extraversion in the context of physiological arousal mechanisms.

*The Scientific Study of Personality* opens with the following quotation that clearly sets both the objective and the tone for the text that followed (Eysenck, 1952, p. vi):

> If we take in our hand any volume, let us ask, Does it contain any abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames; for it can contain nothing but sophistry and illusion. - HUME

The text follows this dictum faithfully. It begins with a lucid distinction between description and explanation, with the latter requiring a greater level of abstraction than the former. Newton's law is given as an example of scientific explanation, one that admits the deduction of observable data.

In his own words,

*what is needed in psychology, as in any other science, is a greater understanding of, and more intensive use of, the hypothetic-deductive method, in which a clear, unambiguous hypothesis is stated, deductions, preferably of a quantitative kind, are made, and experiments performed to verify or disprove the hypothesis* (Eysenck, 1952, p. 16).
This was the path that he chose to follow, a path that deviated from the unsystematic, non-quantitative personality descriptions and untestable, unverifiable explanations that dominated the practice of psychiatry of the day.

The objective of the steps along this path that were put forth in *The scientific study of personality* was to "discover the main dimensions of personality, and to define them operationally, i.e. by means of strictly experimental, quantitative procedures" (Eysenck, 1952, p. 1). The main body of the text introduced the method of factor analysis and its application to the questionnaire data that then operationally defines the neuroticism dimension. A method of criterion analysis was also introduced to establish the validity of the questionnaire data, the criteria being psychiatrically defined groups. In the studies that are reported, a large number of behavioural tasks were also employed and subject to criterion analysis in an attempt to develop an objective measure of neuroticism. These included behavioural measures of suggestibility (the sway test), manual dexterity, persistence, and slow completion times.

*The Scientific Study of Personality* focussed on the determination of a main dimension of personality, namely neuroticism, using both quantitative methods of analysis and objective data. The extraversion dimension was explored in a previous book *Dimensions of personality* (Eysenck, 1947). Although the objectives and the principles for his scientific schema were plainly stated in *The Scientific Study of Personality*, the task of designating the explanatory constructs and forging the causal bases of variation along these dimensions was an objective that was addressed in a subsequent book *The Dynamics of Anxiety and Hysteria* (Eysenck, 1957).

In these early works, Eysenck was closely aligned with the psychiatric community. He perceived the study of personality as a means of enhancing the understanding and treatment of mental disorder to the benefit of all health care workers. This alignment is explicitly expressed by Hans in the introduction of *The Scientific Study of Personality* where he states:

*in the field of personality study, close co-operation between psychologists and psychiatrists is not only desirable but may be considered essential.*

(Eysenck, 1952, p. 2)

Moreover, the foreword to this text is written by Dr. Aubrey Lewis, Professor of Psychiatry at the University of London, and a close friend, who shared that view.

*The debt of psychiatry to the psychologist is now great and growing. Fortunately the indebtedness seems mutual, and the association between the two fields of study most profitably intimate. From these rigorous inquiries, sustained and resourcefully developed over years, psychiatry stands to gain an impetus and accuracy in some essential matters which will advance it and reinforce the free play of clinical skill and insight.*

(Eysenck, 1952, p. viii).
These lofty sentiments assuage the oft-spoken view that Eysenck was hostile to psychiatry, in general, and psychoanalysis in particular. In fact, his stated aim and his research objective was to advance the discipline by bolstering the scientific basis of the discipline.

It should also be mentioned that this landmark book was dedicated to his wife, Sybil, who was also his professional partner in his scientific odyssey. In addition to establishing a solid reputation in the study of personality in children and in different cultures, Sybil made significant contributions in early experiments using objective measures. She also played a key role in the development of the psychometric measures and she was brilliant in formulating items for these tests. Where Hans was quiet and reserved and seldom sought out advice or opinion from others, Sybil offered it freely, and often, to him. And he listened. The role that Sybil Eysenck played in the unfolding of their scientific enterprise cannot be underestimated.

In the *Dynamics of Anxiety and Hysteria* (Eysenck, 1957), the first bold steps were taken that set forth specific hypotheses of the causal bases of extraversion (hysteria) and introversion (dysthymia). In this text, a summary was provided of the constructs from modern learning theory that were selected as relevant to the explanatory framework for variation in extraversion and introversion.

Two postulates were proposed that attempted to integrate personality and learning theory (Eysenck, 1957, p. 114).

**Postulate of Individual Differences.** Human beings differ with respect to the speed with which excitation and inhibition are produced, the strength of the excitation and inhibition produced, and the speed with which inhibition is dissipated. These differences are properties of the physical structures involved in making stimulus-response connections.

**Typological Postulate.** Individuals in whom excitatory potential is generated quickly and in whom excitatory potentials so generated are strong, are thereby predisposed to develop introverted patterns of behaviour and to develop dysthymic disorders in cases of neurotic breakdown.

This typological postulate is abbreviated here. In the text (Eysenck, 1957, p. 114), the corollary was stated for extraversion and a proposition for the construct of reactive inhibition was also put forth.

In looking for explanatory concepts and mechanisms to account for the observed phenomena of hysteria and anxiety, it was inevitable that recourse was had to the principles of modern learning theory. Of all the branches of psychology, the study of learning is much the most advanced, the most relevant, and also the most readily applicable to our problem, and it will be seen that the experiments and theories of Pavlov, Hull, Tolman and the other great figures of learning theory have an immediate connection with the molar aspects of human behaviour usually dealt with by psychiatrists and students of personality (Eysenck, 1957, p. 1).
During the 25 or 30 year prior to the publication of *The Dynamics of Anxiety and Hysteria* (Eysenck, 1957), learning theory had developed as a rigorous science noted for the validity of its constructs and for the precision and reliability of measurement procedures. It was a dominant force in academies throughout the world but especially in North America and the USSR. By exploiting the experimental work that had been accomplished in this research into a theoretical framework for explaining personality and psychopathology, an invitation and an opportunity to participate in this noble venture was extended to all scholars and students who were schooled in learning theory. This call was answered with a wave of research studies and work that persists to this day. The theory was exemplary of the hypothetic-deductive method, in which a clear, unambiguous hypothesis is stated, deductions, preferably of a quantitative kind, are made, and experiments performed to verify or disprove the hypothesis that he advocated (Eysenck, 1957, p. 16).

In *The Dynamics of Anxiety and Hysteria* (Eysenck, 1957), an important experiment conducted by Franks (1956) was cited that gave impetus to the theory. This was a conditioned eye blink study that reported faster conditioning and slower extinction for dysthymic subjects than hysterics and normal controls. Subsequent work in Eysenck's laboratory using similar procedures (Eysenck & Levey, 1972; Jones, Eysenck, Martin, Levey, 1981) reported similar effects for introverts than extraverts, at least under some conditions. In the text, other experimental work in perception and pharmacology was also outlined in the context of the general theory and described in the text, again bolstering wide-spread interest and involvement in personality research.

The publication of *The Biological Bases of Personality* in 1967 was also a major advance in the attempt to explain individual differences in extraversion and neuroticism. In this text, contemporary developments in research on the physiological determinants of learning, attention and motivation were now drawn into the theoretical framework outlining the arousal theory of extraversion and neuroticism, specifically, cortico-reticular arousal for the former and autonomic arousal for the latter. This work provided a neurophysiological basis for the hypothetical constructs presented in the preceding excitation-inhibition theory. Although the central hypothesis was rather vaguely defined...proposing that introverts were characterized by higher levels of activity or lower levels of excitation in the cortico-reticular loop ... the context of the theory was sufficiently seductive to inspire several thousand experiments. In the laboratories at the Institute for Psychiatry in London, Hans, his colleagues, especially Sybil Eysenck, Irene Martin, Glenn Wilson, Jack Rachman, Owen White and their graduate students, led the way in the study of the causal bases of personality with seminal experiments using psychophysical, psychophysiological and learning methods and paradigms.
In the thirty years since the publication of *The Biological Basis of Personality* (Eysenck, 1967), Eysenck submitted an important theory of neurosis (Eysenck, 1979), specifically the incubation theory of neurosis, and he also sketched a theory of psychoticism (tough-mindedness) (Eysenck, 1976). The arousal theory of extraversion outlined by Eysenck in 1967 continues to generate research initiatives. This interest was sustained in spite of important modifications of the theory put forth by Gray (1972) and by Brebner (1974) and by the virtual demise of arousal theory in the physiological literature. This raises important questions of the success and validity of the arousal theory of extraversion. Have the causal bases of extraversion been revealed? What, if anything, has been achieved in this massive research endeavour?

First, both the excitation-inhibition and arousal theories of extraversion enjoyed enormous heuristic success. The quantity of citations attests to that success. The effects that were reported and that have accumulated now offer a substantial corpus that allows some induction of the causal bases of extraversion to be made, in particular from those effects that have been replicated several times and from studies employing different methodologies and paradigms that converge on a singular effect. Three points can be briefly stated here.

1. From reviews of the psychophysiological literature, introverts and extraverts differ in tonic or basal levels of physiological activity. This conclusion is drawn from the absence of differences when skin conductance measures of arousal are measured prior to stimulation and in conditions that have low arousal potential. Moreover differences are seldom reported with EEG measures in low arousing-conditions or during sleep. Thus, the hypothesis of differences in level of arousal receives little support (Stelmack, 1990).

2. There is a substantial body of evidence in research on the extraversion trait that converges on one general effect, namely the greater sensitivity (or reactivity) of introverts than extraverts to punctuate, physical stimulation (Stelmack, 1981; Stelmack & Geen, 1992; Stelmack & Houlihan, 1995). This effect can reasonably account for some social behaviour exhibited by introverts such as their preference for quieter environments and solitude (Campbell & Hawley, 1982; Geen, 1984). The greater reactivity to physical stimulation for introverts than extraverts was observed with a wide range of methods and conditions that demonstrated the following:
   1) lower sensory thresholds (e.g. Shigehisa & Symons, 1973; Stelmack & Campbell, 1974),
   2) lower pain thresholds (e.g. Schalling, 1971; Barnes, 1975),
   3) lower noise thresholds (e.g. Dornic & Ekehammer, 1990),
   4) larger skin conductance responses to brief tones for introverts (e.g. Smith et al., 1990; Stelmack, 1979),
5) larger event-related potential (ERP) amplitudes to simple physical stimulation (e.g. Stelmack, Achorn, & Michaud, 1977; Stelmack & Michaud-Achorn, 1985; Stenberg, Rosen & Risberg, 1990),

6) faster startle reflex response latencies for introverts than extraverts to moderate intensity noise bursts (Britt & Blumenthal, 1992),

7) faster brainstem auditory evoked potentials (Bullock & Gilliland, 1993; Stelmack & Wilson, 1982).

At the present time, there is a strong case that introverts are more reactive to simple physical stimulation than extraverts and there is good progress in identifying the neural circuits that mediate these differences.

3. There is also a good deal of evidence that implicates basic differences between introverts in the performance of motor tasks. In my view, these effects appear to be due to the faster initiation of movement for extraverts than introverts. This effect can reasonably account for the spontaneity, both active and social, that distinguishes extraverts from introverts. The effects demonstrating differences in the expression of motor behaviour between introverts and extraverts include the following:

1) faster reaction time for extraverts than introverts (Barratt, 1959; Robinson & Zahn, 1988),

2) greater reminiscence effects on pursuit rotor tracking tasks for introverts than extraverts (Eysenck & Frith, 1977),

3) more false positive errors for extraverts than introverts in reaction time tasks with speed instructions (Brebner & Flavell, 1978),

4) faster movement time for extraverts than introverts on reaction time tasks (Stelmack, Houlihan, & McGarry-Roberts, 1993; Doucet & Stelmack, 1997),

5) large amplitude Contingent Negative Variation (an event-related potential measure of response preparation) for extraverts than introverts (e.g. O'Conner, 1982),


Given these data, there remains the task of identifying the neural circuits and neurochemical properties that serve these effects and functions that differentiate introverts and extraverts. Some of the psychophysiological research does, in fact, give quite specific information on this. Moreover, there have been several experiments suggesting that dopamine, a neurotransmitter that is thought to modulate the probability and strength of behavioural responses to sensory input (Le Moal & Simon, 1991) may be implicated in variation in extraversion (Rammsayer, Netter & Vogel, 1993).
Overall, the search for the causal bases of personality that was pioneered and nurtured by Hans Eysenck during his 60 years of scholarship is unfolding as it should. It is remarkable testimony to his genius that so much of the work in which he figured prominently 30 and 40 years ago is still viable today.

**References**


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**Ajzenkov doprinos kauzalnim osnovama ličnosti**

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**Вклад Айзенка в исследование кausalных основ личности**

РОБЕРТ М. СТЕЛЬМАК

С самого начала своей академической карьеры Ханс Айзенк стремился к установлению, основывающейся на научных данных и методах, понятийной рамки для объяснения индивидуальных особенностей личности и психопатологии. С этой целью он упорно настаивал на унификации корреляционных и экспериментальных подходов в исследовании личности. В течение жизни, он дал самый большой вклад в определение основных величин описания личности и ее наследственности. Айзенк был свидетелем возрастающего признания его достижений. Выделение кausalних основ индивидуальных особенностей личности остается интерес и внимание ученого.
Хотя в этой области сделан определенный прогресс, работа в значительной мере осталась незаконченной. В настоящей работе указывается на вклад Айзенка в изучение каузальных отношений личности (в частности, размера экстраверсии) и автор опирается на его теории эксцитации - ингибиии и побуждения.