Relationship between a physiological and personality index of excitability

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Eysenck's personality dimension of introversion-extroversion was compared with reaction time as an index of excitatory potential. Inhibitory potentials of the task and stimulus were experimentally minimized. Freshman nursing students served as Ss. Extroverts (11) evidenced significantly faster ($p < .01$) simple visual RTs than did introverts (10). A significant negative correlation between extroversion scale score and RT for 35 Ss was also noted. It was suggested that studies yielding relationships between introversion-extroversion and response systems have depended largely upon the influence of inhibition. Excitation and inhibition were viewed as relatively independent processes which should be investigated separately.

Human behavior, the result of complex interactions between internal and external influences and internal processing operations, is conventionally viewed as the end product of a multitude of complex causal stimuli and mediating processes. Much interest has been vested in the mediating processes involving neurophysiology, biology, and psychology. Eysenck (1960, 1963, 1967) has centered attention on excitatory and inhibitory qualities of the nervous system and their relationship to personality dimensions of introversion-extroversion.

Eysenck's hypothesis holds that introverts are marked by ease in the generalization of excitatory processes while extroverts are postulated to be relatively insensitive to sensory stimuli (Eysenck, 1963). Introversion is related to excitation and extroversion to inhibition. Recent support for Eysenck's hypothesized differences between introverts and extroverts in arousal has been contributed by Smith (1968), Howarth & Eysenck (1968), and Carr (1970). However, Morgenson and Martin (1969) failed to confirm the hypothesized relationship between extroversion and autonomic conditioning in several response systems. Halmiova & Uherik (1969) felt the question of relationship between personality trait and response system to be still open.

The purpose of the present study was to compare Eysenck's personality dimension of introversion-extroversion with a basic response system product of the excitatory process. Simple reaction time (RT), as a basic psychomotor response, is based on physiological arousal level (Lehmann & Knight, 1960) and may serve as an empirical referent for arousal level. Halmiova & Uherik (1969) summarized evidence supporting promptness as dependent on the predominance of excitatory or inhibitory processes; the faster the movement responses to stimuli, the more predominant are excitatory processes. Based on Eysenck's postulated relationship, it was hypothesized that extroverts, as compared to introverts, would display slower (depressed) RTs in a simple visual task. Primary

concern was vested in excitatory processes, with number of RT trials and task duration kept small to minimize inhibition.

METHOD

Subjects

Forty-four female nursing students, aged 17 to 20, volunteered as Ss for extra credit in a basic psychology course.

Apparatus

A simple visual RT apparatus with push button response mode was employed with a chronometer calibrated in 100ths of a second. Form B of the Eysenck Personality Inventory (EPI) was administered, using norms for American college students.

Procedure

Thirty-five of the 44 Ss tested evidenced acceptable lie scales, with 10 introverts and 11 extroverts identified. Testing sequence was counterbalanced, such that half of the Ss received the EPI first and half received RT trials first. A double-blind condition was in effect, as EPIs were unscored until completion of RT trials and Ss were not informed of the specific relationship under investigation.

All Ss were given three familiarization RT trials. Ss were informed of the foreperiod (1-5 sec), which began by E's verbal "ready" and was followed by presentation of a red-light stimulus. Instructions were to press the response button "as quickly as possible" upon noting the stimulus, using the preferred hand and finger. Approximately 5 sec elapsed between the end of one trial and foreperiod of the next. Sixteen recorded trials were obtained, with warm-up and end-spurt effects eliminated by using only Trials 4-13 in computations (Buckalew, 1972). Total testing time (EPI and RT) involved approximately 20 min.

RESULTS

Extroversion scale percentiles for extroverts ranged from 78 to 99, with a mean of 93. For introverts, the range was 4-26, with a mean of 14. RT means were computed in 100ths of a second, with introverts ranging

Fig. 1. Comparison of RT performance for 10 introvert and 11 extrovert Ss under conditions of minimal inhibition, with RT in 100ths of a second.

from 20.7 to 31.3 with a mean of 25.95, while extroverts ranged from 16.8 to 26.0 with a mean of 20.73. The t of 3.7938 ($p < .01$), reflecting RT difference between groups, indicated extrovert performance to be significantly faster than that of introverts.

The relationship between RT and dichotomized (introvert vs extrovert) EPI scores was reflected in an r of $-.69$, though this data represented only extremities of the extroversion scale. Figure 1 reveals the distribution of RTs for introvert and extrovert Ss. An r was found for all 35 Ss with acceptable lie-scale scores to provide a comprehensive index of relationship between RT performance and degree of extroversion. The resulting correlation of $-.51$ was significant ($df = 33$, $p < .01$), indicating that as degree of extroversion increased, RT decreased.

DISCUSSION

The hypothesized decrement in RT performance of extroverts was not confirmed. To the contrary, extroverts significantly outperformed introverts. The evidence of faster RTs in extroverts appeared to be in opposition to Eysenck's position that introverts would be more easily aroused by stimulation. However, there were several important qualifications for these findings as they relate to predictions generated by Eysenck's position.

Arousal threshold and arousal level are separate entities. This study did not seek to argue threshold differences such as those noted by Smith (1968) and Howarth & Eysenck (1968). Stimulus intensity was held constant at a level demonstrated to be above threshold for all Ss. The question under consideration was, given a constant stimulus intensity, which personality dimension could process it faster based on *excitatory* potential of the nerve system.

Eysenck's (1963) argument that extroverts were comparatively insensitive to sensory stimuli was clearly

unsupported by results of this study, which found extroverts (20.73) significantly faster in simple visual RT than introverts (25.95) and a correlation of $-.51$ between extroversion and RT. However, a majority of experimental studies cited in support of Eysenck, such as vigilance tasks, pain tolerance, sensory satiation, and recall of verbal material, all generally involved opportunities of inhibition production due either to task length or complexity. These studies, summarized by Eysenck & Eysenck (1968), confirmed better performance by introverts. Eysenck (1965) indicated that relationships between extroversion and conditioning were dependent upon experimental schedules which produce *inhibition*. Inhibitory influences were deliberately minimized in the present study, as differences in *excitability* were of prime consideration. Halmiova & Uherik (1969) reiterated others' contentions that excitation and inhibition were relatively independent processes with respect to strength and dynamics and should be separately investigated.

Evidence generated by this study suggested that extroverts have at least as much excitatory potential as do introverts, provided that an above-threshold stimulus is used and opportunities for inhibition are minimal. Indeed, the correlation of $-.51$ indicated that as degree of extroversion increased, RT decreased (i.e., excitability increased). These results supported the position that many demonstrated relationships between extroversion and conditioning or psychophysiological responses have been dependent predominantly on the operation of inhibition.

Several factors which might profitably be investigated relative to findings of this study are impulsivity and sociability components of responding. Results would also be enhanced through investigation of other basic functions, such as GSR and EEG, under similar conditions of minimal inhibition. It has been suggested¹ that lengthening the foreperiod, which would change task demands from simple RT to vigilance, might favor superior introvert performance.

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NOTE

I. A. Tellegen, University of Minnesota, personal communication, September 15, 1972.

(Received for publication October 25, 1972;
accepted January 4, 1973.)