Perceptual and Motor Skills, 1971, 33, 375-378.

INDIVIDUAL DIFFERENCES IN TAPPING PERFORMANCE AS A FUNCTION OF TIME ON THE TASK[1]

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Summary.—A group of 187 apprentices were given two sessions on a 1-min. finger-tapping task in which output was taken as the criterion measure. Various individual difference variables changed in the degree and direction of their association with tapping performance as a function of time through the session, presumably reflecting a motivational variable such as persistence. Positive correlations between intelligence and tapping performance became progressively greater toward the end of each 1-min. period, and while high *n* Ach *Ss* and extraverts began tapping at a faster rate than low *n* Ach *Ss* and introverts, this pattern had reversed by the end of the 1-min. practice periods. It is concluded that studies of the relationship between individual difference variables and task performance must take account of changes which occur as a result of "time into the task."

A great many individual difference variables have been investigated in relation to motor-task performance (Eysenck, 1964). Among the most widely studied have been general ability (intelligence), achievement motivation, and extraversion-introversion. Superior performance on motor and other tasks is generally exhibited by *Ss* of high intelligence, high achievement motivation, and introverts rather than extraverts, although many exceptional results have been reported (e.g., see Klinger, 1966).

The majority of these studies have dealt only with performance on a task as a whole and have thus failed to consider the possibility that the relationships between individual difference variables and performance may change in degree, or even direction, as a function of time spent on the task. It might be predicted, for example, that extraverts, being impulsive, would initially attack a task with greater fervour than introverts but become progressively disadvantaged relative to introverts over the duration of any task which demands persistence or concentration [see description of typical extraverts and introverts given by Eysenck and Eysenck (1964, p. 8)]. On the other hand, to the extent that the task involves learning, the correlation of intelligence with performance would progressively increase because *Ss* of high intelligence are presumably better learners. It is not clear what trend should be predicted for achievement motivation, and indeed a study of such processes may serve to clarify the nature of this variable to some extent.

In the present investigation the relationships of intelligence, achievement motivation and personality to performance were examined as a function of time, using one of the simplest possible motor tasks, finger tapping, which may be assumed to measure persistence increasingly in the latter stages of practice.

[1]This study was supported by a grant from the Dept. of Employment and Productivity.

METHOD

Ss were 187 apprentice gas-fitters (all male, aged 16 to 19 yr.) but since not all *Ss* were present at every session *Ns* for some variables were slightly lower. The tapping test described by Frith (1967) was administered individually. *Ss* tapped on a Morse key with the middle finger of their preferred hand, the remaining fingers and the hand being held flat by a perspex bar passing under the working finger. This clamping system was designed to prevent *Ss* from counteracting the build-up of inhibition by transferring the work load to different muscles, so that fatigue effects would be manifested more quickly. Feedback was given by means of a rate meter, and they were instructed to tap so as to try to keep the needle on a red mark corresponding to five taps per second, a rate which is difficult to maintain for more than a very short time. Each *S* was given two 60-sec. practice sessions separated by a 24-hr. "rest" period.

The following individual difference measures were taken in group sessions with about 30 *Ss* at a time: (1) The Otis Quick-scoring Mental Ability Test, and the Raven Standard Progressive Matrices, as measures of verbal and nonverbal intelligence respectively. (2) The T.A.T. Need Achievement Test described by McClelland, Atkinson, Clark and Lowell (1953) and (3) the Eysenck Personality Inventory (Eysenck & Eysenck, 1964).

The tapping key was connected with an oscillator and tape recorder so that whenever the key was in contact a tone was recorded on the tape. This recording was then played back through a LINC-8 computer and analyzed with a program called TAPMAP.[2] This program measured intertap intervals only (since tap lengths tend to be fairly constant and theoretically unimportant) and among the information provided are performance scores for each 15-sec. period within the 1-min. practice.

RESULTS AND DISCUSSION

Output scores for each of the quarter sessions were correlated separately with the individual difference variables and plotted to show changes over time at the task (Fig. 1).[3] Although the actual correlations were low in magnitude, many of them are statistically significant given the large N, and the pattern of changes is consistent across the two 1-min. sessions (consonant changes $=$ 12, opposite changes $=$ 2, $p < .01$, one-tailed binomial test). Besides, the sample was relatively homogeneous on the variables concerned (e.g., extraversion: $M = 14.98$, $SD = 3.34$), which might also attenuate the correlations slightly.

Scores on the two intelligence tests show similar trends within each session,

[2]Program for LINC-8 analysis of tapping records developed at Institute of Psychiatry by Mr. L. N. Law.

[3]Means and standard deviations for each variable are on file in Document NAPS-01536. Order from ASIS National Auxiliary Publications Service, c/o CCM Information Corp., 909 Third Ave., 21st Floor, New York, N. Y. 10022. Remit $2.00 for microfiche or $7.80 for photocopy.

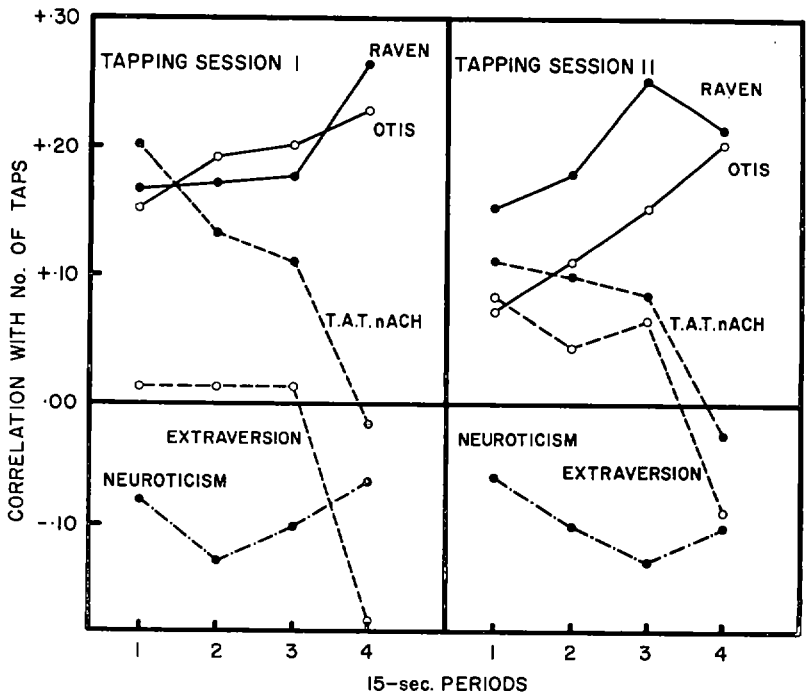

FIG. 1. The relationship between tapping performance and various individual difference variables as a function of time on the task

beginning with a small positive correlation which gradually increases in magnitude over the 1-min. session. This progressive advantage of high-IQ *Ss* is best interpreted either in terms of ability to compensate for the build-up of inhibition or as a short-term learning effect. (It does not imply long-term learning because the advantage is not retained over the 24-hr. interval between sessions.)

High *n* Ach *Ss* began tapping at a faster rate than low *n* Ach *Ss* but had lost all of this advantage by the end of 1 min. This result suggests that T.A.T. *n* Ach scores reflect a fairly superficial kind of ambitiousness which is unrelated to persistence and tends to support Klinger's (1966) argument that fantasy need achievement has not been adequately established as a motivational construct.

As predicted, extraversion-introversion showed a similar trend to *n* Ach, the extraverts beginning, if anything, slightly faster than the introverts but showing a distinctly lower rate by the end of 1 min. Their improvement relative to introverts after the 24-hr. rest suggests a differential "reminiscence" effect analogous to that found with the pursuit rotor task (Eysenck, 1965), and indeed, such a measure calculated as the difference in output between the last period in Session I and the first period in Session II correlates .25 with extraversion ($df = 152, p < .01$). Neuroticism did not correlate significantly with tapping output

at any 15-sec. interval of the 2 1-min. practices, although the correlations were consistently in the direction predicted on the assumption that high N will usually impair performance (cf. Wilson, 1971).

While the particular trends described above carry a certain amount of interest in themselves, the main conclusion is that correlations between any individual difference variable and tapping performance are dependent upon the variable of "time into the task" up to 1 min., to the extent that the very direction of the association may be reversed.

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Accepted June 11, 1971