Perceptual and Motor Skills, 1992, 75, 843-846.

THE CORRELATION BETWEEN REACTION TIME AND THE PONDERAL INDEX[1]

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Summary.—Reaction time (RT) and movement time (MT), and intraindividual variability in RT and MT, measured in elementary cognitive tasks at three levels of complexity of information processing, administered to 213 college males, show nonsignificant correlations with body build, specifically the ponderal index, hence not replicating the results of a study by Smith and Boyarsky (1943).

Smith and Boyarsky (1943) hypothesized a negative correlation between RT and the ponderal index. Their hypothesis was suggested by Sheldon's (1942) theory that different types of physique are related to personality and other behavioral variables. Ectomorphy (slender build), in Sheldon's theory, is related to a constellation of personality characteristics called cerebrotonia, which implies, among other traits, greater than average sensitivity of the nervous system and quickness of reaction to external stimuli. Endomorphy (globular build) is associated with viscerotonia, which implies a relaxed attitude to external stimuli and a relatively slow reaction tendency. Mesomorphy (muscular build) is associated with somatotonia, which implies outgoing energy and strength, but a sensitivity to stimuli and a speed of reaction that is intermediate to that of cerebrotonia and viscerotonia. Hence, Smith and Boyarsky hypothesized that RT should be shortest in ectomorphs, longest in endomorphs, and intermediate in mesomorphs. To represent the three main body types on a single, continuous dimension, Sheldon proposed using the ratio of height to the cube root of weight, which is known as the ponderal index (PI), that is, $PI = \text{height}/\text{weight}^{1/3}$. Thus ectomorphy is reflected by high values of PI, endomorphy by low values. Typical values of PI in Sheldon's system of body-type classification, when height and weight are in metric units, are for ectomorphs $PI > 46$, mesomorphs $PI = 42$, endomorphs $PI < 40$.

For a sample of 50 male undergraduates, ages 17 to 22 years, Smith and Boyarsky obtained measures of height and weight and administered a test of simple RT. The preparatory stimulus was one stroke of a bell, the reaction stimulus, which followed the preparatory stimulus by 2 sec., was a loud buzzer, to which the subject responded by releasing a Morse key. Trials with $RTs < 80$ and $RT > 250$ milliseconds (msec.) were excluded. Based on 100 test trials (following 25 practice trials), the median RT had a split-half reli-

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ability of .95. The correlation between RT and the PI was -.28 ($p<0.05$), thereby confirming their hypothesis. This result was considered to be of sufficient interest to be included in the chapter on RT in the classic textbook *Experimental Psychology* by Woodworth and Schlosberg (1956).

The present report, which is ancillary to our research on the relation between RT and mental ability, in which also height and weight were measured, takes a further look at the correlation of several RT variables with the PI. These RT variables have been found to have significant correlations with IQ in samples of young adults (Jensen & Reed, 1990) and in elementary school children (Jensen, 1991).

Method

Details of the subject sample and the apparatus and procedures for measuring RT and movement time (MT) have been fully presented elsewhere (Jensen & Reed, 1990), so this information need be summarized here only briefly.

Subjects

A total of 213 paid volunteers, all males of European ancestry, between 18 and 25 (inclusive) years of age (M 20.34, SD 2.02), were recruited from the University of California, Berkeley ($N = 123$) and two community colleges ($N = 90$), Diabalo Valley Junior College and Alameda Junior College.

Chronometric Tasks

Three elementary cognitive tasks (ECTs) were used. They are here referred to as simple, choice, and discrimination RT—or SRT, CRT, and DRT. The subject sits at a response console on which there is a "home" button, which is depressed by the subject and released on the appearance of the reaction stimulus. In simple RT, the reaction stimulus consists of a single (under-lighted) push button going "on." The subject lifts his finger from the home button and presses the lighted button (6 in. away) to turn it off. In choice RT, there is a semicircle of eight push buttons (all equidistant from the "home" button), only one of which goes "on," a randomly different one on each trial. The subject responds the same as in simple RT. In discrimination RT, the same semicircle of eight push buttons as in choice RT appears on the response console, but three of them go "on" simultaneously; any two of the three lighted buttons always have less distance between them than the third button, which is called the odd-man-out (OMO). The OMO button is a randomly different one of the eight buttons from trial to trial. The subject responds to the OMO button in the same fashion as in simple and choice RT. In all paradigms, a preparatory stimulus (a 1-sec. beep) precedes the reaction stimulus, with a random intervening interval of 1 to 4 sec. All tasks were subject-paced, each cycle beginning with the subject's depressing the home button. Following eight practice trials on each task, the numbers of

test trials for simple, choice, and discrimination RT were 20, 30, and 36, respectively. The choice RT was given in two parts: 15 trials given *before* the discrimination RT and 15 trials given *after* the discrimination RT. Administration of the tasks and the recording of the subject's performance were computerized.

Chronometric Variables

Each of the three tasks described above yields *four* chronometric scores, measured in milliseconds.

Reaction Time (RT) is the interval between the onset of the stimulus and the subject's lifting his finger from the home button. (This is measured as the *median* RT over all trials.)

Movement Time (MT) is the interval between lifting his finger from the home button and pressing the lighted stimulus button, which is a movement of 6 inches. (This is measured as the *median* MT over all trials.)

Standard Deviation of RT (RTSD) is a measure of intraindividual variability in RT, that is, the variability of the subject's RT from trial to trial. RTSD is calculated as the standard deviation (*SD*) of the subject's RTs over all trials.

Standard Deviation of Movement Time (MTSD) is a measure of intraindividual variability in MT, that is, the variability of the subject's MT around his own mean MT. It is calculated as the *SD* of the subject's MTs over all trials.

Physical Measurements

Subject's height (H) was measured in centimeters; weight (W) in kilograms was measured with a balance scale. The Ponderal Index was calculated for each subject as $PI = H/W^{.333}$. (PI based on inches and pounds is .2997 PI based on cm and kg.)

Results and Discussion

The mean PI (based on metric measurements) in this sample is 42.60 ($SD = 1.82$). (Smith and Boyarsky do not report these statistics for their sample, hence comparison with our sample is not possible.) Table 1 shows the mean and *SD* of each of the chronometric variables and their correlations with the PI. The correlations do not in the least bear out the hypothesis that RT is inversely related to the PI. In fact, only 5 of the 16 chronometric variables show negative correlations and these average only −.065; their two-tailed *p* values average .45. The positive correlations over-all are not significant either, averaging .071 with an average two-tailed *p* of .37. In brief, these correlations afford not the slightest basis for questioning the null hypothesis. Without replication, any interpretation of the variation in these mostly nonsignificant correlations is unwarranted.

Apparently, the finding by Smith and Boyarsky (1943) of a negative

TABLE 1
MEAN AND STANDARD DEVIATION OF CHRONOMETRIC VARIABLES (IN MSEC.), THEIR CORRELATION (*r*) WITH THE PONDERAL INDEX, AND THE *p* VALUE (TWO-TAILED) OF *r*

Task/Variable	*M*	*SD*	*r*	*p*
Simple				
RT	271	29	.142	.04
MT	141	70	-.042	.54
RTSD	33	24	.026	.71
MTSD	65	62	-.055	.43
Choice[a]				
RT	315	34	.089	.20
MT	156	39	.031	.65
RTSD	33	13	-.020	.77
MTSD	109	75	.058	.40
Choice[b]				
RT	328	37	.116	.09
MT	155	40	.073	.29
RTSD	35	17	.081	.24
MTSD	87	65	-.049	.47
Discrimination				
RT	460	63	.102	.14
MT	169	47	.051	.46
RTSD	78	35	.013	.85
MTSD	140	61	-.158	.02

[a]First set of 15 trials, given *before* the Discrimination (odd-man-out) task.
[b]Second set of 15 trials, given *after* the Discrimination (odd-man-out) task.

correlation between RT and the PI is at best of very questionable generalizability to other RT paradigms or measures of response times that are not highly similar to their particular procedure. In their study, for instance, the reaction stimulus was a "loud buzzer," which could have elicited something like a startle response in the more ectomorphic subjects rather than yielding a typical measure of simple RT. In any case, it is unwarranted at present to claim in general that RT has any relation to body build and particularly not to the PI.

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Accepted August 24, 1992.