Proceedings of the Iowa Academy of Science

Volume 49 | Annual Issue Article 78

1942

Reaction Time under Different Stimulus Conditions

Fred Kroeger
Grinnell College

George D. Lovell
Grinnell College

REACTION TIME UNDER DIFFERENT STIMULUS CONDITIONS

FRED KROEGER AND GEORGE D. LOVELL

For military purposes it was desired to know the relation between two types of reaction time tests. These tests were: (1) a simple reaction time test of the usual type, (2) a "clock reaction time" test in which the subject attempted to stop the moving hand of a clock at a certain predesignated point on the face, by pressing a standard telegraph key. Seashore, Buxton, and McCollom (1940) have reported that certain factors corresponding to motor skills have been "isolated in terms of qualitative similarity in the *pattern of action*, including perceptual activity, involved in various tests rather than to anatomical units such as the dominant sense-field, or even the musculature employed." Seashore, Starmann, Kendall, and Helmick (1941) found that both simple and discriminative reaction times for visual and auditory stimuli are included in a group factor of speeds of single reactions. The same authors, however, warn against extending this factor to include other kinds of reaction time without experimental verification.

PURPOSE

It was therefore desired to determine the relation between simple visual reaction time, and reaction time when the subject watches the stimulus approach the given point at which he is to react.

PROCEDURE

Experimentation was conducted in a quiet room with the experimenter concealed from the subject. Subjects consisted of 40 college men, 7 CPT pilots, and 2 CPT instructors. For simple reaction time, the subject responded to a neon bulb flash, after a ready signal, by pressing a telegraph key. He was instructed to keep his attention on the response. In the "clock reaction time" the subject was instructed to watch the hand of a Standard Electric Time Clock, and to stop it at a given point by pressing a telegraph key. This point was changed so that there were four different positions at which the subject was instructed to stop the hand. He was given 10 trials for three of the positions, and 20 trials for one. Scores were in terms of the amount of error in stopping the hand. Fifty trials were given for both the simple

and clock reaction times. The order in which subjects did each type of reaction time was alternated so that one subject did simple reaction time first and the next did the clock reaction time first.

To yield further information as to the method used by subjects in stopping the hand of the clock at a designated point, the CPT individuals were asked for introspections regarding their method of approach, as well as their feelings during the test. They were also rated by the two experimenters on such traits as assurance; tenseness; facial expressions; and on such methods as eye fixations; position of arm; arm, wrist, and finger movements; and smoothness of movement.

Results

1. The product moment correlation between the two types of reaction time for 20 cases was $r = .37 \pm .13$. Doubling the number of cases (N=40), r was $.38 \pm .09$, indicating no need for the addition of cases.

2. Since every other subject took the simple reaction time first, any learning effects would have been cancelled. Had there been any consistent learning from simple reaction time to "clock reaction time" or vice versa, the correlation between these two might have been higher than that found. For this reason a group of 39 subjects was divided into two groups and a separate correlation figured for each. Group I of 21 cases had simple reaction time first. The correlation was found to be $rho = .31$ ($r = .33 \pm .14$). Group II of 18 cases had "clock reaction time" first. This correlation was $rho = .37$ ($r = .38 \pm .13$). Therefore, the correlation obtained with 40 cases was not lowered because of ignoring learning effects.

3. Introspective reports indicated a search on the part of the subject for a method of estimating when to respond, in the case of the clock reaction time. A few subjects hit on the method of watching the point at which the hand should be stopped instead of the hand itself, making use of peripheral as well as focal vision. Others tried to establish a point in advance of the stopping point in order to know when best to press the key. For this reason systematic introspections and ratings were made for 7 CPT students and 2 instructors. There was a tendency in this group of subjects for a lower percentage of error on the "clock reaction time" among those who fixated a spot a certain distance before

the designated stopping point, but this difference was not statistically significant as indicated by the t test. The same group who fixated the advanced point was consistently rated as more assured and confident than the other subjects.

4. The subjects reported feeling a difference in their approach to the two types of tests. This difference might be described as one of preparedness or set.

5. Further systematic ratings and introspections yielded no other differences.

Conclusions

1. The two types of reaction time have some elements in common as revealed by a correlation of almost $r=.40$. This might indicate that the "clock reaction time" is to some degree related to the group factor which includes simple reaction time.

2. There was enough difference in the two types of reaction time tests to be noticed by subjects, though in no consistent manner by them, and to keep the correlation low.

3. There is some indication that training in preparedness, on the "clock reaction time" test, in terms of anticipating the reaction might reduce the percentage of errors made.

Grinnell College,
Grinnell, Iowa

References

Buxton, Claude, 1938. The application of multiple factorial methods to the study of motor abilities. *Psychometrika.* 3:85-93.

Seashore, R. H. 1940. Experimental and theoretical analysis of fine motor skills. *Amer. J. Psychol.* 53: 86-98.

Seashore, R. H., Buxton, C. E. and McCollom, I. N. 1940. Multiple factorial analysis of fine motor skills. *Amer. J. Psychol.* 53: 251-259.

Seashore, R. H., Starmann, R., Kendall, W. E., and Helmick, J. S. 1941. Group factors in simple and discriminative reaction times. *J. Exper. Psychol.* 29: 346-349.

Seashore, S. H. and Seashore, R. H. 1941. Individual differences in simple auditory reaction times of hands, feet, and jaws. *J. Exper. Psychol.* 29: 342-345.