Stimulus presentation rate and level of intellectual competency

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The ability of retarded and normal adult Ss to follow instructions presented auditorially at three rates of speed was examined. Faster rates of stimulus presentation adversely affected the performance level of both groups in recalling and pointing to sequentially ordered concepts of size, color and form. The group of retarded Ss listening to instructions presented at the fastest rate had a significantly lower level of performance than the retarded Ss hearing instructions presented at the slowest rate.

The effect of rate of presentation of items upon the capacity of man's short-term memory (STM) store is equivocal. Conrad & Hille (1958) found that digits were remembered better when they were presented at a rate of 90 rather than 30 per min, while Pollack (1952) showed that recall improved as presentation rate of auditory sequences of digits and letters decreased from 240 to 15 items per min. Rate of stimulus presentation was negatively related to verbal response efficiency in a group of retardates though not in a group of normal Ss when there was no question of STM function, only of efficiency of production (Gordon & Gordon, 1967). This suggests that a relatively slower rate of item presentation might improve performance levels in STM studies with retarded Ss, but that the slower rate might not affect significantly the performance of normal Ss. The present study attempts to assess the relationship of the stimulus presentation rate variable among groups of retarded and normal Ss in a STM task.

Procedure

A set of 17 instructions was developed which regularly increased in difficulty level by the manipulation of item length and concept complexity. Ss were asked to point to certain colors and sizes of forms on a response board. There were large and small circles, squares, stars, crosses, and hearts and five colors of each of these (red, green, yellow, blue, and white) making a total of 50 items on the response board. A column contained only one form while a row contained only one color.

A master tape was made of the 17 instructions. Significant units were recorded at the rate of 60 per min. A significant unit was any single concept which the S must perceive and recall in order to make a correct response to an instruction. This master tape was electronically expanded 50 percent and compressed 50 percent by Infotronics, Inc. Thus additional sets of the same instructions were obtained without pitch distortion of the voice, but with significant units being

presented at a rate of 30 and 90 units per min. A rate of instructions by level of intellectual competence design was used for the study.

Subjects were 36 patients at the Woodward State Hospital-School for the retarded and 36 patients and employees from the VA Hospital in Des Moines who had no history of cerebral trauma or known periods of unconsciousness and who were regularly employed and self-sufficient in the community. Subgroups of 12 Ss received instructions at only one of the three rates. The composition of each subgroup with respect to CA and IQ is shown in Table 1. The normal Ss are approximately 15 years older than the retarded Ss and their estimated IQs (based on verbal subtests of the WAIS) are approximately 35 points higher. Among the subgroups within each major group there are no significant differences in CA or IQ.

Each S was told to point to objects on the response board in the same order as he heard the instructions. Responses were recorded as they were made and scored according to the number of concepts or correctly associated groups of concepts which were recalled in correct sequence for any given instruction. These scores were the criterion measures.

Results

Since there was a mean difference of 15.7 years in the CA of the two groups, the uncontrolled age factor was considered a potential depressant of the level of functioning of the normal group, as it is known that CA and STM are negatively related at older age levels (Bromley, 1958; Craik, 1965). However, the Pearson product-moment correlation coefficients of performance on the rate of instruction task with CA were $-.12$ for the normal group and $-.13$ for the retarded group. As both were nonsignificant, it was not considered necessary to control statistically for the age factor. A group by rate of instruction ANOVA was made of the data. The significant main effects shown

Table 1. Group Characteristics

Rate of Instructions	Group	Mean CA	S.D. CA	Mean Est. IQ	S.D. Est. IQ
30	Retarded	30.0	6.8	71.2	4.8
	Normal	46.0	11.2	101.5	12.5
60	Retarded	31.4	7.6	69.3	6.9
	Normal	46.8	8.6	106.8	17.6
90	Retarded	31.9	5.3	68.3	4.6
	Normal	47.7	9.8	106.0	13.7
Total	Retarded	31.1	6.7	69.6	5.7
	Normal	46.8	10.1	104.8	14.7

Fig. 1. Mean performance levels for subgroups at three rates of stimulus presentation.

by the analysis for both group ($F=41.5$, $p < .001$) and rate of instruction ($F=4.6$, $p < .025$) may be seen in Fig. 1.

While the performance of both groups was adversely affected by the increase in rate of instructions, the drop in performance level as the rate increased appeared to be greater for the mentally retarded Ss than it did for the normal Ss. T tests of the mean performance differences within the two major groups were made for the 30 and the 90 unit per min tasks. The results of these tests showed that the group of retarded Ss performing at the 90 unit per min rate had a significantly lower level of performance than did the retarded Ss performing at the 30 unit per min rate ($t=3.1$, $p < .005$). The normal group performing at the 90 unit per min rate tended to perform more poorly than the normal group performing at the 30 unit per min rate ($t=1.39$, $p < .10$).

Discussion

The hypothesis that stimulus presentation rate might be a more potent factor in determining level of STM functioning of retarded persons than it is of persons with normal levels of intellectual competency was

supported. However, it was clear from the significant main effect of rate that increased presentation rates adversely affect the ability of both intellectually retarded and normal persons to remember and recall sequentially ordered concepts of size, color, and form that have been presented aurally.

It is well known that speed of visual perception and integration of information can be increased with practice, e.g., as in increased rates of reading without loss in comprehension. It has also been shown that the rate of perception and integration of aurally presented material can be increased with practice (Friedman, 1966). The fact that Conrad & Hille (1958) found optimal recall of digits at a 90 rather than at a 30 per min presentation rate may be due to the circumstance that their Ss were telephone company employees who were highly practiced in STM tasks requiring recall of digit sequences.

It would appear that the time needed to perceive and analyze or to encode conceptual units and order them sequentially varies with levels of intellectual competence. Mentally retarded persons appear more likely to need slower rates of item presentation for their optimal performance on tasks requiring STM. The question is raised: Could better results be obtained in training programs for the retarded if initial work were done at a slower rate of stimulus presentation?

References

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