Chapter - II

HISTORICAL RESUME

In the first Chapter it was observed that a fixed amount of time is necessary for learning a fixed amount of material, regardless of the method of practice and the number of individual trials. A greater number of research studies have been conducted to study the tenability of the Total Time Hypothesis. Literature related to this hypothesis has been cited in the following section of the present chapter.

Hovland (1938a, 1938b) did two studies in which subjects learned the lists of twelve non-sense syllables in a serial order either at a two seconds or a four seconds rate of syllable presentation. However, his aim was to work out the number of trials required to achieve the criterion and that is why he did not compute the total time, but his data indicate that while trials to criterion may vary greatly, but there was very little variation in total learning time. In his study of reminiscence (Hovland, 1938a), the mean number of trials to reach the criterion of 7/12 non-sense syllables was significantly lesser at the four second rate than at the two second rate (3.28 vs 6.05 trials). Mean total time
per item was 13.12 seconds at the 4 seconds rate and 12.10 seconds at 2 seconds rate. In his study of distributed practice (Hovland, 1938b), the mean number of trials to one perfect recitation was 6.32 at the four second rate and 13.04 at the two seconds rate. Mean total time per item was 25.28 seconds at the slow rate and 26.08 seconds at the fast rate.

In a study of Melton and Stone (1942) subjects learned serial lists of 16 adjectives to a criterion of 12 correct anticipations and then rested for varying lengths of time, after which they relearned the same lists to a criterion of two successive errorless trials. Half of the subjects learned at a two second presentation rate and rest half at a 1.45 second presentation rate. They concluded that with an increase in the rate of presentation there would be a subsequent increase in the number of trials required for partial or complete mastery of the lists, but the total time spent in learning, more or less, remained unaffected.

Subjects of the study conducted by Hovland (1949) learned nine pairs of non sense syllables either at a 1:1 second or a 2:2 second rate. The mean number of trials to criterion at the 1:1 second rate was 25.5. Although, at the 2:2 second rate it was 15.0. However, the
difference between the per item total presentation time of the two groups was found insignificant.

Three studies which confounded increase in stimulus and stimulus-response durations (Goss, Morgan and Golin, 1959; Hovland, 1949; Wilcoxon, Wilson and Wise 1961) support the total time hypothesis, however, another study with the same confounding (Caroll and Burke, 1965) does not support it. (Nodine 1965), who factorially manipulated stimulus, and stimulus-response durations found that increase in stimulus duration caused increase in total learning time.

The authors of two earlier studies which confounded increases in stimulus and stimulus-response durations were not looking at the total time hypothesis. Goss, Morgan and Golin (1959), presented eight pairs of nonsense syllables either at a 2:2 second or a 3:3 second rate and manipulated percentage occurrence of response members. It took considerably fewer trials to learn the 100% occurrence of response members. It utilized reasonably lesser number of trials to learn the 100% occurrence of response members list at the 3:3 second rate than it did at the 2:2 second rate (16.4 Vs 24.8 trials), when two groups were compared on the basis of the total time per item, there was hardly any difference,
though numerically the group of the 3:3 second rate got a slight advantage (98.4 Seconds Vs. 99.2 Seconds).

Braun and Heyman (1958) used a 2x2x2 factorial design with two degrees of meaningfulness (high and low), two inter-trial intervals (6 seconds and 2 minutes) and two presentation rates (2 seconds and 4 seconds). Mean trials to learn the high meaningful list was 8.04 at the 4 seconds rate and 19.58 at the 2 second rate. Mean trial to learn the low meaningful list was 23.5 at the 4 second rate and 31.67 at the 2 second rate. Like Hovland, (1949) Braun and Heyman also did not compute total time. However, when mean total time was calculated from their data, it appears that total time in variance holds only for the high meaningful list. Mean total time per item for the high meaningful list was 32.16 second at the 4 second rate and 39.16 second at the 2 second rate. For the low meaningful list it was 63.34 seconds at the 2 second rate and 94.0 seconds at the 4 second rate.

Wilcoxon et al (1961) employing a 3x3x3 factorial design manipulated the learning lists (4, 6, 8 pairs), percentage occurrence of response members (100, 50, 25%) and the rates of presentation (1:1, 2:2, 4:4 seconds). All manipulations in above mentioned three variables did not affect the total time needed to achieve the criterion. Thus, the results supported the view of total
time hypothesis. Although, they noted that with increased rate of presentation there was increase in the mean number of trials taken.

Bugelski (1962) conducted a study which put forth a strong evidence in support of the total time hypothesis. The subjects learned eight pairs of nonsense syllables to a criterion of two successive correct anticipations of each pair. The stimulus presentation time was kept constant at 2 seconds, as was the time between the occurrence of a stimulus-response pair and presentation of the stimulus of a subsequent pair. There were total five groups of subjects and the duration of the stimulus-response presentation was varied as 2, 4, 6, 8 and 15 seconds. Therefore, on a given trial presentation time per item varied from 6 seconds to 19 seconds. There was a significant difference in trials to criterion, most rapid learning occurred in the 19 seconds groups (3.3 trials) and the slowest learning was recorded in the 6 seconds group (10.2 trials). However, there was a non-significant difference in the total time to learn. The total time was measured by multiplying trials by presentation time. The total time to learn per item for the 6 seconds group was 61.2 seconds and 62.2 seconds for 19 seconds group. One year later, Bugelski and Rickwood (1963) allowed the subjects of a group to control the stimulus-response exposure time at their own.
total time per item for this group came 65.5 seconds which was also statistically indifferent from the per item mean total time of the five groups of previous study. The per item mean total time of the five groups was 61.5 seconds.

An experimental study on bidirectional paired associate learning by Underwood and Keppel (1963) provides an unique confirmation of the total time hypothesis. Subjects learned the lists of 10 pairs of two syllable adjectives up to a criterion of one perfect trial. The experimental group learned under a condition in which stimulus-response pairs appeared twice in the sequence S-R and twice in the sequence R-S for the four orders. Control groups learned either all S-R sequences or all R-S sequences. After attainment of the criterion, half the experimental group learned a list of all S-R sequences and the other half, a list of all R-S sequences. The control groups learned lists of reverse sequences (backward learning). The control groups took 23% fewer trials to learn the first list, but they recalled 25% fewer items on the first transfer trial of the second list. The difference in time to learn the first list between experimental and control groups was almost perfectly matched by the difference in degree of learning or (number) of backward associations (25%).
Caroll and Burke (1965) used a $4 \times 3 \times 2 \times 2 \times 3$ factorial design with four list lengths (4, 8, 12, 20 pairs), three levels of meaningfulness, two levels of ability, two equivalent forms and three rates of presentation (1.5:1.5, 2:2, 4:4 sec). The aim of the study was to investigate the effect of number of variables on the total time required to reach the criterion. And so, the dependent variable was the amount of time to learn each pair to one correct anticipation. An analysis of variance performed for all data pertaining to acquisition of complete lists e.g. learning four pairs in a four pair list and eight pairs in an eight pair list etc. showed a significant effect of rate of presentation.

Nodine (1965) asked the experimental subjects to learn 16 consonant-vowel-consonant (CVC) trigrams to a 15/16 criterion. Stimulus and stimulus response durations were varied factorially over four values i.e. 1.5, 1, 2 and 4 seconds. As stimulus response durations increased there were increasing numbers of correct responses on the first 20 trials and statistically this effect was significant. Total learning time showed a significant increase with increasing stimulus duration but not with increasing stimulus-response duration. Increasing stimulus response duration increased the rate of learning and therefore, did not increase the total learning time.
In a study of Keppel and Rehula (1965), subjects learned serial lists of 14 adjectives to the criteria of 5/14 and 10/14 at a 2 second or a 4 second rate of presentation. For both criteria the slower rate of presentation resulted in faster learning, when it was measured in terms of trials to criterion (3.17 vs 5.63 trials and 7.87 vs 15.17 trials, respectively), but total learning time did not differ for the two rates. Furthermore, when the groups were compared with the total presentation time held constant (i.e. the 4 sec. groups performance on the first trial vs. the 2 seconds groups performance on the second trial. The 4 sec groups performance on the second trial vs the 2 sec groups performance on the fourth trial, etc. over the first four such comparisons) although the total number of correct responses was slightly higher for the 4 second group (18.31 vs 17.97), but, this difference was non significant.

In a study of Baumeister and Hawkins (1966), subjects learned eight non sense syllable pairs to a criterion of two successive perfect recitations. The stimulus item was exposed for 2 seconds, during which the subject was instructed to anticipate the response term. The stimulus response duration and inter item interval were varied concomitantly for different groups, so that total time per item remained constant at 19 seconds.
First Group, which had a 2 second stimulus response duration and a 15 second interitem interval, took 12.2 trials. Second Group which had a 7 second stimulus duration and a 10 second interitem interval took 10.9 trials. Group 3rd which had a 15 second stimulus response duration and a 2 second interitem interval took only 9.2 trials. However the differences between these mean scores were found statistically insignificant.

In the anticipation method of serial learning the study time and the test time are compounded. Therefore, the attainment of a common criterion with different presentation rates may not reflect equal degrees of learning. Specifically, a list presented at a slow rate might not be learned even when it is presented at a fast rate, but due to the longer time for anticipation at the slow time, performance could be equal under both conditions. To separate learning from performance, Keppel and Rehula (1965) factorially combined pre-criterion presentations rate (2,4 sec) with postcriterion presentation rate 2,4 sec.). Relatively fast and complete switch overs to postcriterion rate of presentation indicated that during this study, the attainment of a common criterion with different presentation rates did, in fact, reflect equal degrees of learning.
Postman and Goggin (1966) conducted a study by using paired associate learning task. No CVC items were used in this case. Total time required for whole and part methods was compared. The total learning time for whole and part condition was same or near about same. In this experiment they compared the whole, pure part and repetitive part methods also. On comparison the total learning time used for repetitive part was lesser then in whole and pure part conditions.

Muhar and Shrivastva (1971) tested the total time hypothesis. In their study, two hundred University students were equally devided into four groups on a random basis. They were asked to learn a list of non sense syllables (NSS) having an association value of 20%, four different methods (massed, spaced, whole and part) were followed. However, for each group only one method was employed. The results showed differential learning by the four learning methods.

Later, in 1972, Bhasker and Muhar observed that if N.S.S. of a higher association value are used, the total time hypothesis holds time except for the whole method of practice.

Pardeep and Yadav (1985) used a multi group design with four groups for testing the tenability of total time hypothesis. Subjects of each group learned three lists.
One of meaningful words, and remaining two of nonsense (100% and 60% association value) syllables, by either the massed, spaced, part or whole method of practice on three consecutive days. Each of lists consisted of 20 items. However, the total learning time was kept constant for each group. Results supported the view that the total time hypothesis holds true for meaningful material.

Dhaliwal, Varinder (1987) in their study, "of short term and long term memory of serial learning tasks", told the following details. Total 240 subjects of 3 age groups i.e. 12, 16&20 years were selected randomly. Three serial learning tasks-list of meaningful words, figures, and nonsense syllables were used. The results revealed that age, emerged to be a significant determiner of memory S.T.M. and L.T.M. Sex was not found to be a significant determiner of memory. Visual mode of presentation resulted better performance in STM and LTM in comparison to auditory mode of presentation. For distribution of practice means favoured spaced practice as compared to the massed practice for both STM & LTM.

With this background, we may now pass on to the next chapter dealing with the problem and hypotheses of the present investigation.