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ABSTRACT

This experiment was designed to test the hypothesis that subjects must know the length of the viewing matter they will be scanning before the target is presented in order to scan efficiently. Adult subjects were required to scan visually for a predetermined item. Targets were one, two, or four letters in length and the pairs of slides shown on each trial were presented via modified Lafayette projection tachistoscopes. Subjects went through two identical sessions. A precise analysis of the data is not presented, but the results--provided in narrative and table format--suggest information that should be of interest for further research. (RB)

Visual Scanning of Known and Unknown Target Lengths

Leonard Katz and David A. Wicklund

This experiment was intended to test the hypothesis that S must know the length of the target which will be scanned before the target is presented in order to scan efficiently. Adult Ss were required to visually scan for a predetermined item. Targets were 1, 2, or 4 letters in length. The pair of slides shown on each trial were presented via modified Lafayette projection tachistoscopes. The first stimulus, the predetermined letter, was displayed for 2 seconds and was followed immediately by the target. S responded "Yes" or 'NO" on a pair of telegraph keys. Latencies were recorded by a Hunter Model 1520 electronic timer.

S went through two identical sessions. In each, he was presented with two types of trial blocks: (1) known target lengths (e.g., three successive subblocks, within each of which all 20 trials were the same length) and (2) unknown target lengths (e.g., 60 trials of equal numbers of the three lengths in random presentation).

Due to an assistant't error, slightly different numbers of trials in each condition were run for different Ss. A precise analysis of the data is not possible, but the results tentatively suggest information of interest. Figure 1 presents the data and linear fits for the known and unknown conditions. The data suggest that scan rates are not very different (the slopes are 39.5 and 31.5 msec. for unknown and known targets, respectively) but the intercepts differ by 61 msec. The uncertainty about the scan length does, in fact, slow reaction time. A parsimonious explanation is that S used the additional 61 msec. to ascertain the target size and then begins to scan, in the unknown target length condition. The preliminary step is not performed in the known target length scans.

If S judges the size of the target first, in the unknown target length condition, this judgment is perhaps based on a low-level extraction of visual information; S counts gross units and does not engage in letter-feature analysis. Since the slopes of both conditions are similar, it is likely that the preliminary size analysis is not serial in nature, or, at least, is a process S always completes in a fixed amount of time (61 msec.) whatever the actual target size.

The notion of a preliminary low-level analysis on a target prior to letter-feature extraction is one that is discussed further in experiment PRR-11.

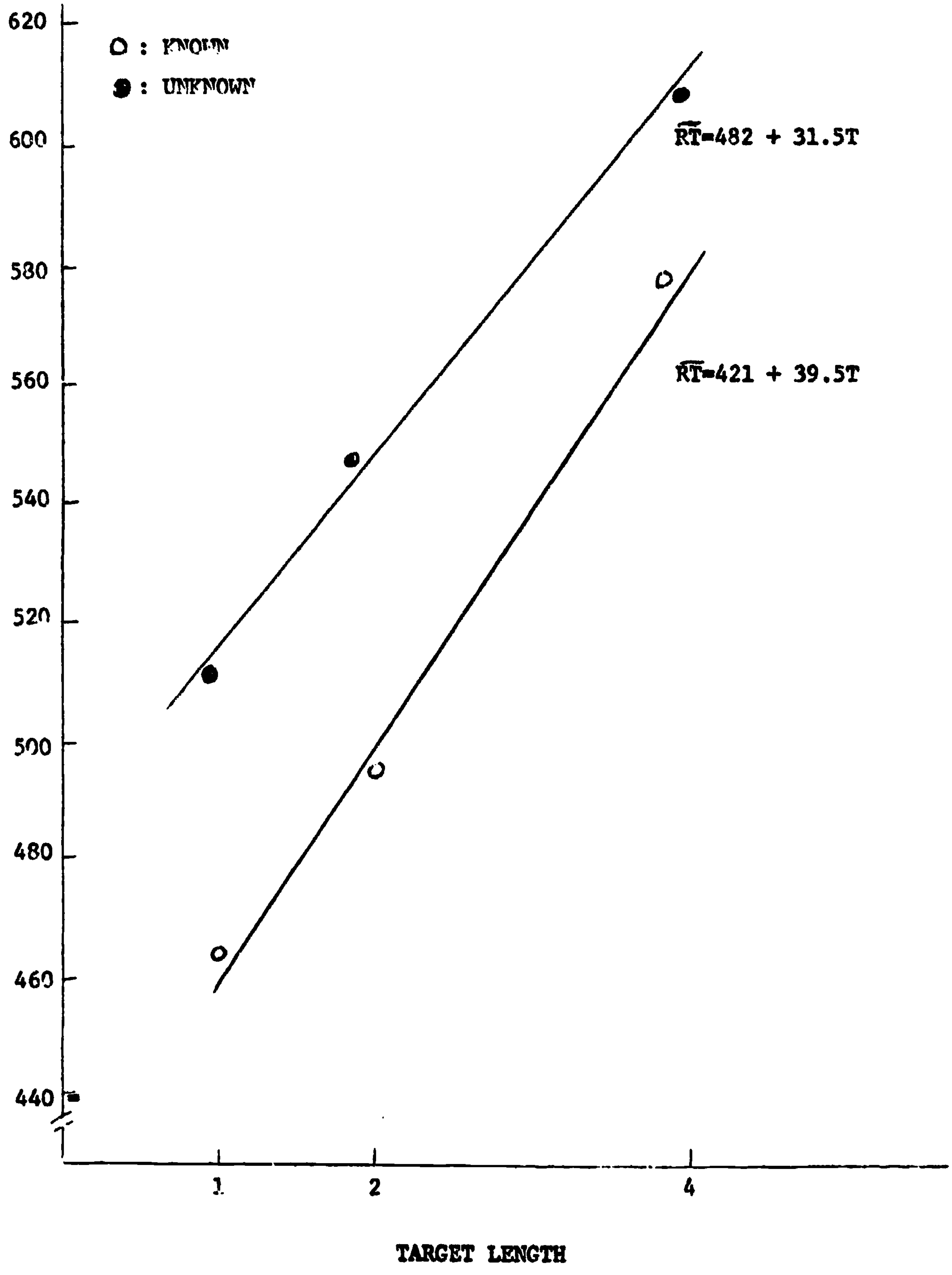

Figure 1

PRR-16

A comparison of visual and memory scanning

The purpose of the present experiment was to study the rate of inner speech (slow speed) scanning as a function of the size of the memory load and the size of the display load. A pilot study (PRR-14A) suggested that the character-pair reversal task used by Sternberg (1969) required Ss to search memory at a slow rate (approximately 114 msec./digit). Sternberg's experiment did not include a set-size of two, nor did he study the analagous visual scan situation.

Method

Each of 16 adult Ss went through one Memory Scan (MS) session and one Visual Scan (VS) session, separated by one week. The order of scan type was balanced.

Stimuli were letter row arrays. Scan sets of size (load)2, 3, and 4 were constructed from the same set of letters. For each trial, a letter pair (probe) was constructed; for half the scan sets, the probe letters were repeated in the load in the same serial positions (positive trial) and for the remaining scan sets the probe pair was a reversal of adjacent letters in the scan set.

On each MS trial, the scan set of a given load was presented, via slide projector for a fixed interval. Scan loads of size two were presented for 2 sec., loads of size 3 for 4 sec., and loads of size 4 for 6 sec. After a 940 msec. slide change interval, the two-letter probe appeared. S was required to respond "Yes" if the probe letters were in the same order as in the scan set. For each VS trial, the order of the probe and scan set was reversed. The probe pair came on first for 2 sec.

For each load size, each serial position was tested equally often; thus there were 16 trials of size two, 32 of size three and 48 of size four in each session. Each S went through a block of each load size in the order two, three, and four. Each block was preceded by three practice trials.

Results

Figure 1 presents the mean RT for positive (same order) and negative (reverse order) trials as a function of load (2, 3, or 4) and type of load (MS or VS). Both MS and VS had identical latencies for load size two, as, of course, they should: their tasks were identical. Fr. load size two, S need only compare one letter in the memory stimulus with the display letter in the same serial position; if an identity match is made, S answers, "Yes". This task requires only a simple one-character identity scan.

The task is more difficult for load sizes three and four. Inspection of Figure 1 indicates that RT increases with load size and that the memory scan is much slower than the visual scan. Although Ss in the present experiment were less practiced than Ss in Sternberg's Experiment 8 (1969), RTs for VS in the present study were faster than the memory scan RTs of Experiment 8. Thus, there is the suggestion that memory scans for reversal information are slower than comparable visual scans.

References

Sternberg, S. Memory-Scanning. American Scientist, 1969, 57, 421-457.

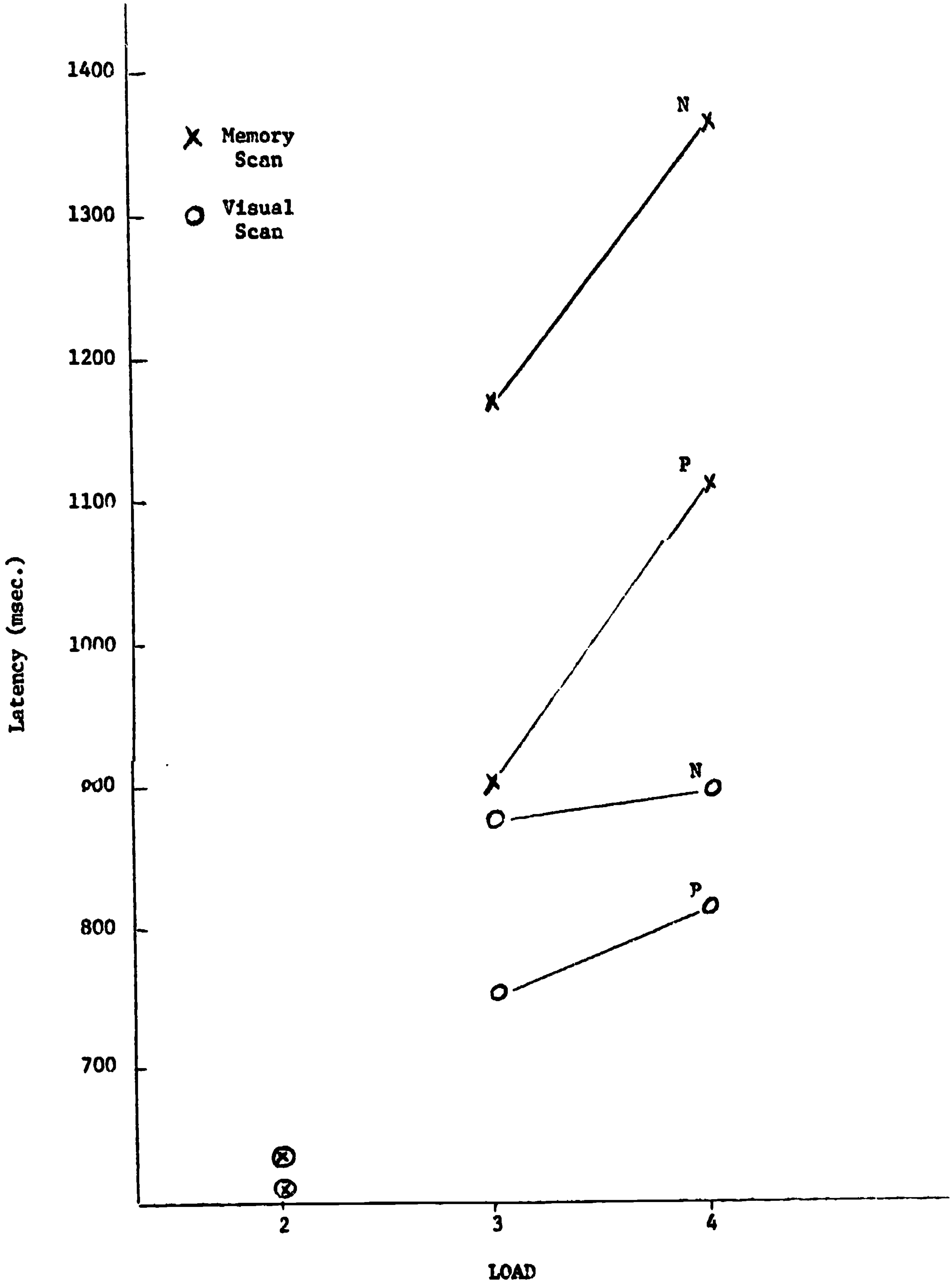
1400
1300
1200
1100
1000
900
800
700
Latency (msec.)
Memory Scan
Visual Scan
N
P
N
P
2
3
4
LOAD

Figure 1

Retrieval of Categorical Information from Short-Term Memory

Thirty-two fourth grade Ss were each given a fixed alphanumeric memory set which consisted of one digit and one letter (dL) or one-digit and two letters (d2L). On each of a series of 24 trials (for each memory set) S was presented with a single digit or single letter target and was to respond manually "Yes" if the target item was in his memory set and "No" if otherwise. On six trials the target item was posi e, i.e. it was a memory set member, and on six trials it was a negative. On half the trials the target item was positive and on the other half, negative; on half of each of these the target was a digit and on the other half, a letter. Each S had two experimental sessions, on each of which he was given both dL and d2L. Reaction time was significantly faster for (1) positive than for negative targets, and (2) dL than for d2L. In addition, positive reaction time for trials decreased faster with practice than reaction time for negative targets. The data suggested that an increase of one letter from dL to d2L increased scanning time as much for digit targets as for letter targets; Ss appeared to have exhaustively scanned memory even when memory consisted of categorizeable items. In addition, when each S's mean RT in each condition was used, RT to digits was significantly faster than RT to letters; this significance did not appear when each S's median RT in each condition was used instead.

Analyses that remain to be performed include the correlations of reading score (WRAT) with slope of the RT function for positive and negative digits and letters.

Figure 1 contains the mean across Ss of median latencies to dL and d2L for the first half (A) and second half (B) of Session one and Session two. The main effect of practice was to lower the intercept of latency (this was statistically significant); the apparent decrease in slope with increasing practice was not significant.

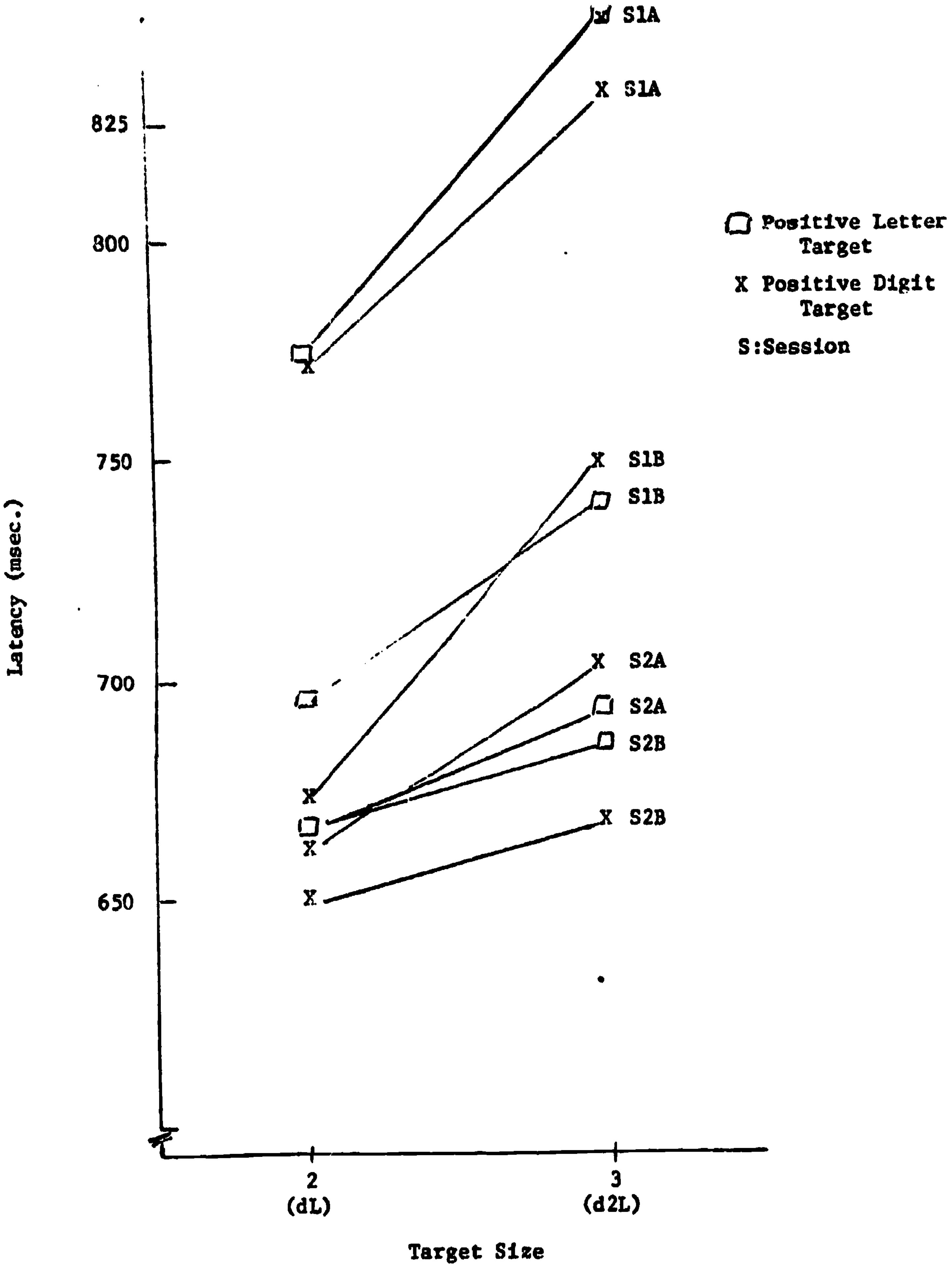

Figure 1

Mean across Ss of median latency for positive positive letter and positive digit targets

PPR-15