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ABSTRACT

The relationship between learning style (impulsivity-constriction and stability-anxiety), reading scores, and scanning performance was investigated. Twenty high school students enrolled in a precollege reading and study skills program participated in an 80-trial (10-session) scanning experiment. The task involved searching for a target sentence embedded in a page and responding by pressing the appropriate button on a machine. Errors were of two types: when the wrong button was pushed or when response time exceeded 1 second. Data analysis showed that the mean scanning times for session 1 and session 8 were significantly different ($p<.01$) and that there was some improvement in accuracy. Correlations between mean rate scores on the two sessions was high (.78). Both mean scanning time and mean number of correct responses did not differ significantly between (1) same vs. different context, (2) oral vs. written stimulations, or (3) male vs. female subjects. Slow scanners were more constricted in application of strategies, while fast scanners reported more variability in eye movement patterns. Multiple regression analysis of test variables in a pretest battery and initial scanning speed revealed that the highest correlation obtained was between impulsivity as measured on Smith's I-S Scale and scanning rate (.65). (AW)

Learning Style and Other Correlates of Performance on a Scanning Experiment

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Although a number of investigators have examined the relationship between cognitive style and/or personality factors and scanning speed, their studies have typically been concerned with the rate of scanning for target characters (letters or numbers) from a matrix, not with locating a meaningful phrase or instruction in connected prose.

That scanning speed and accuracy may be related to personality characteristics is suggested by some of the recent research on deviant populations. Attkisson (1971) found that the perceptual span of chronic schizophrenics was significantly smaller and less stable than that of normal controls. On the other hand, Messick, in a personal communication, reports that simple schizophrenics scan widely to find evidence to confirm their negative self-image while paranoid schizophrenics scan widely for signs of threat.

Instructors in high school and college reading programs have long observed that some students fail to improve their reading rates and do not develop skimming and scanning skills despite great efforts. Such students are often described as "compulsive," "constricted," "rigid" or "inflexible."

This study was designed to investigate the relationship between learning style, (specifically, impulsivity-constriction and stability-anxiety), reading scores, and performance on a scanning experiment

involving potentially meaningful material.

Twenty high school students[1] enrolled in a pre-college reading and study skills program participated in an 80 trial (10 session) scanning experiment. The task in each trial of the experiment involved searching for a target sentence embedded in a single-spaced typewritten page and, when found, to respond by pressing the appropriate button on a machine. The experimenter presented the first phrase in the target sentence (stimulus phrase) either orally or in written form. This stimulus phrase was "When you hear the bell (buzzer or click)...." The subject was timed as he scanned the page to locate the rest of the sentence, (i.e., the target phrase) "push the red (white, blue or yellow) button." Stimulus phrases and targeted phrases were randomly paired. When S located the sentence, he then pushed the button on the machine that matched the color given in the target phrase. His response time was recorded and his score on each trial was the mean number of seconds (or fractions thereof) per line that it took to locate the target and respond. Target phrases were randomly distributed on the pages but there was only one target per page.[2]

Data were analyzed by sessions (10 trials). Each trial was individually administered and each subject was scheduled for two sessions

[1]Students ranged from grade 9 through 12. Thirteen were males, seven females. Three were Orientals, four Black and thirteen White.

[2]A complete description of the experimental procedure and apparatus may be found in Maxwell, Martha J. "Effects of Practice and Learning Strategies on Speed of Scanning for Phrases in Meaningful Material," Reading: Process and Pedagogy, Vol. 1, George B. Schick and Merrill M. May (eds.), Nineteenth Yearbook of the National Reading Conference, Milwaukee, Wisconsin: National Reading Conference, 1970, 226-234/

Table 1

Mean Scanning Times for Total Group by Sessions

(N=20)

Session	Mean times in Seconds	Sigma
1	.79	.17
2	.63	.21
3	.61	.19
4	.61	.20
5	.58	.16
6	.57	.13
7	.60	.16
8	.59	.19

Table 2

Comparison of Mean Scanning Times of Fast and Slow Scanners on Each Experimental Session

Session	Fast Group Mean	Fast Group Sigma	Slow Group Mean	Slow Group Sigma	T-Ratio	Significance Level
1	.67	.11	.90	.14	4.14	.01
2.	.49	.13	.76	.19	3.71	.01
3.	.50	.12	.72	.19	3.10	.01
4.	.50	.13	.72	.19	2.94	.01
5.	.46	.07	.70	.14	4.73	.01
6.	.49	.11	.66	.10	3.76	.01
7.	.49	.07	.72	.15	4.36	.01
8.	.45	.09	.72	.16	4.70	.01

Note: Mean time is computed by averaging mean time per line for each of 10 trials in the session and is expressed in seconds. The total number of correct responses given within the time limit average 8.7 for the fast group and 7.7 for the slow group.

(20 trial blocks) per day with the testing period extending over the last two weeks of the program. In addition to computing mean scanning time per trial and session, the number of correct responses was also noted. Errors were of two kinds: 1) when the subject pushed the wrong button, or 2) when the subject did not make a response within the one-second time limit. (The time limit per line assured that subjects "read" at a minimum of 800 words per minute.)

Scores from a pre-test battery comprising of the Brown-Holtzman SSHA, Nelson-Denny Reading Test, Reading Versatility Test, and Smith's I-S Scale[3] (a measure of Learning Style) were correlated with the mean scanning time on Session 1 (Trial Block 1-10) of the experiment to determine the extent to which the tests would predict initial scanning rate.

Results and Conclusions:

Table 1 shows the mean scanning times per session for the total group of 20 students. Differences in rates between Trial Blocks 1-10 and 71-80 were statistically significant ($p < .01$), and there was some improvement in accuracy i.e., the mean number of correct responses within the time limit on Session 1 was 6.95 and on Session 8 was 8.7. The correlation between mean rate scores on Session 1 and 8 was high ($r = .78$) indicating that although S's significantly reduced scanning time as a result of practice, they tended to remain in the same relative positions in regard to each other.

[3] I-S Scale description and reliability information can be found in Smith, Donald E.P. (Ed.) Learning to Learn, New York: Harcourt, Brace and World, Inc., 1961, pp. 3, 9-13.

Data were analyzed further by dividing the group in half based on their mean scanning scores on Session 8. Table 2 shows the results of this analysis and indicated that the fast group took significantly less time on every session than did the slow group. Between Sessions 1 and 8 the fast group averaged a 32% decrease in time taken to locate the target, while the slow group averaged a 20% decrease. However, the largest gains for each group occurred between Sessions 1 and 3 (Trial Blocks 1-10 and 21-30.) By the end of the experiment, slow scanners had not attained rates as fast as fast scanners showed initially.

The context in which target phrases were embedded differed on half the sessions and remained the same on the other half. Administration of sessions with same versus different context were randomized.

Mean scanning times did not differ significantly between same versus different context nor did mean number of correct responses i.e,

Table 3

Mean Scanning Scores and Context

	$\bar{x}$ scanning time	$\bar{x}$ correct
same context	.60	8.7
different context	.64	8.2

The stimulus phrase was presented orally on half the trials and in written form on the other half. These presentation conditions were randomized by sessions.

There were no significant differences between the mean scanning time and the oral versus written conditions. Nor were there differences between the number of correct responses under oral and written stimulus

presentation conditions.

Table 4

Mean Scanning Scores and Stimulus Presentation Condition

Stimulus Condition	$\bar{x}$ time	$\bar{x}$ correct
oral	.60	8.4
written	.64	8.1

A possible explanation of this finding is that subjects looking at a written stimulus---e.g., "when you hear the bell" may have repeated the phrase mentally to themselves as they scanned and used the same internal auditory prompting method when a stimulus phrase was presented orally. Some students reported doing this. The finding of no significant difference between responses to oral and written stimuli is consistent with the findings of much of the research literature on reaction time.

Distribution of Fast and Slow Scanners by Sex

There were no significant differences in the proportion of fast versus slow scanners by sex:

	Slow	Fast
Males	7	6
Females	3	4

Learning Strategies

Each subject was asked about the methods he used to locate the target phrase at the end of each Session.

A typical strategy reported by "fast scanners involved using their fingers to guide them down the page and looking for configuration cues

i.e., the "ll" in bell or "zz" in buzzer. Others reported that they thought "color" and searched for color words.

Slow scanners tried and rejected more different strategies but tended to be more constricted in their application of strategies.

There was more variability in the reported eye movement patterns of fast scanners (i.e., some would scan down the left half of page and up right side of page---or glance down middle of page and back and forth on each side of middle.)

The most difficult phrases to locate were those that were split up ---part on end of one line and part at beginning of next line, or where there were other words that had same configurational pattern (e.g., one selection had the words "black buzzards" three times and the subject was to search for the phrase, "When you hear the buzzer.")

Several subjects tried and rejected such strategies as holding page at a distance and trying to look at the whole page at one time.

Slow scanners were more likely to persist with their initial strategy e.g., moving eyes in a Z-pattern but looking at each line, while fast scanners who continued to use a Z-pattern reported that they skipped lines.

Results of the multiple regression analysis of test variables and initial scanning speed on the experiment show that the I-S Scale, Reading Rate in Part 2 of the Reading Versatility Test (technical material) and Scanning Rate on the Reading Versatility Test account for most of the variance (64%) of the Ss' initial scanning rates on the experiment. (Note: the multiple-R between these tests and scanning rate was .80

and the highest zero-order correleation obtained was between Impulsivity and scanning rate (.65.) These results suggest that impulsive, stable subjects who read technical material at a rapid rate tend to be fast scanners and can improve their scanning skills with practice. On the other hand, constricted, anxious subjects who read technical material more slowly are likely to be poorer scanners and show smaller gains as a result of scanning practice.

These findings confirm earlier studies by Smith et.al. (1961) which showed that college students tending toward impulsivity have a higher rate of reading than do "constricted" students both before and after special training in a reading course.

References

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