A COMPARISON OF SPACED AND MASSED PRACTICE ON THE ACQUISTION OF FUNCTIONAL SIGHT WORDS

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A Thesis by VICKI LYNN JONES

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A COMPARISON OF SPACED AND MASSED PRACTICE ON THE ACQUISITION OF FUNCTIONAL SIGHT WORDS

A Thesis

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May 1982

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ABSTRACT

A COMPARISON OF SPACED AND MASSED PRACTICE ON THE ACQUISITION OF FUNCTIONAL SIGHT WORDS. (May 1982) Vicki Lynn Jones, B. S., M. A., Appalachian State University

Thesis Chairperson: Max Thompson

A review of the literature revealed a superiority of spaced trial sequencing over massed trial sequencing when teaching motor and cognitive skills to normal and retarded subjects. The research in this paper attempted to substantiate and generalize these findings to the severely mentally retarded by investigating trial sequencing and relating its use to the number of trials required to reach acquisition when learning functional sight words. Four functional sight words were taught in alternation under massed and spaced practice conditions so that a comparison could be made between the two methods. Spaced practice conditions consisted of a distributed presentation of trials with a thirty second intertrial rest period. Massed practice conditions consisted of program trials occurring so closely in succession that no other behavior could be emitted.

Two subjects participated in the study. Each subject was taught four functional sight words to acquisition. Two words were taught under spaced practice conditions while two words were taught under massed practice conditions.

Results of the study indicated a superiority of spaced practice over massed practice with two severely handicapped adults. It tended to increase performance and promote acquisition when learning functional sight words.

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Subjects taught under spaced practice conditions tended to increase performance thereby, decreasing acquisition time. Massed practice conditions impaired the performance of both subjects and increased the amount of time spent on acquiring the functional sight words taught under that condition.

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Last but not least, I would like to thank my parents, Mr. and Mrs. David B. Jones. Without their continued support, love, and encouragement, I would not have had the strength to accomplish the goals I have thus far set in my life.

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DEDICATION

This manuscript is dedicated to the residents of Western Carolina Center for the betterment of their education which will hopefully lead to a more normalized life.

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CHAPTER I

INTRODUCTION

Introduction

In past years, researchers have investigated the influence of massed practice trials on the acquisition of various skills with normal and retarded subjects. (Pavlov, 1927; Hull, 1943; Dent & Johnson, 1964; Drowatsky, 1970). Massed practice refers to program trials which occur so closely in succession that no other behavior can be emitted (Mulligan, Guess, Holvoet, & Brown, 1980). Spaced practice is the distributed presentation of program trials with a rest period between each trial (Mulligan, et al., 1980).

Pavlov (1927) stated that when an activity is practiced so that no other behavior occurs, certain bonds are formed in the central nervous system which facilitate the learning of that activity. While this process is taking place, neural impulses are traveling through the neurons and synapses. This seems to impair performance and stimulate fatigue or drowsiness. The obstruction of performance and the development of fatigue is referred to by Hull (1943) as "reactive inhibition". It accumulates during practice and interferes with learning. If an individual performing under massed practice conditions is given a rest period, the phenomena of "reminiscence" occurs. "Reminiscence is an overall increase in the level of performance after given a rest period" (Mulligan, et al., 1980, p.329). Therefore, it may be hypothesized that performance will be improved if

skills are taught under spaced practice conditions which promote reminiscence instead of massed practice sessions which promote reactive inhibition. Purpose

The purpose of this study was to compare the number of trials required to reach the acquisition stage of learning when a skill was taught under massed practice and spaced practice conditions. It investigated the effectiveness of the spacing of trials versus the massing of trials when teaching two severely handicapped individuals. This study attempted to answer the question: Is acquisition time shorter during skill learning under massed practice conditions or spaced practice conditions? It was hypothesized that acquisition would take fewer trials when spaced practice conditions were incorporated into a functional sight word program.

Studies in experimental psychology indicated that the spacing of trials may be superior to the massing of trials. It was the purpose of this research to investigate trial sequencing and relate its use to the number of trials required in the acquisition of a skill.

CHAPTER II

REVIEW OF RELATED LITERATURE

Literature which presented information regarding the effectiveness of spaced practice and massed practice trials is examined in the following review.

Spaced practice versus massed practice

Drowatsky (1970) conducted a study which compared the effects of massed practice and spaced practice schedules upon the acquisition of pursuit rotor tracking by normal and mentally retarded subjects. The data suggested that differing rates in the buildup of reactive inhibition occurred between normal and retarded subjects under different practice conditions. The normal subjects' performance was superior under the two minute intertrial rest practice condition. Both the 20 second and two minute distributed practice conditions seemed to be of equal value for the retarded subjects. Twenty-seven of the 29 retarded subjects were unable to learn the tracking task under the massed practice conditions while only four mentally retarded subjects in the distributed practice groups were unsuccessful. When comparing the normal and mentally retarded subjects' level of performance under each practice condition, spaced practice was superior to massed practice during the presentation of a pursuit rotor tracking skill.

In a study on rote learning, Hovland (1938) tested the amount of reminiscence which occurred during spaced practice. Thirty-two normal adult subjects learned 16 lists of 12 nonsense syllables by massed practice, without a rest period, and spaced practice with a two minute rest period between learning and relearning. Hovland's results indicated that the rest pause is effective not only in improving recall but also results in improvement in relearning for a considerable amount of time afterwards. The rate of negative acceleration in learning is temporarily reduced following the introduction of a rest pause.

Patten (1938) conducted a similar investigation in which 16 non-retarded male subjects each learned 16 nonsense syllables series of 16 syllables each. Half of the subjects were placed under massed practice conditions and the other half under spaced practice conditions. It was found that learning was more rapid during spaced practice conditions than during massed practice conditions. The data suggested that the curve of difficulty was higher for the massed practice group as compared to the spaced practice group.

In a study on reminiscence in motor learning, Kimble (1949) observed five experimental groups perform an alphabet printing task. It was demonstrated by Kimble that reactive inhibition decreased as the intertrial interval increased; therefore, reiminscence increased. When studying the total number of repetitions required to produce complete learning, spaced practice conditions increased acquisition time. This study presented evidence that indicated spaced practice was superior to massed practice. Effects of spaced practice on performance

An experiment conducted by Duncan (1951) was done in order to determine whether spaced practice groups, with less practice, performed at a higher rate than massed practice groups when the length of the experimental session was the same for both groups. One hundred and fifty-seven normal female subjects, divided into four groups, learned a pursuit rotor task.

It was concluded from this study that subjects who had used spaced practice before rest had not only shown superior performance, but had learned as much as the massed practice subjects.

Eighteen mildly retarded and moderately retarded children were subjects in a study conducted by Dent and Johnson (1964). Massed practice and spaced practice groups were formed in four groups of eight each from the respective categories. On a paired-associates learning task, it was found that subjects within the mildly retarded and moderately retarded groups who learned under spaced practice made significantly fewer errors than the subjects in the massed practice group. The results of this study indicated that the spacing of practice increases the rate of learning and decreases errors.

The stabliometer task was used to study initial acquisition, retention, and relearning of a gross-motor skill by mentally retarded boys under conditions of massed and spaced practice. The results of the study indicated that spaced practice was more effective than massed practice in the initial acquisition stage. The spaced practice group showed superior retention of the skill. No differences were found between the groups for relearning (Chasey, 1976).

Length of intertrial rest

Adams (1952) conducted a study on warm-up decrement in performance with 39 normal male subjects. Warm-up decrement is referred to as a loss of set or a decrease in proficiency. During motor performance if periods of practice are separated by relatively long intervals of rest, a decrease in proficiency may occur. Two groups of subjects practiced on the Epicyclic Pursuit Rotor for five consecutive days. The practice of one group was massed while the practice of the other group was spaced.

Adams postulated that no warm-up decrement would occur under spaced practice conditions since inhibition would be minimized. It was found that the growth of inhibition did not relate to warm-up decrement. Warm-up decrements were found at the beginning of both the massed and the spaced practice conditions.

Kimble and Horenstein (1947) investigated the phenomena of reminiscence in motor learning as a result of the length of rest. Ninety-three normal adult subjects were placed in six groups to perform a modified version of the Koerth pursuit rotor. Two 50 second reminiscence trials were given after rests of 10, 30, 150, 300, 600, or 1200 seconds. The results of the study indicated that as the length of rest increased to the 600 second point, reminiscence became negatively accelerated.

Denny, Frisbey, and Weaver (1955) conducted a study in which a rotary pursuit task was practice by 64 normal adult subjects in three different rest time frames. Massed practice was continuous and spaced practice consisted of 30 seconds of work and 30 seconds of rest. The results indicated that inhibition was present in motor learning. Temporary inhibition built up rapidly under the spaced practice conditions but 50 percent of this dissipated during the 30 second rest period.

Jahnke and Duncan (1956), in a study on reminiscence, attempted to determine if reactive inhibition continued to dissipate over longer intervals than a few minutes. Four hundred and forty normal adult males practiced on a pursuit rotor task. It was found that reactive inhibition continued to decrease for as long as one day and possibly longer. Warmup decrement increased at one point because of the massing of practice. Performance increased as reactive inhibition dissipated during the longer rest period.

In a study on performance decrement in a motor task, Bildodeau (1952) had 256 normal females compete in lifting weighted table tennis balls and from a cup placing them in a chute. The purpose of this study was to investigate several aspects of response decrement. One aspect, related to the recovery from decrement, was found as a function of the duration of an intertrial rest. The results of this study indicated that recovery from the decremental effects of practice was spontaneous after rest. Recovery seemed to be related to the length of the interpolated rest. As the rest period increased to eight minutes, a decline was noted in the recovery from the decremental effects of practice.

Carron (1969), in observing subjects perform a peg turn task, found that reminiscence occurs after a five second rest and a longer rest of 30 seconds. This study seems to contradict Bilodeau's findings in that greater amounts of warm-up decrement were found after longer periods of rest. Also, Carron's results indicated that under nonrhythmical conditions of practice, "set" does not develop as rapidly.

Summary

Numerous studies have been conducted to compare spaced practice to massed practice with normal and mildly mentally retarded subjects. There were no studies found which involved reactive inhibition and how it related to the severely mentally handicapped individual. The research indicated that spaced trial sequencing produced better results in performance and acquisition. Overall, massed trial sequencing impaired performance and increased the time required for acquisition.

In the past, educators have traditionally used massed and nonrhythmical patterns in trial sequencing when teaching the mentally retarded. The

utilization of the spaced practice techniques may be of great value to the special educator who is involved in the promotion of skill acquisition and increasing the performance level of retarded individuals.

CHAPTER III

METHODOLOGY

The purpose of this study was to compare the effects of massed and spaced practice on the length of time required for skill acquistion. Subjects

The two subjects selected for the study were severely mentally handicapped male residents of a state institution. Both subjects were enrolled in a full-time vocational and educational program. Subject one was 27 years and 8 months old and had been institutionalized for 17 years. Subject two was 20 years and 10 months old and had been institutionalized for 6.5 years. Both subjects were motorically imitative and consistently used intelligible speech. They followed simple directives for behavioral and instructional control. Sensory impairments were not exhibited.

The following criteria were used in the selection of subjects for the study: evidence of pointing behavior, compliant behavior in the training setting, and moderately good attending behavior.

Setting

The study was conducted in the natural classroom environment. Instruction was on an individual basis. The classroom was closed to other students during the experimental session in order to minimize distracting stimuli.

Materials

The functional sight word program will include the following materials: 6 X 3 inch white cards with the words, women, in, out, and open printed on each card; data collection sheets; and one stopwatch.

Procedures

Current goals for each subject included recognition of functional words. Acquisition of functional sight words was selected as the task. The following verbal cue, reinforcement, and correction technique was employed for each stimulus word under the massed and spaced practice conditions. A pretest was administered which required the subjects to identify several functional sight words. Four words which the subjects were unable to identify were selected for the program. The following words were randomly selected for instruction in the spaced practice condition: "out" and "open". "In" and "women" were selected for instruction under the massed practice condition. The subjects were required to point to the given functional sight word when presented with one distractor word. Criterion was reached for the task when nine consecutive correct responses were made by the subjects in two consecutive training sessions. The following verbal cue, reinforcement, and correction technique was employed for each stimulus word under the massed and spaced practice conditions.

Verbal cue

"Point to the word _____." If the subject pointed to the correct word after the verbal cue, he was reinforced with verbal praise and physical praise (pat on the shoulder).

Correctional procedure

(Subject making an incorrect response) "No, that is not _____." Point to the correct response and say, "This is the word _____." "Point to the word _____." If the subject pointed to the correct response after

the correction procedure, only verbal praise was given. If the subject did not respond correctly after the correction procedure, a new trial was begun.

Spaced practice conditions

During the spaced practice conditions, an intertrial rest of 30 seconds was used. The 30 second period began after the subject had responded and reinforcement had been given or the correction procedure had been implemented. The 30 second rest period was spent discussing topics which interested the subject and events which occurred during and after class.

A 30 second intertrial interval was utilized under the conditions of spaced practice. While the intertrial rest period may extend up to 24 hours, it is usually 60 seconds or less and over the range of zero to 30 seconds. The shorter the intertrial interval, the lower the standard of performance (Adams, 1954).

Massed practice conditions

In the massed practice conditions, an intertrial rest was not given. Directly after the subject responded to the verbal cue and reinforcement had been given or the correction procedure had been utilized, a new trial began with the presentation of the verbal cue. The subject was given a maximum of four seconds to respond after the presentation of the verbal cue and before the implementation of the correction procedure.

Data collection

The data were collected two days per week until criterion was reached. Four sessions were recorded for each day. Two sessions were recorded daily under conditions of massed practice and two each day under conditions of spaced practice. Correct and incorrect responses were recorded to determine if the subjects had reached criterion. This procedure was utilized to determine the number of trials required for acquisition.

Reliability data was collected by a trained observer during eight non-consecutive sessions during this study. Four reliability observations were conducted for both the massed and spaced practice conditions. The reliability was computed by dividing agreements by agreements plus disagreements (Hersen & Barlow, 1976).

Research design

A multielement design (Sulzer-Azaroff & Mayer, 1977) was employed in order to compare the effects of massed practice and spaced practice upon the acquisition of functional sight words. The nature of the study allowed for the deletion of the experimental phases of the design. Massed and spaced practice were presented in an alternate fashion in a consistent pattern. A different stimulus word was used for each phase of alternation. A total of the number of correct trials to criterion was calculated and recorded. The data were graphed for each specific stimulus word.

The multielement design permitted the experimenter to compare the effects of the two different treatments during acquisition. The design also allowed for the comparison of the effects of treatment on one or both subjects.

CHAPTER IV

RESULTS

The study compared the effectiveness of the spacing of trials versus the massing of trials with two severely retarded adult subjects. The purpose of this research was to investigate trial sequencing and relate its use to the number of trials required to reach acquisition when learning functional sight words.

Interobserver reliability was conducted for eight nonconsecutive sessions. A total of 80 trials were observed to obtain interobserver agreement of data. Data were obtained for every subject under each training condition. The range of reliability extended from 60 percent to 100 percent, with an average reliability of 93.8 percent.

Figure 1.0 represents the total number of trials utilized for Subject 1 and Subject 2 to reach acquisition on the four functional sight words. The graph presents a comparison of the spaced practice conditions versus the massed practice conditions. It required more trials for both subjects to reach acquisition on the massed practice words than on the space practice words.

Figure 2.0 and Figure 3.0 presents the percentage of correct trials to acquisition for Subject 1 and Subject 2, respectively. The multielement design has been separated in four separate sections so that the results can be observed more clearly. The ordinate represents the session number in which the word was trained. It can be seen that both subjects began each program with 90 percent or 100 percent accuracy. This was due to the



FIGURE 1.0: TOTAL NUMBER OF TRIALS TO ACQUISITION FOR SUBJECT 1 AND SUBJECT 2 UNDER MASSED AND SPACED CONDITIONS FOR EACH STIMULUS WORD.





use of zero distractor words in the first session. No distractor words were used in order to allow for success and promote errorless learning. Errorless learning is the reducing of errors by eliminating irrelevant characteristics of a task so that relevant characteristics ar apparent. Figure 2.0 indicates that Subject 1 had more difficulty with the stimulus words, "in" and "open". This was also evidenced by Subject 2 in Figure 3.0. When comparing the two graphs, Subject 2 appeared to have more difficulty reaching acquisition on the four stimulus words than Subject 1.

Table 1.0 indicates the superiority of spaced practice over massed practice when considering the total number of trials for each practice condition. The percentage of massed practice trials over spaced practice trials was computed by subtracting the total number of spaced trials from the total number of massed trials and dividing by the total number of spaced trials $\left(\frac{M-Sp}{Sp}\right)$. For Subject 1, 28.5 percent more trials were needed in order to reach acquisition under massed practice conditions while it took 6.3 percent more trials for Subject 2. When combining the total trials to acquisition for each subject and using the previous mentioned formula, a total of 13 percent more trials were utilized under massed practice.

TABLE 1.0

Percentage of Massed Trials Over Spaced Trials

.

	<u>[</u>	massed			total spaced			ed	total	% of massed over spaced		trials trials
words	wor	nen	in			out	o	pen				
Subject	1 4	40	50	9	כ	30		40	70	2	8.5%	
Subject	2 5	50	120	17	כ	50	1	10	160		5.3%	
Subject &	1 9	70	170	26	כ	80	1	50	230	13	3.0%	
Subject	2											

CHAPTER V DISCUSSION

The purpose of this study was to compare the number of trials required to reach acquisition of a skill taught under massed and spaced practice conditions with two severely retarded subjects. Four functional sight words were taught to both subjects in alternation under massed and spaced practice conditions so that a comparison could be made between the two methods. Spaced practice conditions consisted of a distributed presentation of program trials with a thirty second intertrial rest period. Massed practice conditions consisted of program trials occurring so closely in succession that a rest period was not allotted.

The study revealed that it took a total of 13 percent more trials under massed practice than spaced practice when teaching functional sight words to two subjects. This would constitute a significant difference in the time spent teaching. When teaching several students on an individual basis, instructional time may be shorter when utilizing spaced practice. Subject 1 required 28.5 percent more massed trials while Subject 2 required 6.3 percent more massed trials. This may have originated from individual differences. Subject 1 seemed to adapt to the spaced practice conditions more readily and anticipated cues. The thirty second intertrial rest seemed to enhance performance. Subject 2 did not exhibit these same characteristics. Massed practice seemed detrimental to performance because the subject became disinterested and had the tendency to lose eye contact.

Under spaced practice conditions, Subject 2 seemed to stay on-task longer because of the 30 second intertrial rest period. This gave the subjects time to talk about topics of interest and daily events. Limitations

Under the massed practice condition more trials were required to reach acquisition for the word, "in" than the word, "women". This was also apparent in the spaced practice condition. More trials were required to reach acquisition factors. As was mentioned previously, the functional sight words were chosen by random selection. If a word analysis had been done in order to factor out the complexity of each word used, this may have resulted in less discrepancy between the number of trials required to reach acquisition for each word. Also, acquisition may have taken longer for "in" and "open" because the classroom changed from an environment which was familiar to both subjects to a classroom (workshop) with extraneous stimuli.

Future Research

Spaced task sequencing trials seemd to be superior to massed task sequencing trials when teaching specific functional sight words. It should be noted, however, that this study was not extended to use a variety of sight owrds. Future researchers need to deal with a more systematic method of choosing functional sight words and applying both spaced and massed practice conditions. This may be possible through word analysis.

This study may be extended by using a variety of subjects with more heterogeneous characteristics. This would provide for an analysis of different characteristics and their effect on performance when using both massed and spaced practice. Another factor which may be considered in future research is the intertrial rest period used during spaced practice. Varying the length of the intertrial rest may improve performance to a further degree. Also, differing the rest periods could effect each individual's performance in varying degrees.

Moreover, massed and spaced trial sequencing needs to be generalized to areas other than that of functional sight words. It seems that more research should be conducted in the area of trial sequencing to provide information concerning the use of instructional time, increasing student performance, and promoting acquisition.

In summary, spaced trial sequencing appeared to increase performance and promote acquisition when teaching certain functional sight words. Massed trial sequencing may be beneficial when using specific sight words but at the present it has not been found to be an adequate method of presenting trials.

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