

ABSTRACT

Kirikopoulos, C. Comparison of specific, variable/blocked, and variable/random practice schedules for the retention and transfer performance of college males in a basketball jump-shooting task. MS in Physical Education-General, 1992, 63pp. (J.C. Greenlee)

College males ($N = 22$, mean age = 21.3) were randomly assigned into 3 groups (SP, VB, VR) and practiced under specific, variable/blocked, and variable/random schedules respectively, performing 5 sets of 45 jump-shots for each set (total = 225). Two posttests were given, 1 for retention performance from a prepracticed position, and 1 for transfer performance from a new position. Each posttest consisted of 45 shots. Two ANCOVAs, with day 1 practice percentage being the covariate were calculated for the detection of treatment effect during retention and transfer among the groups. An LSM post-hoc test was employed subsequently to determine differences between pairs of groups for percentage of successful shots. Level of significance was set at ($p < .05$) for all tests. No differences among the groups were found during retention ($p = .61$). Difference was detected during transfer, with the VR group performing better than the VB group ($p = .02$). The results indicated no superiority of variable over specific practice schedules for both retention and transfer. Also, it appeared that VR schedules were more effective than VB schedules for performance from a novel position.

COMPARISON OF SPECIFIC, VARIABLE/BLOCKED, AND VARIABLE/RANDOM
PRACTICE SCHEDULES FOR THE RETENTION AND TRANSFER PERFORMANCE OF
COLLEGE MALES IN A BASKETBALL JUMP-SHOOTING TASK

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CHAPTER I
INTRODUCTION

Background

Adaptability in sport comes with practice. A good player is characterized by his/her ability to adapt to various situations that he/she faces during practices and games (Hautala & Kidd, 1990). What is the most effective way to prepare a player for this? One of the primary areas of concern in motor learning research is how distributing practice influences learning (Magill, 1988). In order to acquire this knowledge, it is essential to understand the processes and mechanisms that contribute to acquisition, retention, and transfer of motor skills (Wright, 1991).

Shea and Kohl (1990) asserted that teachers and coaches tend to prepare their students or players for a specific task, sport skill, or game by providing experiences specific to the game or test conditions. However, when the purpose of the practice is to develop a more general ability (e.g., throwing, jumping, or hitting), varied practice schedules are often developed. "The variable practice is thought to better equip the performer to produce novel task variations than specific practice" (Shea & Kohl, 1990, p. 170).

The question of the type of practice that best facilitates later retention and/or transfer resulted initially in two traditionally contrasting positions as answers. One theoretical

position was termed "the specificity of learning principle", which appeared to have been borrowed from the specificity of training principle in exercise physiology (Barnett, Ross, Schmidt, & Todd, 1973), and was best articulated in the work by Henry (1960) and Adams (1971). The other was what Moxley (1979) had pointed out as the most extensively examined prediction that arose from Schmidt's schema theory (Schmidt, 1975, 1976), termed as "the variability of practice hypothesis".

Later, one of the major concerns regarding the validity of Schmidt's (1975) schema theory came from work on the contextual interference effect in the motor learning domain (Lee & Magill, 1983; Lee, Magill, & Weeks, 1985; Shea & Morgan, 1979; Shea & Zimny, 1983). Specifically, there had been some doubt as to whether the often-found advantages of variability in practice were due to schema formation as proposed by Schmidt (1975), or due to the phenomenon of contextual interference as was first demonstrated in the motor domain by Shea and Morgan (1979). Shea and Morgan followed the original conceptualization by Battig (1966, 1979), who focused on verbal learning.

Although the results of laboratory studies exploring practice structure appear to have relevance for the teacher/coach, little research has been conducted in applied contexts or with common motor skills (Wrisberg & Liu, 1991). The fact that a considerable number of laboratory studies have been conducted, suggesting one or another approach, does not help to determine the generalizability of their results to intact

teaching/learning environments (Wrisberg & Liu, 1991). One possible explanation is that "much of motor learning findings, which are based mainly on verbal and fine motor skills may not be applicable to the activities involving the big-muscle groups of the body" (Goode & Magill, 1986, p. 308).

It should also be noted that the majority of the laboratory studies, in an attempt to draw significant differences among practice conditions, have not used adults as subjects. That has also resulted in a hesitation on the part of the practitioners to implement the findings in regular class or team settings (Wrisberg & Liu, 1991).

By inferring the effects of the different practice schedules in that practical skill setting, the study may contribute in the development and future use of more efficient and scientifically-based teaching strategies, specifically in basketball shooting.

Purpose of the Study

This study examined the effects of constant (or specific) practice, variable/blocked practice, and variable/random practice on the jump-shooting performance of college males from a prepracticed spot and from a novel spot.

Need for the Study

This study attempted to provide additional data from practical skill settings and have adults serving as subjects.

The need for the study includes the following:

1. To determine the effect of the three practice schedules in an applied skill in which no prior research was conducted. The

feature of the popular game of basketball, satisfies the criteria for more evidence from nonlaboratory situations which, until now, are limited in beanbag tossing, badminton serving, and golf putting.

2. To determine whether the three different practice schedules could demonstrate significant differences among a sample population of adults, whereas the majority of research is restricted in children with no prior experience in the administered tasks. The present study engaged an adult population, proficient in basketball jump-shooting to examine the applicability of the reported findings in this complex skill.

Statement of the Problem

The problem of the study was to determine the effects of constant practice, variable/blocked practice, and variable/random practice on the jump-shooting performance of college males from a prepracticed and from a novel spot.

Null Hypotheses

After performance means of the posttests were adjusted for performance means of the first day of practice, the following null hypotheses were tested in the study:

1. There is no difference among constant practice, variable/blocked practice, and variable/random practice groups on the jump-shooting performance of college males from a prepracticed spot.

2. There is no difference among constant practice, variable/blocked practice, and variable/random practice groups on the jump-shooting performance of college males from a novel spot.

Assumptions

1. All the participating subjects were considered capable of performing the jump-shot as defined in the study.
2. The subjects performed to the best of their ability during each test.
3. All subjects were healthy and free of any visual problems that would impair their shooting ability.
4. All subjects followed the instruction not to practice jump shooting out of the test's practice context during that period.
5. The jump-shooting task was representative of the kinds of situations encountered in a basketball practice or game.

Delimitations

The delimitations of this study were as follows:

1. The subjects used were volunteer, male students at the University of Wisconsin-La Crosse, between the ages of 18 and 31 years.
2. Twenty-one of the subjects participated in the Intramural Sports' basketball tournament of Spring 1992, and two others played with the freshmen team during the same year.
3. Performance was measured in shooting accuracy percentages.

Limitations

1. Despite the stratified randomization assignment of the subjects into the three experimental groups, differences among the groups at the beginning of the practice sessions could not be controlled.
2. The subject population ($N = 23$) was relatively small.

Definition of Terms

Practice Sessions - each consisted of one set of 45 jump shots behind an assigned position for all three experimental conditions. The Acquisition phase consisted of five practice sessions. One session was administered for the Retention, and one for the Transfer test.

Jump Shot - the only requirement for the jump shot was that the ball had to be released when the performer was in the air which is the essential difference between the one-hand set shot and the jump-shot (Tarkanian, 1983). The subjects were permitted to execute the jump-shot according to their own individual styles, which varied in several features. For example, the grip of the ball, the wrist and elbow positions during the shot, and the timing of the release, which could be before, at, or after the peak of the jump, were left to the individual performance.

Specific Practice (SP) - one experimental condition in which all practice trials were taken from the same spot during the practice sessions (acquisition phase).

Variable/Blocked Practice (VB) - one experimental condition in which practice trials were performed from nine different spots,

shots from the same spot before they switched to another spot within one practice session.

Variable/Random Practice (VR) - one experimental condition in which practice trials were performed from nine different spots, and had a random practice schedule of spot sequence throughout the acquisition period. The subjects assigned to the VR group switched spots after every trial within one practice session.

Retention Jump-Shooting Test - retention is defined as the delayed practice experience on a task or a task variation that was experienced during acquisition, even if the schedule during retention is altered from that of acquisition (Shea & Kohl, 1990).. In this study, the retention test was comprised of 45 shots taken from the prepracticed Spot 5 for all three groups.

Transfer Jump-Shooting Test - transfer is defined as the delayed practice on a task or a task variation that was not experienced during acquisition (Shea & Kohl, 1990). In this study, the transfer test was comprised of 45 shots taken from the novel Spot 10.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

To understand how the three different practice schedules could affect the jump-shooting performance of the three groups, it would be helpful to present information about the theoretical positions upon which the three different practice schedules were built. These are: (1) the Specificity of Learning Principle, (2) the Variability of Practice Hypothesis, and (3) the Contextual Interference Effect. Subsequently, experimental evidence and the important issues of age and practical skill settings regarding these theories are presented.

The Specificity of Learning Principle

According to Barnett, et al. (1973), the specificity of learning principle in motor learning was borrowed from the field of exercise physiology. The analogous principle in physiology stated that "...the systems that support the exercise are developed in different ways for different intensities of training and training is maximally effective for a criterion performance of the same intensity" (Barnett et al, p. 440).

Franklin Henry (1960) suggested that the specificity of learning principle applied to motor learning, since motor skills were seen as quite specific, relating only superficially to each other. Therefore, when someone changed a motor task slightly, he/she produced a "new" motor task for which a new motor program

ought to be learned. Henry based his conclusion on evidence upon the low correlations typically found among very similar-appearing motor skills.

For the formulation of his influential closed-loop theory in 1971, Jack Adams took a specificity position concerning motor skill acquisition. He used the instrumental learning of simple, self-paced, graded movements (e.g., drawing a line), although he claimed that the implications were including more complex movements.

The two essential features of his theory were the perceptual trace and the memory trace. According to his definition, perceptual trace "... is the construct which fundamentally determines the extend of movement, and it is what subject uses as a reference to adjust his next movement on the basis of the Knowledge of Results (KR) he has received" (Adams, 1971, p. 123). The strength of the memory trace was dependent upon stimulus-response contiguity and it would grow stronger with increasing amounts of practice on the criterion movement direction (Christina & Merriman, 1977). Eventually, the perceptual trace would become strong enough for the individual to be able to detect and correct his or her own error when making a movement. That type of learning when the specifications for the correct response are within the subject "in the form of a strong perceptual trace" (Adams, 1971, p. 124) was named "subjective reinforcement", and was reflecting the final stage of learning where the "conscious" behavior becomes "automatic". While the

was giving an answer to the following problems that remained unaccounted for until then:

(1) Perceptual Trace Development: In Adams' theory it was held that the perceptual trace is formed from feedback traces associated with having moved to the correct location, and that without this experience at the correct location, the perceptual trace cannot develop (Adams, 1971). However, Schmidt (1975) indicated that "... subjects who had never experienced the correct location (Group IR) could move as accurately (and maintain accuracy more effectively) as those subjects who had the conditions necessary for the development of the perceptual trace" (p. 229).

(2) The Novelty Problem: Schmidt pointed out that athletes never execute a movement exactly as they had before, when they perform a motor response in a game, and that it was probably true that "the same response is never made twice when one considers the number of possibilities there are, for example, in shooting a basketball" (Schmidt, 1975, p. 230). In the conclusion of his criticism of Adams' theory, Schmidt claimed that "a new motor-learning theory must be able to account for the generation of novel movements to overcome the shortcomings of the existing theories in this regard" (p. 230).

(3) The Storage Problem: According to Adams' theory, humans must have a nearly countless supply of either programs or feedback states in storage, in order to move their musculature and execute an infinite number of movements. Schmidt proposed an

alternative to this that did not require that volume of material to be stored.

The Schema Theory

The existing motor program notion was first modified in Schmidt's study as follows: It is no longer claimed that a one-to-one match was existing between the program and each specific movement that the individual can produce. In this way, the storage problem was avoided. Instead, it was claimed that there are generalized motor programs for a given class of movements, and "these generalized motor programs are assumed to be able to present the prestructured commands for a number of movements if specific response specifications are provided" (Schmidt, 1975).

In addition, rather than considering the memory and perceptual traces as the controlling mechanisms of a movement, Schmidt presented schemata. He defined a schema as: "a rule, concept, or relationship formed on the basis of experience" (Schmidt, 1988, p.491). The important feature of a schema is that "it is developed from abstracting important pieces of information from related experiences and combining them into a type of rule" (Magill, 1989, p.82).

Schmidt stated that for a given class of movements (in the present study the basketball jump-shot), we abstract different pieces of information about each response made when a jump-shooting pattern is used. Throughout these experiences, we produce a schema that will allow us to successfully carry out a variety of movements where the jump-shooting pattern is involved.

The following four pieces of information are abstracted from each movement experience: (1) The initial conditions. They consist of the information received from the various receptors prior to the response. "These receptors are proprioceptive information about the positions of the limbs and body in space, as well as visual and auditory information about the state of the environment" (Schmidt, 1975, p. 235). (2) The response modifications. Before the movement can be run off, the subject must specify the speed with which it is run off, the forces involved, etc. The response modifications produce the variations of the basic pattern which is already stored as a general motor program. In other words they "serve as a record of the specifications of the movement produced". (3) The sensory consequences, which are an exact copy of the afferent information provided on the response. That information consists of the actual feedback stimuli received from the eyes, ears, proprioceptors, etc. (4) The response outcome, which is expressed in the same terms as the desired outcome (or goal) of the movement. This response outcome arises from information the subject receives after the movement, and consists of KR (when present) and subjective reinforcement that the subject obtains from other sources of feedback. "The accuracy of the outcome information is a direct function of the amount and fidelity of the feedback information, and a subject without any feedback does not have outcome information to store" (Schmidt, 1975, p. 235).

The above four sources of information are stored together after the movement is produced. When a number of such movements have been made, the subject begins to abstract the information about the relationship among these four sources of information, and as Schmidt (1975) emphasized, "the schema for the movement type under consideration is more important to the subject than is any of the stored instances, which are forgotten more quickly over time than is the schema" (p. 235).

In his theory, Schmidt conceptualized the motor response schema as actually being a combination of two schemata, each with different responsibilities. First, the recall schema is the relationship between the initial conditions and actual outcomes and the response specifications. It is responsible for adding specific response instructions to the motor program and initiating the movement execution. The recognition schema then, is the relationship between the initial conditions and actual outcomes and the sensory consequences. It enables the performer to evaluate the correctness of the initiated movement by comparing actual sensory feedback information against the expected sensory feedback and then to make movement corrections. It was claimed that "while some variables are different, both schemata depend on the actual outcome and the initial conditions, and both schemata will develop according to the experience the individual has had with these variables" (Schmidt, 1975, p. 237).

The Prediction for Novel Response Situations

Schmidt proposed that the strength of the schema was a function of the amount and variability of practice with different values of a particular parameter for a class of actions controlled by a motor program (Schmidt, 1975). Thus, if new distance (novel response situation) for shooting a jump shot in basketball was attempted, the probability of success in making that shot would be a function of the amount and variability of practice the individual had with shots from different distances from the basket, since distance could be related to the overall force parameter associated with the motor program controlling the jump shot.

Schema Theory for Retention

Schema theory and the related variability of practice hypothesis did not directly address the value of variable practice composition on the retention of the variations practiced. Schmidt (1975) proposed that, what is stored in memory is an abstract representation and specific variations are not stored. Therefore, the abstract memory representation developed as a result of variable acquisition practice should be capable of supporting retention and transfer (Shea & Kohl, 1991; Shea & Kohl, 1990). Laboratory findings from Kerr and Booth (1978), and from Carson and Wiegand (1979) showed that not only was varied practice effective in producing novel task performance, but it was more effective than practicing the constant criterion task itself.

Contextual Interference Effect

The contextual interference effect has its roots in the verbal learning work of Battig (1966, 1972, 1979), who provided the original evidence for what he initially called "the paradox of intratask interference". The term contextual interference is attributed to the same researcher who later saw practice context components as potential sources of interference of the kind that would enhance learning rather than inhibit learning.

The Contextual Interference Theory

The contextual interference effect refers to the finding that practice of multiple tasks in a random (high contextual interference) practice schedule results in greater retention and transfer than when tasks are practiced in a blocked practice schedule (low contextual interference), where practice of one task is completed before practice on a different task is given (Lee & Magill, 1983; Shea & Morgan, 1979).

According to Battig (1972, 1979), contextual interference could be manifested (a) when there is an increase in the similarity among items to be learned (widely used in the verbal learning domain), or (b) when there is an increase in the variety of processing requirements on successive trials. Especially when increasing this latter aspect of interference during learning it can lead to improved retention and/or transfer.

Theoretical explanations for that effect have primarily focused on the notions of elaboration (Shea & Morgan, 1979; Shea & Zimny, 1983) and action plan reconstruction (Lee & Magill,

1983). Advocates of the elaboration view asserted that trial-to-trial changes in the practice of a variety of movements promote (a) the maintenance of multiple items in working memory, (b) interitem elaboration and/or distinctive processing, and (c) the development of a stronger and more flexible memory representation. Reconstruction theorists, however, argued that varied practice facilitates learning and memory because at least partial forgetting of each movement variation occurs when other variations are practiced in between. Thus, every time a particular variation is attempted, more laborious processing is needed to reconstruct the response requirements of that movement. Conversely, they contended that repeated practice of the same variation is reasoned to be less beneficial because between-trial forgetting is less likely and therefore subjects can bypass the reconstruction process on all but the first trial in a block.

Experimental Evidence

Specific Practice

In one of the first studies dealing with Adams' closed-loop theory, Christina and Merriman (1977) tested the hypotheses that (a) memory trace and perceptual trace were independent memory states and (b) they develop as a positive function of the amount of practice on the criterion movement. They utilized a slow, self-paced, graded arm movement where the subject attempted a linear displacement of a stylus measured in two dimensions (direction and extent) in the horizontal plane. They concluded that indeed movement direction and extent can be learned

independently of each other. Furthermore, since these two dimensions can be developed independently, they inferred that the mechanisms controlling them (memory trace and perceptual trace) are also independent of each other and are therefore, autonomous memory states. They also supported the hypothesis that learning the direction and extent of a simple, self-paced, graded movement is a positive function of the amount of practice on the criterion movement provided that adequate conditions of KR and feedback exist. The general conclusion was in support of Adams' theory of learning. Additional support to the specificity of practice notion was given earlier in studies on both gross motor (Bachman, 1961) and fine motor performance (Henry, 1960).

Variable Versus Specific Practice

Since Richard Schmidt published his schema theory (1975), numerous studies have assessed the variability of practice hypothesis. Typically, a group of subjects who had practiced multiple trials on only one variation of a movement task were compared to another group of individuals who had practice multiple trials on two or more variations of the same task. The two different practice schedules were built according to rival predictions from Adams' and Schmidt's theories of learning. Of these studies, only research using children as subjects provided consistent results in favor of variable practice schedules (Carson & Wiegand, 1979; Kerr & Booth, 1978; Moxley, 1979). Findings from adult studies have been equivocal, providing weak (Catalano & Kleiner, 1984; McCracken & Stelmach, 1977; Newell &

Shapiro, 1976; Shea & Kohl, 1990; Wrisberg & McLean 1984; Wrisberg & Ragsdale, 1979) or no support (Bird & Rikli, 1983; Doody & Zelaznik, 1988; Johnson & McCabe, 1982; Kanode & Payne, 1989; Zelaznik, 1977) on variable over specific practice schedules.

Variable/Random Versus Variable/Blocked Practice

In 1979, Shea and Morgan conducted a study that was based on Battig's (1972) conceptualization that increased contextual interference during skill acquisition can lead to improved retention or transfer. Multisegment movement tasks were used for the first time to assess the applicability of Battig's claims in the motor learning domain. Subjects learned three motor tasks under a blocked (low interference) or random (high interference) sequence of presentation. Retention was measured after a 10-min or 10-day delay under blocked and random sequences of presentation. Subsequent transfer to a task of either the same or greater complexity than the originally learned tasks was investigated. Results showed that retention was greater following high interference (random) acquisition than following low interference (blocked) acquisition. Likewise, transfer was greater for high interference (random) acquisition groups than for low interference (blocked) acquisition groups. These results were considered as support for Battig's conceptualization of contextual interference effects on retention and transfer.

With the exception of a study by Wulf and Schmidt (1988), subsequent evidence consistently supported random contexts of

practice over blocked ones for both acquisition and transfer in adult populations (Battig, 1979; Del Rey, Wughalter, & Whitehurst, 1982; Goode & Magill, 1986; Husak, Cohen, & Schandler, 1991; Lee & Magill, 1983; Lee, Magill, & Weeks, 1985; Shea & Kohl, 1991; Shea & Morgan, 1979; Shea & Wright, 1991; Shea & Zimny, 1983; Weeks, Lee, & Elliott, 1987; Wood & Ging, 1991; Wright, 1991; Wright, Li, & Whitacre, 1992; Wrisberg, 1991; Wrisberg & Liu, 1991).

Comparison of Theories of Learning with Regard to Age

In studies in which specific and variable practice were compared, there were significant practice effects only with children serving as subjects (Carson & Wiegand, 1979; Kerr & Booth, 1978; Moxley, 1979). In a review of relevant studies, Shapiro and Schmidt (1982) concluded that "schema development occurs much more easily in children than it does in adults" (p. 124). Their theoretical explanation was that adults have already established the schematic representations prior to engaging in the experimental procedures, while the children who have not previously developed them are acquiring them in the experimental settings, thus more dramatic changes occur in their performance.

Four studies, reporting ambiguous results, engaged children or youth as subjects in comparisons of variable/random and variable/blocked schedules. Del Rey, Whitehurst, and Wood (1983) reported that blocked practice led to better transfer than random practice in a coincidence anticipation timing task. Pigott and

Shapiro (1984) found no blocked versus random schedule differences, while Edwards, Elliott, and Lee (1986), and Kanode and Payne (1989) showed the benefit of a random practice schedule over a blocked practice schedule. In studies engaging adult population as subjects, random-practice schedules are generally shown to be superior to blocked-practice schedules.

Nevertheless, Magill and Hall (1990) suggested that more research is needed to determine the degree to which the contextual interference effect is age-related.

Comparison of Theories of Learning in Practical Settings

Only seven studies have been reported using nonlaboratory tasks. These were: beanbag tossing (Kanode & Payne, 1989; Kerr & Booth, 1978; Pigott & Shapiro, 1984), badminton serving (Goode & Magill, 1986; Wrisberg, 1991; Wrisberg & Liu, 1991), and golf putting (Hautala & Kidd, 1990).

In the study of Hautala and Kidd, analysis of test putts for varied and constant practice groups indicated a superiority of varied practice subjects in adjusting on a later test trial after initial attempts. In all three badminton studies, random practice led to better retention-test performance as well as to better transfer-test performance. In transfer, the same serves were performed but from the left service court rather than the right court which was used during acquisition. However, no differences were found in the three beanbag tossing studies between specific and variable practice groups.

Hautala and Kidd (1990) pointed out that keeping the theories within the laboratory rather than exploring their applicability in more commonly pursued sport-skills was limiting their value. They emphasized that "the need to balance internal and external validity is always an issue, but the present study lends credibility to the argument that further research into externally valid, sport-related settings should be undertaken" (p. 1357).

Summary

The specificity of practice principle has received limited support in laboratory studies for both gross motor and fine motor performance. The central prediction is that practice should be specific to the task to be learned. On the other hand, the variability of practice hypothesis, derived from schema theory, predicts that increasing the variability of previous experiences in a motor task leads to increased schema strength. Thus, it was directly assumed that it leads to better transfer in a novel variation of the task, and indirectly assumed that it enhances retention of the practiced variations. Theoretically based on the contextual interference effect, recent evidence indicates that when variable practice is organized so that attempts at all variations are practiced in a random order, support for schema theory is relatively strong. Yet, when variable practice is organized so that all trials at one variation are completed before another variation of the task is practiced, support for variable practice is generally weak or not evident. It is

important to test the three theoretical positions in a practical setting in order to explore their applicability outside the laboratories.

CHAPTER III

METHODS AND PROCEDURES

Introduction

The purpose of this study was to compare retention and transfer under specific (SP), variable-blocked (VB), and variable-random (VR) conditions on a basketball jump-shooting task among college males. The procedures that were used to obtain all necessary data are described below.

Subject Selection

Twenty-seven male college students from the University of Wisconsin-La Crosse voluntarily participated in the study. The experimenter distributed letters (Appendix A) to the subjects in which the purpose of the study and the procedures of the test were explained concisely. All experimental procedures took place in Gymnasium 113, Mitchell Hall, at the University of Wisconsin-La Crosse. The letter distribution began on March 1, 1992 and ended on March 14, 1992, two days prior to the beginning of the Spring Intramural Sports' Basketball Tournament. The 27 students who participated returned a signed informed consent (Appendix B) and a completed informational sheet (Appendix C) prior to initiation of the study.

The sample of subjects consisted of participants from the 1991-1992 Intramural Sports' Basketball Tournaments, with the addition of three players from the University of Wisconsin-La Crosse freshmen basketball team, for whom the same procedure was

followed. The particular sample of male college students consisted of individuals playing in any of the five positions (point guards, shooting guards, small forwards, power forwards, and centers) on their current teams that were participating in the Intramural Sports Basketball League Tournament. All subjects were right-handed. Subjects were classified into four categories: a) active freshman basketball players ($n = 3$), b) team level A --according to the league in which they were playing during the intramural tournament-- players ($n = 10$), c) team level B players ($n = 10$), and d) those who declared before the beginning of the testing that, for some reason, they were going to miss one or more practice sessions ($n = 4$). Subjects from each category were randomly assigned in one of the three practice conditions, by using a random numbers computer program (Appendix D); hence, a stratified randomization procedure occurred. Four subjects withdrew for reasons not related to the study. Thus, data from 23 subjects were finally collected.

Apparatus

Six rubber Mikasa balls of the same model were used in both acquisition and retention/transfer days. All six balls had approximately the same air pressure (9 lb). White colored athletic tape, approximately 12 in. long and 3 in. wide, was used as the marking spot for the shooting positions and the starting position (the position from which the subject was initiating his attempt) throughout. A black-color marker was used for numbering

the nine shooting spots and the novel spot during the transfer day. A measuring tape was used for drawing the distances from the spot that a vertical line connects the floor with the back side of the rims to the several shooting positions. Data were recorded on score sheets (Appendix E) for all acquisition and retention/transfer days. These sheets had three different colors (yellow, cherry, and green) that represented the three different practice groups (SP, VB, and VR) respectively. All six baskets that were available in Gym 113, Mitchell Hall, were used for collecting data from up to six subjects simultaneously. Six identical testing stations were utilized.

Procedures

The practice period took place from March 16 to March 20, 1992, and two posttests were given on March 23 and March 24, one for retention performance from a prepracticed position, and the other for assessing transfer from a new position. During the practice period, each subject performed one set of 45 jump-shots every day. Thus, every subject performed a total of 225 shots throughout the practice period. Each of the 2 posttests also consisted of 45 shots.

Administration Process

Assistants ($N = 8$) stood on the right side of each of the six baskets, recording on the data sheets the shots made with a plus (+), and shots missed with a minus (-). The data sheets were placed on a chair near each assistant.

The responsibilities of the assistants were the following:

- (a) Check if every shot that was taken was in accordance with the definition given by the experimenter. If not, the assistant asked the subject to repeat the shot; (b) Rebound the ball after the shot; (c) Walk back to the chair and record the outcome of the previous attempt; (d) Roll the ball to the starting position, behind which the subject was starting his attempt; and (e) If the subject was assigned to the VB or VR group, the assistant announced the next position behind which the next shot would be taken, right before rolling the ball to the subject.

Experimental Set Up

The experimental set up during acquisition is shown in

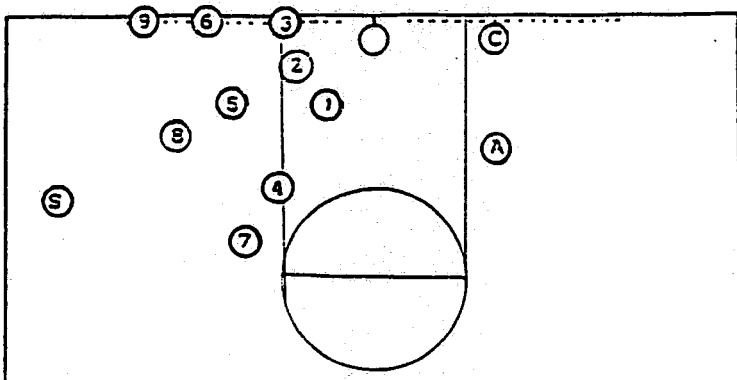


Figure 1. Set up of shooting positions, placement of subjects, assistants, and apparatus during Acquisition phase.

Nine shooting spots (1,2,3,4,5,6,7,8,9) were marked on the floor. All subjects initiated their trials behind spot S.

Assistants stood in the vicinity of spot A. Chairs used for marking data after every trial were placed in the vicinity of spot C.

After two pilot studies were conducted, it was determined that the angles that the shooting positions would be placed were 0, 30, and 60 degrees to the left side of a spot where a perpendicular to the level of the rim line met the floor. That perpendicular line was measured beginning from the back of the rim.

The left side of the baskets was used for all shooting positions. In this way, subjects were forced to dribble from the starting position to the shooting spot with their left hand, and thus minimize potential fatigue effects for their shooting hand (the right one). Additionally, the practice sessions always preceded games in which some of the subjects were participating. Finally, it was assumed that the subjects followed the instruction not to be involved in any kind of vigorous physical activities at least 3 hours prior to the practice sessions.

The three different chosen angles are very often used in game situations. The 0 degrees positions were adopted for the additional reason that the subjects could not use the backboard, unlike they could do from the other two angles. The three different distances (10, 15, and 19 ft) were finally adopted as representatives of low, middle, and long range shooting distances for the particular sample of male college students.

Acquisition Phase

The subjects who were assigned to the SP group shot from spot 5 (30 degrees, 15 ft from the basket) for all five days. Each day they performed one set of 45 jump-shots, thus they had a total of 225 shots. The subjects who were assigned to the VB group shot from all nine positions in a blocked order; that is, making 5 shots from one position, and then switching to another position, for a total of 45 shots per set. The sequence of positions was randomized for all five sets but remained the same for all subjects of the same group. The subjects who were assigned to the VR group shot from all nine positions in a random order; that is, they were performing a block of five shots from each of the nine positions, having a total of five blocks of shots in one set. The sequence of positions was randomized for each block of the sets. All practice groups performed equal number of shots per set, and the same total number of shots per subject.

No verbal feedback was given to the subjects during the test phase. However, they received feedback after the completion of each of their sets by checking the data sheets. As is the case in most skill test settings, the subjects were allowed to warm up for about 5 minutes and then watch, wait for their turn, or start their set right away. If a subject missed a day's set for reasons that could not be controlled by the experimenter, he then performed two sets in one day--with a minimum interval of 15 minutes between sets in order to eliminate fatigue effects--so

that the total number of shots remained constant for all 23 subjects.

Retention/Transfer

One posttest was administered to all 23 subjects for retention, and one for transfer (Figure 2).

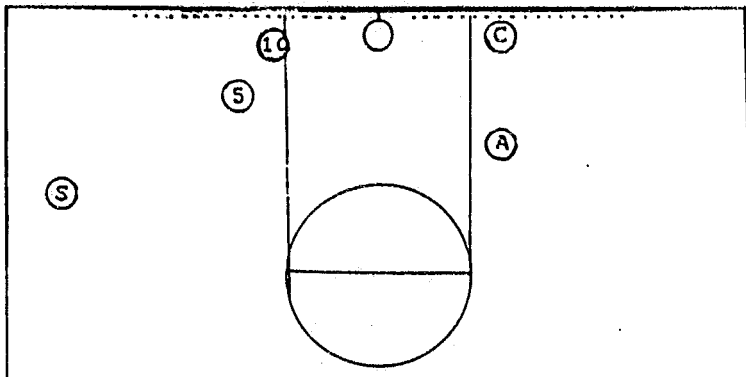


Figure 2. Set up of shooting positions, placement of subjects, assistants, and apparatus during Retention/Transfer phase.

Spots 5 and 10 were the shooting positions for Retention and Transfer tests respectively. All subjects were initiating their trials behind spot S. Assistants stood in the vicinity of spot A. Chairs used for marking data after every trial were placed in the vicinity of spot C.

The retention test consisted of one set of 45 jump shots behind position 5 (30 degrees, 15 ft). The transfer test consisted of one set of 45 shots behind novel position 10 (16 degrees, 11 ft 7.5 in.). Position 10 was randomly chosen among four spots that were the intersections between the nine shooting spots during acquisition.

Statistical Treatment of Data

Twenty-seven subjects initially signed the informed consent form for participation in the study. Four of them dropped out before the first day of practice, and after the subjects were assigned to the three groups. The means and standard deviations for the percentage of shots completed were computed for all groups on both the retention and transfer tasks. Two analyses of covariance (ANCOVA), with the shooting percentage for the first day of practice being the covariate, were calculated using the Statistical Analysis System (SAS) for the detection of treatment effect for retention and transfer performances among the three groups. All calculations were completed using a Zenith Z-386 SX, following the directions from the SAS (Edition 5) Statistical Package Manual (p. 495). Subsequent least squares means (LSM) analysis was employed in order to determine any significant differences between pairs of groups during retention and/or transfer when significant treatment effects were shown to exist. The command file used to run the program is presented in Appendix F.

CHAPTER IV
RESULTS AND DISCUSSION

Introduction

The results of laboratory studies exploring practice structure appear to have relevance for the teacher/coach, yet little research has been directed to applied contexts. In addition, in the majority of the laboratory studies, adults have not been used as subjects. That has resulted in a hesitation on the part of teachers/coaches to implement their findings in regular class or team settings (Wrisberg and Liu, 1991).

The aim of this study was to compare the effects of specific practice, variable/blocked practice, and variable/random practice on the retention and transfer of a jump-shooting performance of college males. This chapter reports the results of the present study, and compares the findings to the reported literature. Included are the means, standard deviations, and ranges of the subjects' age characteristics, and separate statistical analyses for retention and transfer.

Results

Descriptive Characteristics

The data from one of the participants were not considered for the statistical treatment as he was assumed to be an outlier in his group. Thus, data from 22 individuals were eventually analyzed.

The means, standard deviations, and ranges of the subjects' age characteristics are recorded in Table 1.

Table 1. Means, standard deviations, and ranges of subjects' age characteristics

Group	n	Mean Age	Std Dev.	Range
SP	6	20.5	1.50	18-22
VB	9	20.3	1.76	18-23
VR	7	23.7	3.92	18-31
TOTAL	22	21.3	4.05	18-31

Statistical Treatment

Despite the stratified randomization that occurred for the assignment of the subjects in the three experimental groups, significant performance differences were shown (Table 2) during the first day of practice ($F = 10.93$, $df = 2, 19$, $p < .01$).

Individual performances for first, retention, and transfer days can be found in Appendix G.

Table 2. Means and standard deviations of group performance during the first day of practice

Group	n	Mean Performance*	Standard Deviation
SP	6	58.52	6.57
VB	9	49.61	7.02
VR	7	41.27	6.14
Total	22	49.39	9.59

* expressed in percentage

Since treatment effects could not have occurred as a result of Day 1 practice, it was assumed that individual differences among the subjects resulted in superior performance of the SP group over the VB and VR groups, and the VB group over the VR group during the first day of practice. An ANCOVA was employed as the appropriate procedure to statistically control for variability that was due to experimental error (Winer, 1971, p. 752). Analysis of covariance is a combination of regression and ANOVA. An adjustment was first made in the retention performance score of each group according to its mean observed performance at the first day of practice. A correlation (r) was calculated between the first-day-of-practice score and the retention score. The resulting prediction equation, retention score = $a + (b) * \text{first-day score}$, was used to calculate each group's adjusted (or predicted) retention score. The difference between the observed retention score and the adjusted score is called the residual. A simple ANOVA was then calculated using each group's residual score as the dependent variable. That allowed an evaluation of the retention score with the first day's score controlled (Thomas & Nelson, 1990, p. 158). The above procedure was also followed for analyzing the transfer posttest data.

Retention

Results for the retention performance of the three groups are shown in Table 3.

Table 3. Observed means, standard deviations, adjusted means, and standard errors of the means during retention

Group	n	Obs. Mean	Std Dev.	Adj. Mean	Std Error
SP	6	64.82	4.95	59.93	5.30
VB	9	53.81	14.44	53.69	3.42
VR	7	48.90	7.59	53.25	4.83
Total	22	55.25		55.25	

The ANCOVA analysis revealed the results shown in Table 4.

Table 4. Analysis of retention performance

Source	df	Type III SS	Mean Square	F value	Pr>F
Group	2	106.38	53.19	0.51	0.611
1st Day	1	239.75	239.75	2.28	0.149
Error	18	1895.50	105.31		
Total	21	2985.28			

The ANCOVA analysis did not produce any significant results at the .05 level of significance when the first day of practice was used as the covariate ($F = 0.51$, $p = .61$). This is due to the fact that the covariate and the Group variate were highly related and, therefore, they explained almost the same portion of the total variance. Thus, the hypothesis that there is no

and variable/random practice groups on the jump-shooting performance of college males from a prepracticed spot was retained.

Transfer

Results for the transfer performance of the three groups are shown in Table 5.

Table 5. Observed means, standard deviations, adjusted means, and standard errors of the means during transfer

Group	n	Obs. Mean	Std Dev.	Adj. Mean	Std Error
SP	6	71.10	10.79	65.03	4.68
VB	9	56.04	8.30	55.89	3.02
VR	7	64.11	10.92	69.51	4.27
Total	22	62.72		62.72	

The ANCOVA revealed the results summarized in Table 6.

Table 6. Analysis of transfer performance

Source	df	Type III SS	Mean Square	F value	Pr>F
Group	2	732.55	366.27	4.46	0.027*
1st Day	1	369.91	369.91	4.50	0.048
Error	18	1895.51	105.31		
Total	21	2985.28			

Comparisons significant at the .05 level are indicated by *.

The ANCOVA analysis did produce significant results for the transfer test at the .05 level of significance when the first day of practice was used as the covariate ($F = 4.46$, $p = .03$). Thus, the hypothesis that there is no difference among constant practice, variable/blocked practice, and variable/random practice groups on the jump-shooting performance of college males from a novel spot was rejected. Subsequent least square means tests (LSM) for transfer were computed in order to determine between which groups the shown significant difference existed. The least square means, standard errors of the means, and their probability values are shown in Table 7.

Table 7. Least square means, standard errors of the means, and probability values during transfer performance

Group		SP	VB	VR
	LS Means	65.03	55.89	69.51
	Std Error	4.68	3.02	4.27
SP	65.03	4.68	(p-values)	0.12
VB	55.89	3.02	—	0.02*
VR	69.51	4.27	—	—

* significant difference at the .05 level.

The least square means revealed significant difference between groups VB and VR ($p = .02$). Thus, it was assumed that the Variable/Random practice group performed significantly better

than the Variable/Blocked practice group during transfer, while there were no other differences between the groups.

Discussion

Only previous research using children as subjects provided consistent results in favor of variable practice schedules. The present data provided no support to variable over specific practice schedules for both retention and transfer and is in agreement with findings from adult studies (Bird & Rikli, 1983; Doody & Zelaznik, 1988; Johnson & McCabe, 1982; Kanode & Payne 1989; Zelaznik, 1977). Indeed, the SP group performed slightly better in retention than the two other groups with 59.93 over 53.69 and 53.25% for VB and VR respectively, while in transfer the VR group had slightly better performance over the SP group with 69.51 and 65.03% respectively.

The improved performance during transfer demonstrated by all three groups must be due to the relatively shorter distance of the novel spot from the basket (11 ft 7.5 in.), when compared with the prepracticed spot (15 ft), or the average shooting distance from all nine spots (14 ft 6 in.) for the two variable-practice groups. In a recent review, Magill and Hall (1990) indicated that, while there has not been an abundance of research in which both retention and transfer tests have been administered, in those cases consistent results were found for the two types of tests. Contrary to the above data, this study showed retention performance for all three groups to be about the same. Results in transfer were consistent with reported evidence

supporting random contexts of practice over blocked ones in adult populations.

A possible explanation for the lack of significant evidence favoring random over blocked schedules in retention (in fact, blocked condition maintained a subtle difference of .44% over the random condition) may be attributed to the test context. In Shea and Morgan's findings (1979), it was argued that random practice demonstrates better results over blocked practice when the context of the retention or transfer tests is random. The fact that in the present study, a specific context, that is, 45 consecutive shots from the same position, was employed for the two posttests so that the specific practice condition would be included in the test, may have limited the demonstration of group effects. The same rationale regarding the test context was also employed by Lee, Magill, and Weeks (1985) in order to explain the equivalent transfer performance exhibited by all three practice conditions, similar to the ones of this study. It should additionally be noted that consistent demonstration of the contextual interference effect is met in laboratory tasks, while results in nonlaboratory tasks results are somewhat mixed.

One final speculation regarding the similar performance of the specific group and the variable/random group in both acquisition and transfer should be made. It was exhibited that all six individuals who comprised the SP group were very accurate shooters. According to Schmidt (1975, 1982), those adults have most likely already developed strong schemata from their past

experiences on jump-shooting, and thus their performance in the study could be based on schemata as well as the treatment they received in the study.

Based on the results of this study, specific and variable schedules appear to have equivalent effects on the basketball jump-shooting task among adults. Nonetheless, it appears that random schedules are more effective than blocked schedules for the transfer to a novel shooting position.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to compare the effects of a specific, a variable/blocked, and a variable/random practice schedule of a basketball jump-shooting task on the subsequent performance of college males from a prepracticed spot and from a novel spot. Data from 22 college males of an average age of 21.3 years were collected and analyzed in the study. Those individuals participated in the intramural basketball activities of the Freshmen Basketball team at the University of Wisconsin-La Crosse during the academic year 1991-1992, and were all able to perform jump-shots. The subjects were randomly assigned into three groups. The practice period consisted of five days with 45 shots per day, and two posttests were given later, one for retention performance from a prepracticed position, and the other for assessing transfer from a new position.

Two analyses of covariance, with the first day of practice being the covariate, were calculated for the detection of treatment effect for retention and transfer performances among the three groups. A subsequent post-hoc test using least squares means analysis was employed in order to determine any significant differences between pairs of groups during retention and/or transfer. The level for statistical significance was set at ($p < .05$) for all tests.

In the first null hypothesis, it was stated that "there is no difference among constant practice, variable/blocked practice, and variable/random practice groups on the jump-shooting performance of college males from a prepracticed spot". This hypothesis was retained since no difference among the three groups was found for performance from the prepracticed spot.

In the second null hypothesis, it was stated that "there is no difference among constant practice, variable/blocked practice, and variable/random practice groups on the jump-shooting performance of college males from a novel spot". This hypothesis was rejected since differences were found among the groups for transfer performance. Subsequent post-hoc analysis using the least square means revealed that the Variable/Random practice group performed significantly better than the Variable/Blocked practice group during transfer, while there were no other differences between the groups.

Conclusions

Based on the results of this study in which adults served as subjects, the following conclusions were reached:

1. While results in nonlaboratory tasks are somewhat mixed, the present data indicated no superiority of variable over specific practice schedules for both retention and transfer.
2. It appeared that variable/random schedules are more effective than variable/blocked schedules for the transfer in a novel shooting position.

Recommendations

The following recommendations are presented for consideration based on the results of this study.

1. Similar studies including larger samples of subjects and various applied sport tasks are needed for the evaluation of laboratory findings regarding their applicability in practical settings.
2. Involve female subjects in order to examine a possible gender and conditions of practice interaction.
3. Further investigate the role of test contexts in the evaluation of practice effects.
4. Examine a possible interaction between the age factor (adults versus children) and the skill-level factor (simple versus complex skills) utilizing large movement skills.

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APPENDIX A
LETTER TO THE SUBJECTS

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Dear Intramural Sports Participant,

As a graduate student currently enrolled in the Physical Education Master's Degree Program at the University of Wisconsin-La Crosse, my thesis research compares the efficiency of different practice schedules in basketball jump shooting.

In order to complete my thesis research, thirty six males who participate in the '91-'92 basketball tournaments of the UW-L Intramural Sports, and are able to perform jump shots, are needed as subjects.

The testing period will be from March 16 (the first week after Spring Break), 1992 to March 24, 1992 in Gymnasium 113, Mitchell Hall, and will consist of five practice sessions and one postpractice session. Each session will last approximately fifteen minutes for the practice sessions, and thirty minutes for the postpractice session for each subject. The times of practice will be from 3:30 pm to 6:00 pm, and will be scheduled at the convenience of each participant. The thirty six subjects will be randomly assigned into three groups, and will practice jump shooting from particular position(s), depending on the group that each subject is assigned. All subjects of the three groups will take an equal total number of jump-shots (225 shots during practice and 90 shots during the postpractice period).

Your cooperation is critical to the successful completion of my research. With your cooperation, this study will provide additional data from real-life situations in order to direct physical education instructors and coaches in manipulating the most effective kind of practice schedule that would facilitate retention and transfer in the basketball jump shooting.

Along with this letter is an informed consent form that you need to sign and an informational sheet that you must complete. I will be present at your next game. Please return these two forms to me at this time. If requested, results and conclusions from the study will be mailed to the participant subjects.

Thank you for your cooperation with my research.

Sincerely,

Constantine Kirikopoulos
UW-La Crosse Graduate Student

Joy C. Greenlee, Ed.D.
Professor of Physical Education

APPENDIX B
INFORMED CONSENT

INFORMED CONSENT

I understand that the purpose of this study is to learn more about practice schedules affecting jump-shooting performance in basketball.

I confirm that my participation as a subject is entirely voluntary. No coercion of any kind has been used to obtain my cooperation.

I understand that I may withdraw my consent and terminate my participation at any time during the investigation.

I have been informed of the procedures that will be used in the study and understand what will be required of me as a subject.

I understand that the results of this study will remain completely anonymous.

I wish to give my consent to serve as a subject in this study.

Signed

(subject)

(address)

(telephone number)

(date)

APPENDIX C
INFORMATIONAL SHEET

Informational sheet

- 1) NAME:
- 2) AGE:
- 3) CLASSIFICATION (circle one): FRESHMAN SOPHOMORE JUNIOR
 SENIOR GRADUATE
- 4) LOCAL ADDRESS:
- 5) TELEPHONE NUMBER:
- 6) TEAM NAME (if you currently participate in a team):
- 7) POSITION IN WHICH YOU CURRENTLY PLAY OR PLAYED LAST SEMESTER
(circle one or two):
 1.point guard 2.shooting guard 3.small forward 4.power
 forward 5.center
- 8) PLEASE INDICATE YEARS AND LEVEL OF EXPERIENCE IN BASKETBALL
(from Elementary School through College):
- 9) DO YOU WEAR GLASSES FOR DAILY ACTIVITIES?
- 10) DO YOU WEAR CONTACT LENSES FOR DAILY ACTIVITIES?
- 11) DO YOU WEAR GLASSES WHEN YOU PLAY BASKETBALL?
- 12) DO YOU WEAR CONTACT LENSES WHEN YOU PLAY BASKETBALL?
- 13) ARE YOU AWARE OF ANY UNCORRECTED VISUAL PROBLEM THAT WOULD
 LIMIT YOUR SHOOTING PERFORMANCE?

APPENDIX D
RANDOM NUMBERS PROGRAM

Random numbers program

\$RNDORD*

LIST

```

1  REM RNDORD: PLACING INTEGERS IN RANDOM ORDER
10  PRINT " THIS PROGRAM WILL LIST THE NUMBERS FROM 1 TO M IN"
15  PRINT " RANDOM ORDER."
20  PRINT "HOW MANY DIFFERENT LISTS DO YOU DESIRE"
30  INPUT U
40  PRINT "WHAT DO YOU WANT M TO BE"
50  INPUT M
60  PRINT "HERE ARE "U" LISTS OF THE NUMBERS FROM 1 TO "M" IN"
70  DIM (200), B(200)65  PRINT "RANDOM ORDER"
80  FOR Q = 1 TO U
90  N = 1
100 Z = 0
110 FOR A = 1 TO M
120 LET A(A) = A
130 NEXT A
140 B = INT((M-N+1)*RND(1))+1
150 B(N) = A(B)
160 IF N = M THEN 200
180 A(B) = A(M-N+1)
185 N = N+1
190 GOTO 140
200 FOR V = 1 TP M
210 PRINT B(V)
220 NEXT V
230 PRINT""
240 PRINT""
250 NEXT Q
260 END

```

M = 9, V = 1000

*Contributed Program from the Hewlett-Packard Time-shared Basic
Computer System #8405-36264A

APPENDIX E
SAMPLE OF SCORE SHEETS

Sample score sheets. Note: (1) the associates were instructed to always read the data sheets horizontally and record the data accordingly (2) the sequence of spots was randomized from set to set and from block to block within the same set for the VB and VR groups respectively.

SAMPLE DATA SHEET 1: ACQUISITION PRACTICE FOR GROUP SP

NAME:

DATE:

TIME:

GROUP:SP

5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5

SAMPLE DATA SHEET 2: ACQUISITION PRACTICE FOR GROUP VB

NAME:

DATE:

TIME:

GROUP:VB

4	4	4	4	4
9	9	9	9	9
5	5	5	5	5
1	1	1	1	1
2	2	2	2	2
8	8	8	8	8
6	6	6	6	6
3	3	3	3	3
7	7	7	7	7

APPENDIX F
ANCOVA-COMMAND FILE

ANCOVA-Command file

```
1  OPTION  LINESIZE=79;
2  FILENAME mine 'ancova.dat';
3  DATA  alldata;
4          INFILE  mine;
5          INPUT   group  subj  X Y Z;
6  PRETEST = X/10;
7  RETENTION = Y/10;
8  TRANSFER = Z/10;
9  PROC GLM;
10 CLASS GROUP;
11 MODEL RETENTION TRANSFER = GROUP  PRETEST/SOLUTION;
12 LSMEANS GROUP/STDERR  PDIFF;
13
14 PROC SORT;
15 BY GROUP;
16 PROC MEANS;
17 VAR PRETEST  RETENTION  TRANSFER;
18 BY GROUP;
19 PROC ANOVA;
20 CLASS GROUP;
21 MODEL PRETEST  RETENTION  TRANSFER = GROUP
22 MEANS  GROUP/LSD;
```

APPENDIX G

RAW SCORES FOR ACQUISITION AND RETENTION/TRANSFER

Individual data from day 1, observed retention, and observed performance

GROUP	SUBJECT #	DAY 1	RETENTION (OBSERVED)	TRANSFER (OBSERVED)
SP	23	66.67	71.11	71.11
	12	66.67	68.89	82.22
	18	57.78	62.22	82.22
	20	53.33	62.22	53.33
	9	53.33	66.67	66.67
	28	53.33	57.78	71.11
	GR. PCT	58.52	64.81	71.11
VB	11	53.33	73.33	68.89
	2	33.33	73.33	57.78
	16	62.22	60.00	64.44
	5	44.44	62.22	60.00
	4	37.78	40.00	44.44
	6	44.44	35.56	48.89
	13	53.33	42.22	53.33
	19	48.89	42.22	46.67
	17	48.89	55.56	60.00
GP. PCT	47.41	53.83	56.05	
VR	22	42.22	35.56	82.22
	1	42.22	57.78	68.89
	8	48.89	48.89	64.44
	25	31.11	55.56	62.22
	27	42.22	53.33	68.89
	26	35.56	46.67	51.11
	15	46.67	44.44	51.11
	GP. PCT	41.27	48.89	64.13
*OUTLIER FROM VR	21	24.44	22.22	24.44