



UNIVERSITI PUTRA MALAYSIA

**EFFECTS OF MENTAL AND PHYSICAL PRACTICE
ON LEARNING AND ACQUISITION
OF A HITTING SKILL**

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**EFFECTS OF MENTAL AND PHYSICAL PRACTICE
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BY

NOOREEN BINTI NOORDIN

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NOOREEN BINTI NOORDIN

January 1997

Chairperson : Associate Professor Dr. Othman bin Dato' Haji Mohamed

Faculty : Educational Studies

This study examined the effectiveness of mental, physical, and mental-physical practice in the skill of hitting a ball off a batting tee and a ball thrown by a pitcher among upper secondary school students. A total of 59 subjects (n=59) were assigned into three groups, where each group underwent three stages of the experiment - 1) Pre-test Stage, 2) Practice Stage, and 3) Post-test Stage. During the pre-test stage, performance scores were taken for both skills. All groups did not receive any form of practice. The practice stage required each subject learning how to hit a ball off a batting tee correctly. Verbal and written instructions as well as a demonstration session



were given on how to perform the skill. Scores were taken during the post-test stage as each subject hit ten legal balls thrown by a pitcher and another ten legal balls using the batting tee. Findings showed that subjects' who received physical practice and mental-physical practice improved significantly in their batting performance (batting tee). However, the mental practice group failed to show any significant improvement. As for their hitting performance using a pitcher, subjects' who practiced physically failed to improve their performance results. In contrast, the mental practice and the mental-physical practice groups recorded significant changes in their performance scores. Analysis of covariance did show statistically significant differences in subjects hitting performance on both skills between the three groups. All three practice methods produced significant changes but the combined practice method proved most effective.

Abstrak tesis yang dikemukakan kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian daripada keperluan untuk mendapatkan Ijazah Master Sains.

**KESAN LATIHAN MENTAL DAN FIZIKAL TERHADAP
PEMBELAJARAN DAN PEROLEHAN
KEMAHIRAN MEMUKUL**

Oleh

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Kajian ini menyelidik kesan latihan mental, fizikal, dan gabungan mental-fizikal terhadap prestasi kemahiran memukul bola di tempat memukul dan bola yang dilontar oleh pembaling di kalangan sekumpulan pelajar sekolah menengah. Sejumlah 59 orang subjek (n=59) telah dibahagikan kepada tiga kumpulan di mana setiap kumpulan telah menjalani eksperimen yang terdiri dari tiga peringkat - 1) Peringkat Ujian Pra, 2) Peringkat Latihan, 3) Peringkat Ujian Pos. Semasa peringkat ujian pra, skor prestasi telah diambil bagi kedua-dua kemahiran. Ketiga-tiga kumpulan tidak menerima sebarang bentuk latihan. Peringkat latihan memerlukan setiap subjek mempelajari cara-cara memukul bola yang diletakkan di atas tempat memukul dengan betul. Arahan berbentuk lisan dan bertulis serta sesi demonstrasi telah diberikan tentang bagaimana

melakukan kemahiran tersebut. Skor diambil ketika peringkat ujian pos apabila subjek memukul 10 biji bola yang dibaling secara sah oleh pembaling dan 10 biji lagi menggunakan tempat memukul bola secara sah. Dapatan menunjukkan subjek yang menerima latihan secara fizikal dan mental-fizikal meningkat secara signifikan dalam prestasi pukulan mereka (tempat memukul). Walau bagaimanapun, kumpulan latihan mental gagal menunjukkan sebarang peningkatan yang signifikan. Bagi prestasi pukulan menggunakan pembaling, subjek yang berlatih secara fizikal gagal meningkatkan keputusan prestasi mereka. Sebaliknya, kumpulan latihan mental dan latihan mental-fizikal mencatatkan perubahan signifikan pada skor prestasi mereka. Analisis Kovarians menunjukkan perbezaan signifikan secara statistik di dalam prestasi pukulan subjek pada kedua-dua kemahiran diantara ketiga-tiga kumpulan. Ketiga-tiga kaedah latihan menghasilkan perubahan-perubahan signifikan tetapi kaedah latihan gabungan terbukti paling berkesan.

CHAPTER I

INTRODUCTION

Background of the Study

Movement is truly a critical factor of our existence. The learning and performance of various movements provide a means of physical and emotional expression. In physical education, learning and performance serve as the vehicle for the translation of thought into action as well as being the integral component of the mechanism through which the organism can interact with its environment. The learning of motor skills is inherent to the growth and development of the individual and serves as a rewarding process of acquiring new knowledge and skills in its own right.

Learning as a Process

What exactly is learning? Why is learning such an important aspect in our everyday lives? Learning is defined as a relatively permanent change in behaviour; resulting from experience or some type of practice; it is a process of adaptation (Drowatzky, 1975). In the context of physical education, Magill (1989, p 48) defines learning as “ a change in the capability of the individual to perform a skill that must be



inferred from a relatively permanent improvement in performance as a result of practice or experience". This however, does not imply that once a skill is learned it will be performed correctly every time it is attempted.

To Magill (1989), learning is an internal phenomenon that cannot be observed directly, it can only be inferred from practice observations, retention tests, and transfer tests. To indicate whether learning has taken place, performance measures are used to show distinct changes as a person practices the skill.

Performance that changes during learning can be identified where the performance of the skill show some form of improvement over time. The improvement in the performance of a skill is marked by a degree of persistence. It should not last for just a short period of time or for one performance only. The learner should not only be able to exhibit the improved performance today, but also tomorrow, next week and so on. Consistency is another characteristic that should be apparent when learning has occurred. Decreasing indecision in trial-to-trial, or attempt-to-attempt performances is a key indicator that learning has taken place.

Drowatzky (1975), Magill (1989), and Schmidt (1991) describe that a learning assessment evaluation situation can be done by observing the learner's performance each day for a specific period. The record of performance measure on a chosen skill can be graphically represented so that changes resulting from practice can be observed and interpreted.

By far the most common way to evaluate learning progress during practice observations is through performance curves. Schmidt (1991) summarized the major points about performance curves which consists of : (1) performance curves are plots

of individual or average performance against practice trials; (2) performance curves can either increase or decrease with practice, depending on the way the task is scored; (3) the law of practice says that improvements are rapid at first and much slower later - a nearly universal principle of practice.

A retention test is another means of inferring learning from performance in a motor skill situation. A test is administered to the learners on the first day of practice. This test is administered again after a period of time and the difference between the two scores will be an indicator of performance increase. If the interest is on learning, the test is administered once again sometime later, after no actual practice of the skill has occurred. If there is a statistically significant difference between that score and the score on the first day of practice, it is without a doubt that learning has occurred (Magill, 1989).

Learning can also be inferred using transfer tests. Subjects must use the skill they have acquired and practiced but in a relatively new situation. As an example, in a tennis serve situation, the transfer test is a serving performance in a game situation. If the learners had learned the tennis serve during practice, there should be an increase in the number of good serves in the game situation compared to the serves made before practice.

Transfer tests are especially important when the skill being learned will have to be performed under a variety of test conditions - open skills. For instance, although learners can practice hitting a ball off a batting tee, it is highly unlikely that in another situation (hitting a ball thrown by a pitcher), learners will hit a ball that has the same pattern of execution that has been practiced. What is required in this type of skill is for

the learner to adapt to the demands of each response situation. Thus, a transfer test is a method that can be applied to test how capable a learner is adapting to the unique situations.

The acquisition of motor skills via mental and physical practice is not a new phenomenon. Research investigations of the relationship between mental and physical practice can be traced back as early as the 1890s. A traditional belief in the physical education world is that the only way to learn a motor skill is to spend long and hard hours physically practicing. However, throughout the years, researchers successfully have proven that reading about a skill or simulating the movements to be executed may also be effective strategies when the objective is motor skill acquisition.

According to Murphy and Jowdy (in Horn, 1992), the use of mental practice began during the 1930s by Jacobson (1932), Perry (1939), and Sackett (1934 and 1935). Most of the studies until the 1980s were concerned with the effects of mental practice on the learning and performance of motor skills and were all based in the laboratory, rather than using field research methodologies. The standard methodology utilized involved a between-subjects, pre-test/post-test design with three groups : physical practice, mental practice, and no practice. To analyze mental practice effects, researchers usually looked at the changes in performance of each group from preintervention to postintervention. The majority of the studies however were not concerned with the mechanism underlying the mental practice effects.

Despite the long history of research done on mental practice, the question of just how effective mental practice can be in skill acquisition and performance still remains open for discussion. However, in the Malaysian context, only a handful of researchers

have attempted to conduct experiments related to mental, physical, and mental-physical practice.

Gentile's Two-Stage Theory

This study is based upon several theoretical concepts. Gentile's Two Stage theory (1972) is one of the concepts used to describe the stages of learning which consists of : 1) getting the idea of the movement, and 2) fixation/diversification. According to Gentile, the first stage is identified as the goal of the learner, which is getting the idea of the movement. Two things must be done in order to accomplish the goal of the skill.

First, the learner must establish the relevant and irrelevant stimuli related to the skill. Relevant stimuli are those pieces of information in the environment that will regulate movements that will be produced as the skill is performed. As an example, if the goal of the skill is to hit a pitched ball with a bat, the relevant stimuli should include information like the spin of the ball, the speed of the ball, the spatial trajectory of the ball and so on. If learners are to learn to hit the ball, these relevant stimuli must be given attention.

There are also information that can attract the learner's attention but are in fact distracting (irrelevant stimuli). To give attention to these stimuli would not help the person accomplish the goal of the skill. For example, the motion used by the pitcher in the delivery is usually irrelevant information in helping the batter know what the pitch will be like. Other irrelevant stimuli can also include the pitcher's eyes or talk by other players which tend to attract the attention of novice learners.

Second, the learner must establish the most appropriate movement pattern for effectively attaining the goal of the skill. This aspect of learning involves coordinating the limbs correctly so they can function together smoothly. It is during this first stage of learning that the individual concentrates on developing coordinated movement pattern becomes characteristic of the response.

The second stage of learning in Gentile's theory is called fixation/diversification. Congruent to the first stage of learning, the learner must focus on accomplishing two things as well during this stage. First, the learner must develop the capability of doing what is needed to accomplish the goal of the skill, regardless of the situation.

Second, the learner must increase his or her consistency in achieving the goal of the skill. The terms fixation and diversification are related specifically to what each - open and closed skills require in terms of the movement patterns that must be produced to accomplish the goals of these skills.

Fixation refers to what is required to be successful in performing a closed skill. Closed skills performance refer to skills that are performed in an environment where events are usually predictable, fixed and involves stationary objects such as hitting a ball off a batting tee. The object in the skill of hitting waits to be acted upon by the subject.

Practice during this stage must enable the learner to refine the movement pattern learned in the first stage so that the required movement pattern can be produced correctly, consistently, and efficiently from response to response.

Diversification relates to the needs of performing open skills. Open skills performance refer to skills that are performed in an environment which is ever-changing, unpredictable and requires anticipation and prediction of moving objects

such as hitting a ball thrown by a pitcher. The focus in this stage is to develop the capability to successfully adapt to the changing environmental demands that characterize open skills.

The same movement pattern will not be produced on each response, therefore, the movement pattern learned in the initial stage must be practiced but with the goal to diversify the variations of the pattern that can be produced. In this study, the skill is measured whereby the performer must act upon the object according to the action of the object (Magill, 1989, p 13).

On the other hand, Fitts and Posner's Three Stage model (1967) labeled the stages of learning as follows : 1) cognitive phase, 2) associative phase, and 3) autonomous phase.

Fitts and Posner's Three Stage Model

The process of learning a motor skill is best described by the distinct stages or phases that all learners seem to experience as they learn skills through practice. As practice continues under suitable conditions, certain changes take place in the learner.

Researchers have attempted to identify these stages so that a better understanding of the learning process can be achieved. One of the classic stage of learning model was developed by Paul Fitts and Michael Posner in 1967. They have labeled the first stage of learning - the cognitive phase.

According to Schmidt (1991), when the learner is new to the task, the primary concern is to understand what is to be done, how the performance is to be scored, and

how best to attempt the first few trials. Thus, considerable cognitive activity is required, so that the learner can determine appropriate strategies.

This stage is also marked by a large number of errors being committed during performance. Performance is usually inconsistent, partly due to the learner trying many different ways to correctly execute the movement. Learners generally are not aware of what should be done differently the next time to improve. As a result, specific information is needed in order to assist them in correcting what they have done wrong.

The second phase of motor learning is termed as the associative phase. In this phase, the learner has determined the most effective way of executing the task and begins to make more subtle adjustments on how the skill is performed. Magill (1989) explains that during this stage, learners have developed an ability to detect some of their own errors in performing the skill. Small changes in the motor pattern are apparent which allows the learner more effective performance. Performance improvements become more gradual and movements become more consistent.

After much experience practice and experience with the skill, the learner moves into the final phase of learning - the autonomous phase. The skill has become almost habitual or automatic for the learner. Learners do not have to attend to the entire production of the skill; that is, the skill is performed without thinking and with less interference from many other simultaneous activities.

For example, highly skilled dancers do not think about every step of the routine. Instead, they begin to concentrate on some of the more critical phases of the routine. Performers are now able to not only detect their own errors but also make necessary

adaptations to correct them. Hence, the autonomous phase is the result of a tremendous amount of practice.

These are some of the concepts which support and had led to the development of the study on mental practice and physical practice. Gentile's Two-Stage theory is chosen as the conceptual framework for this study because it contains an important feature, which is its suggested application to instruction. It is a known fact that the goal of practice in the initial stage is to develop the basic movement pattern that will achieve the goal of the skill, regardless of whether the skill is open or closed. This theory does not restrict the goal of practice to laboratory experiments alone. Field based experiments can be associated with this model as well, regardless of the skill is open or closed.

Statement of the Problem

The capability of human beings to perform skills is a crucial characteristic of our existence. Simple task such as pushing the buttons on a telephone could not be executed without the capacity for skilled performance. As for learners involved in physical activity, diversity in sports and athletic endeavours would be limited; especially for those who consider them fascinating and exciting.

According to Schmidt (1991), humans have the most flexibility of all, which allows the possibility of increasing proficiency for conducting daily activities. Thus, skill acquisition and the production of skilled behaviours are vital as they play a major role in almost every aspect of our everyday lives.

Skill acquisition is also important as an indicator of quality performance (Magill, 1989). In addition, the degree of proficiency is often subjectively determined as performance is expressed qualitatively. One of the ways to determine proficiency in skill attainment is based on certain characteristics exhibited by the performer. This comprises :

1. Consistency of performance.
2. Ability to anticipate in advance what the response should be made.
3. The use of relevant cues and not be distracted by irrelevant cues.

Hence, quality of performance or whether learning has occurred is based on how well the individual accomplishes the goal of the task. This is where the problem arises. The amount of learning and how efficient the individual is able to perform depend on several factors which include individual differences (maturation, motivation, intelligence, and growth), the nature of the task, how the knowledge about the skill is imparted and the quality of experience and practice. However, knowledge by itself is not sufficient to bring about changes in practice. A basic tenet of any learning theory states that we do not become adept at a skill until we practice it constantly.

Here, different practice conditions must be established to develop the capability of doing what is needed to accomplish the goal of the skill. Thus, one of the questions that can be asked concerns how this needed variety in practice condition can lead to the greatest potential for maximal performance. Some learners may excel in several areas of cognitive and physical abilities, while others may excel in only one area and finding the other area difficult to grasp. For example, some learners may perform better than

others in the skill of hitting a ball thrown by a pitcher; where no one pattern of movement must be produced to achieve the goal of the action.

Therefore, preparation and strategies for designing practice methods and instructions are essential to optimize learning and performance. Mental, physical, and mental-physical practice conditions are the types of practice methods the researcher plan to utilize in investigating the problem.

To conclude, in this study, the researcher intends to assess the effectiveness of mental, physical, and mental-physical practice in the skill of hitting among upper secondary school students.

Objectives of the Study

In general, the study attempts to assess the effectiveness of mental, physical, and mental-physical practice on the performance in the skill of hitting.

The specific objectives of this study are as follows :

- 1) To study the effects of mental practice on the performance of hitting a ball off a batting tee.
- 2) To study the effects of mental practice on the performance of hitting a ball thrown by a pitcher.
- 3) To study the effects of physical practice on the performance of hitting a ball off a batting tee.
- 4) To study the effects of physical practice on the performance of hitting a ball thrown by a pitcher.

- 5) To study the effects of mental-physical practice on the performance of hitting a ball off a batting tee.
- 6) To study the effects of mental-physical practice on the performance of hitting a ball thrown by a pitcher.
- 7) To compare the effects of mental practice, physical practice, and mental-physical practice on the performance of hitting a ball off a batting tee.
- 8) To compare the effects of mental practice, physical practice, and mental-physical practice on the performance of hitting a ball thrown by a pitcher.

Null Hypothesis

The following hypotheses were formulated based on the objectives of the study :

- I. Ho: There is no significant effect on the performance of hitting a ball off a batting a batting tee among upper secondary school students undergoing mental practice.
- II. Ho: There is no significant effect on the performance of hitting a ball thrown by a pitcher among upper secondary school students undergoing mental practice.
- III. Ho: There is no significant effect on the performance of hitting a ball off a batting tee among upper secondary school students undergoing physical practice.