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An Evaluation of the Effectiveness of Instructional Television as Applied to Learning Beginning Golf Skills

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AN EVALUATION OF THE EFFECTIVENESS OF
INSTRUCTIONAL TELEVISION AS APPLIED
TO LEARNING BEGINNING GOLF SKILLS

———

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the Graduate Faculty

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———

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

———

by

Everett LoWayne Brewer

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APPROVED FOR THE GRADUATE FACULTY

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CHAPTER I

THE PROBLEM AND STATEMENT OF TERMS USED

Instructional television has been used in education since Iowa State College developed an educational television station in February, 1950. Since then, the population explosion and the rapid growth in human knowledge has revealed a shortage in competent classroom teachers. Research in instructional television has been stimulated by these problems.

In 1956 the videotape recorder was invented and an unlimited area of instructional television emerged. At first, cost was a limiting factor, but with improved techniques and production methods instruments are now within reach of educational institutions. Now that the cost is within the reach of educational institutions, educators are finding a variety of uses for the videotape recorder: recording student teachers, recording physical education activities, and recording outstanding teachers' lectures.

During fall quarter, 1966-67, educational television was introduced into the Physical Education Department at Central Washington State College. A videotape recorder-camera chain was placed in Nicholson Pavilion to serve as an instructional tool.

Instructors have used the videotape recorder in many different ways. The football coach used the recorder to expedite teaching of the rudiments of team play; the golf instructor used the recorder to show a student his full golf swing; and the swimming coach used the recorder to help his swimmers see their swimming form.

Many articles have been written explaining the uses of the videotape recorders and the possibilities that educators have with them. One of the questions asked by educators concerning the uses of the videotape recorder is: Is a video replay of a student's performance skills with an instructor's comments more valuable than an instructor's comments without the video replay?

There have been articles written reporting the outcomes of various experiences in many institutions, but few of these articles have been reports of research. If educators are to use the videotape recorder in the educational process, there is a need to measure the effect of the videotape recorder upon the teaching of various skills.

I.   THE PROBLEM

Statement of the Problem

This study compares the golf skills of a class viewing its own videotape replays to those of a class who was videotaped but did not view the replays. All other relevant

variables were equalized between the two groups. In addition, a test was made of the attitudes of the experimental group toward videotape as a learning aid, and finally, an attempt was made to reduce the number of trials necessary in the post-test, in order to make the test more functional.

Purpose of the Study

The purposes of this study were (1) to test the hypothesis that beginning golf students who view a videotape replay of themselves performing a full swinging golf shot with an instructor's critique will score significantly higher on a specially designed skill test than beginning golf students whose performance is videotaped, but who are not exposed to a videotape replay, but are provided with an instructor's critique; (2) to test the hypothesis that use of a videotape replay with an instructor's critique will result in favorable attitudes toward being televised as an aid to learning; and (3) to determine whether the test of skill for the full swinging shot in golf can be administered with fewer trials without appreciable loss of test reliability, using the original full length test as criterion.

II. LIMITATIONS OF THE STUDY

This study was limited to two classes of Central Washington State College students who were enrolled in

Physical Education 62, both taught by Dr. Robert N. Irving during Winter Quarter, 1968-69. The length of time involved in this study was one quarter, during which the students met with the instructor two times per week.

The number of times the students were exposed to videotape replay was limited to three, with six full-swinging golf shots allowed per person each time the video-tape was used.

III. DEFINITIONS OF TERMS USED

The following list of definitions is provided to acquaint the reader with early uses of instructional television and unfamiliar terms which appear in the context of this study.

Mirror Television

This term is used to define a situation in which a television camera and videotape recorder were used to allow a performer to see himself as he performed.

Videotape Recorder-Camera Chain

The videotape recorder-camera chain used in this study consisted of (1) a Cohu model 3200 television camera with zoom lens, (2) a Sony EV 120U videotape recorder, (3) a Motorola RF-video monitor with a 21-inch screen, and (4) a Shure microphone.

IV. ORGANIZATION OF THE REMAINDER OF THE THESIS

In Chapter II, a review of the related literature is made to acquaint the reader with the first uses of instructional television in education, the uses of instructional television in physical education, and the uses of videotape recorders in physical education.

Chapter III contains a detailed discussion of the procedures used in this study.

A report of the findings of the study is given in Chapter IV.

Chapter V provides a summary of the study, conclusions, discussion of its implications, and suggestions for additional research.

CHAPTER II

REVIEW OF THE LITERATURE

The use of videotape recorders within educational institutions is relatively new. Production techniques have increased the feasibility of using videotape recorders by lowering the cost and making the recorder-camera units portable. However, few attempts to teach motor skills, aided by the use of the videotape recorder, have been made.

A discussion of instructional television as it applies to general education and physical education is reviewed in this chapter. Also included in the discussion is a review of literature concerning videotape recorders in physical education and golf tests in physical education, followed by a summary of the chapter.

I. INSTRUCTIONAL TELEVISION

Instructional television has been used in our schools for about eighteen years. Throughout this relatively short period of time, intensive research has taken place on the development and use of television as an instructional medium. This research was stimulated largely by a predicted and actual shortage of competent classroom teachers. To compound the need for competent teachers, there was also the

need for educating a rapidly growing population which had to learn more to meet the needs of industry and technology.

The great volume of research on instructional television has been made possible by considerable financial support, first from several philanthropic foundations in the mid-1950's and more recently by the federal government through such agencies as the Office of Education (16:1). This philanthropic and governmental research has been aided by theses and dissertations conducted by individual researchers.

In the decade from 1951 to 1960, the Ford Foundation spent $50 million on instructional television activities. These included:

> . . . (1) supporting the Joint Committee on Educational Television, the agency through which educators lobbied for the reservation of Educational Television channels and which later assisted local groups in activating those channels; (2) establishing and maintaining a center for Educational Television program production and distribution, which is now--after several name changes--called National Educational Television (NET); (3) assisting in the construction of thirty-five Educational Television stations in key cities by granting $3.5 million on a matching basis to educational institutions or community groups (2:196).

In the early 1960's the federal government came to the aid of instructional television by passing the Educational Television Facilities Act, which authorized $32 million over a five year period.

Relative effectiveness studies are by far the largest type of research that exists at the present. These are

studies in which the performance of students instructed via television has been compared with the performance of others instructed directly by a teacher in the usual classroom manner.

Stickell, in a study conducted in 1963, carefully examined 250 comparisons between televised instruction and direct instruction. These were classified according to the extent to which they met his rigorous requirements for adequate experimental design. Of the 250 studies compared only ten were classified as interpretable. The rest were classified as uninterpretable or partially interpretable due to various defects in experimental design. Of the ten interpretable studies, all showed "no significant differences" in learning at the .05 level of confidence between television and direct teacher instruction (15:4).

Although no significant differences were found in this particular review, this does not indicate that no differences exist. There is a value in such results. Consistent findings of no significant differences in learning from different instructional methods indicate that several apparently equally useful teaching methods are available to educators. Administrators can now choose which one should be used in a specific situation on the basis of considerations other than relative instructional merits. For example:

Television has excellent distributive powers. It can extend instruction (good or bad) to many places

simultaneously. It is, therefore, an excellent means of
extending experienced teachers and above-average teach-
ing resources to a larger number of students than would
be possible under direct instruction. In this way
television can offset a shortage of experienced teachers.
To the extent that the television teacher is more experi-
enced than the available classroom teachers and has
better instructional resources than might be available
to the average classroom teacher, it is possible that
televised instruction can be superior to direct teach-
ing.
Another reason for using television might be to offer
courses that would otherwise be unavailable. In some
cases there might also be economic advantages in using
televised instruction.
It is for these reasons that the use of instructional
television has expanded so rapidly during the last 10
years (15:5).

By 1963, well over half of the major universities in

the United States were using television for instructional

purposes (6:172).

II. INSTRUCTIONAL TELEVISION IN PHYSICAL EDUCATION

The shortage of competent classroom teachers and the

vast increase in numbers of students enrolling in schools

that stimulated the growth of television in education also

stimulated its introduction into physical education.

As in other academic fields, educators in physical

education faced the prospect of teaching more material to

a greater number of students. Instructors were too few,

and space and facilities were limited.

In July of 1964, the Physical Education Advisory Com-

mittee authorized the formation of a Division Committee on

the Utilization of Educational Television in Physical Educa-
tion. It was the responsibility of the committee to:

> . . . collect and disseminate information concerning the
> development of educational television in physical educa-
> tion and to establish and maintain liaison with other
> concerned organizations, e.g., National Education and
> National Association of Educational Broadcasters, and to
> encourage physical educators to increase the utilization
> and study of educational television as an instructional
> tool (7:87).

Television was being used in many schools as a form
of public relations, but only a limited number of schools
and colleges were using television as an instructional
technique in their physical education classes. In a recent
national survey of educational television facilities and
institutions known to be producing telecourses, 357 schools
were contacted. Twenty-three of the 357 respondees indi-
cated some experience with instructional television in
physical education. While it was the consensus of the
group that instructional television was an effective teach-
ing device, only four of the twenty-three were conducting
research concerning the teaching of physical skills.

The early uses of television were in the sports area
and not devoted to skill development of the general student
participant. Although sports contests were not justifica-
tion alone for the development of an instructional television
program, a program of teaching sports skills could be justi-
fied as it was by the Athletic Department of Ohio State

University. Ohio State started a program called "Champions of Tomorrow," and offered such activities as diving, golf, basketball, and football (9:30).

Michigan State University was one of the first institutions to use closed-circuit television to improve instruction and learning in physical education classes. They experimented with sixty-six sections of a Foundations of Physical Education course during the fall quarter of 1961.

> A total of 66 sections (2,130 students) received instruction by television. Four women on the faculty shared the responsibility of the television teaching, and eleven faculty personnel, four graduate students and sixteen upperclass major students were assigned as class-room instructors. Every aspect of the first trial by television was evaluated. Generally the results have been found favorable and encouraging and have stimulated further experimentation with the use of television (10:29-30).

Other experiments and studies have taken place and the results have been favorable.

Even with the evidence at hand there are still questions to be answered: How can physical education best use instructional television, and how can educators best present their areas through the media of television?

III. VIDEOTAPE RECORDERS IN PHYSICAL EDUCATION

A review of the literature indicates that videotape recorders have been used only to a limited degree by physical educators in the public schools and colleges.

The Air Force Academy was one of the first institutions to use the videotape recorder. The ideas that were used at that time were not based upon established practices of physical education but were ideas of one of the instructors.

Another early user of the videotape recorders in physical education was Hall High School in West Hartford, Connecticut (5:36). Hall was the first high school in the Northeast, and one of the first in the nation, to use videotape in football.

High schools and colleges are turning to the videotape recorder more and more because it provides them with certain advantages over the use of films. Some of the advantages are:

1. No processing is needed.
2. There is no additional cost, as they rely largely on student crews.
3. Instant replay can be employed for immediate use at practice.
4. Stop motion and slow motion are available.
5. The tape is re-useable.
6. Sound may be recorded along with the picture, enabling the coach to instruct with the film (19:36).

Bretz stated:

Immediate playback of videotape allows a physical education student or athlete to criticize objectively his own form and style as the coach points out his mistakes (2:949).

This statement by Bretz indicates the type of program used by Purdue University called, "Mirror Television."

James Miles, director of radio and television, Purdue
University, said:

> A number of institutions are now experimenting with
> what has been dubbed at Purdue, mirror TV. This is the
> simple use of the television camera and the videotape
> recorder to allow a performer to see himself as others
> see him. At Purdue, it has been used successfully for
> ministers, speech students, physical education majors,
> drama majors and the training of teachers (13:559).

Motor learning is at best a complicated task involv-
ing, among other things, the art of imitation. Motor
learning also calls for frequent analysis of error. It may
be that when an athlete sees himself he can better interpret
the analysis of his teacher and it may become easier to cor-
rect and improve. Thus, seeing others perform and observing
his own performance may make his learning and understanding
of motor skills more rapid.

IV. GOLF TESTS IN PHYSICAL EDUCATION

A review of the literature on full-swinging golf
tests reveals that these tests are extremely limited. The
golf tests found in the literature that are adaptable to a
full iron shot are of two types: target tests and distance
driving tests. Clevett used a square target in which the
size and values of the scoring areas were subjectively deter-
mined. Each subject was allowed ten trials with a midiron,
the sum of the scores of each shot being the final score.
No evidence of reliability for the test was presented.

Wood devised a target test in which the target is constructed of concentric circles, the size determined by the concentration of shots by four expert golfers. Sixteen college students were used to determine the validity of the test, each subject having thirty trials. Validity was determined by correlating the test scores with a subjective form grade and with the scores of a distance driving test. The results were as follows:

Distance scores, ten trials, corre-
    lated with form scores 94
Target scores, thirty trials, corre-
    lated with form scores 79
Sum of distance and target scores
    correlated with form scores 79 (21:44)

Autrey developed a test to measure distance and accuracy. A driving range was used and marked at five-yard intervals. When the ball stopped rolling, it was measured to the nearest five yards. Reliability of this test with forty-two subjects using a brassie was found to be .72 for ten trials (1:53).

Watts developed a test for approach shots in golf that has significant implications. This test dealt not only with accuracy but the correct amount of force to reach a target. The target's size, shape, and scoring areas were determined by sigma units. Reliability was determined from three dis- tances, 10 yards, 20 yards and 30 yards, with only ten trials, and ranged from .83 to .89 (20:37).

Most of the aforementioned studies seem to indicate that at least thirty trials are necessary to have a reliable and valid test. However, two studies have yielded better results than the others. Mary Ellen McKee, in her study, "A Test for the Full Swinging Shot in Golf," Washington State University, 1949, and Ellen R. Vanderhoof, in her study, "Beginning Golf Achievement Tests," Iowa State University, 1956, produced good results with fewer than the thirty trials per club suggested for adequate reliability.

In the Vanderhoof test, a #5 iron club was used, and other apparatus included plastic practice golf balls; a cocoa mat; standards placed fourteen feet from a line from which the balls were hit, with a rope at an eight foot height between the standards; and a small object placed at the opposite end of the gymnasium as a target (11:9). The person being tested could take as many practice swings as he desired, then hit two or three balls for warm-up. When he was ready, and using a full swing, he hit fifteen balls at the target placed at the other end of the gymnasium.

The score was tallied from zero to three points, according to the area in which the ball landed. Two topped balls in succession were recorded as a trial and computed as a zero score. The total score was the sum of the fifteen trials. Reliability was obtained by the sum of the odd trials and the even trials and was .73 for 110 subjects.

The Spearman-Brown formula raised the score to .84 for the total. Validity was .66.

McKee developed a test that was devised to measure beginning golf students' performance skills. The test consisted of two phases: a hard ball test for outside testing and a cotton ball test for inside testing. The tests were designed so that correlation between the hard ball test and the cotton ball test would give some indication of beginning students' performance skills.

The test measured four phases of a full golf swing: range, velocity, angle of impact, and angle of deviation.

Range and velocity were computed together. Range was the distance the ball traveled from club impact until the ball first touched the ground. Velocity was computed by dividing the range by the length of time the ball was in flight.

The angle of impact was determined by the construction of a right triangle. Angle of impact is the angle formed by the range--the distance between the point of impact of the club and the ball at its starting point and the point at which the ball first touches the ground-- and the hypotenuse.

The angle of deviation was determined by the construction of a right triangle in a horizontal plane. The

two sides were the straight-away distance and the devia-
tion from the straight-away. The hypotenuse was the range.

McKee tested forty-four students in the fall and
thirty students in the following spring. Each subject was
allowed twenty trials with a #2 iron and twenty trials with
a #5 iron. The average scores of twenty trials with hard
balls and twenty trials with cotton balls were correlated
to determine the validity of using cotton balls to measure
the skill in executing a full swing. The results of these
correlations are described in Table I.

TABLE I. VALIDITY

CALCULATED FROM 20 TRIALS WITH BOTH HARD
AND COTTON BALLS, 30 SUBJECTS

	Range	Velocity	Angle of Impact	Angle of Deviation
#2 iron	.65	.42	.31	.17
#5 iron	.49	.44	.33	.14

V. SUMMARY

Instructional television has been used in our
schools for a relatively short period of time, but inten-
sive research has been done covering its development and
use as an instructional medium. Since 1956 when the first
videotape recorder was invented, a new and unlimited area
in instructional television has emerged.

Early studies were concerned with teaching with the
aid of instructional television as compared to direct
instruction. These studies indicate that "no significant
differences" existed between the two, but pointed out that
television offered several advantages. Some of these advan-
tages were: greater distributive powers, offerings in
courses that are not otherwise available, and economy.

Instructional television was introduced into physi-
cal education because of teacher shortage and the population
explosion. At first, television was used in sports, but
soon many uses applicable to the physical education class-
room were found. Michigan State University was one of the
forerunners in the use of instructional television in the
physical education classroom.

Videotape recorders have followed the same pattern
in physical education as did television--used first in sports
and recently in physical education classes. The first

videotape recorder was used in physical education in 1958 by the Air Force Academy. Its audio-visual director felt that it would give students the chance to see themselves immediately after performing, which is important in learning. As research continues it becomes more apparent that instructional television and the videotape recorder are becoming even more valuable in the teaching of motor skills.

The number of useful skill tests available for the full-swinging shot in golf is very limited. Two of these tests, however, appear to be superior.

CHAPTER III

DESIGN OF THE STUDY

It was the intent of this study to (1) test the
significance of difference in variance between students in
two beginning golf classes, one of which had seen its own
videotaped replay of golf shots and the other which had not;
(2) test the null hypothesis that attitudes of students who
had viewed their own replays of shots would not differ from
chance expectation; and (3) attempt to reduce the number of
trials required in the original criterion test without
appreciable loss of reliability.

I. HYPOTHESES

The following hypotheses motivated the writer to con-
duct this study:

1. It was hypothesized that beginning golf students
    who viewed a videotape replay of themselves per-
    forming a full swinging golf shot would score
    significantly higher on a golf skills test than
    beginning golf students whose performance was
    videotaped but who were not exposed to the
    replay.

2. It was also hypothesized that the beginning golf
    students who view their own videotape replay

with accompanying instructor's critique would
have a favorable attitude toward the use of
the videotape recorder.

3. It was further hypothesized that the number of
trials in the post-test criterion measure of
golf skill used to test the performance of
beginning golf students' full swinging golf
shots could be reduced without appreciable
loss of reliability.

II. DESCRIPTION OF THE SAMPLE

The students who participated in this study were
randomly selected by the registration process at Central
Washington State College. During winter quarter registra-
tion, the students registered for a beginning golf class
(Physical Education 62). The students had a choice from
eight different class periods. The classes which met
second and fourth period on Tuesday and Thursday were
selected because both classes were instructed by Dr. Robert
N. Irving.

A total of fifty students enrolled in the two classes
for Winter Quarter, 1968-69. Not all of the students who
enrolled in the two classes were used in the study. Because
of students' dropping and adding classes after the pre-test
was administered, it was necessary to adjust the total

sample to N = 47, with 23 subjects in the experimental group and 24 in the control group.

Because of the type of registration held at Central Washington State College, the variables of age, sex, and golf skill of the two beginning golf classes were assumed to be randomly distributed between the control and experimental groups.

III.   EXPERIMENTAL DESIGN

The students were divided into two groups, with the second-period class acting as the control group and the fourth-period class as the experimental group. A pre-test was given to both control and experimental groups before treatment, and a post-test was given to both groups after treatment.

IV.   TESTS

Two tests were used in this study: (1) "A Test for the Full Swinging Shot in Golf," and (2) an attitude scale as developed in a previously written thesis.

A Test for the Full Swinging Shot in Golf

"A Test for the Full Swinging Shot in Golf," developed by McKee, was used as the criterion to measure the beginning students' golf performance skills. In McKee's

study each subject had twenty trials, from which McKee computed angle of impact, range, deviation of the ball from left or right of the intended line of flight, and velocity. Reliability was calculated from ten odd- and ten even-numbered trials and was as follows:

Velocity	.729
Angle of impact	.815
Angle of deviation	.684
Range	.788 (11:42)

Attitude Scale

Morrow, in an unpublished thesis (14:28), developed an attitude scale to determine the attitudes of students toward their videotaping experience. The instrument asks nine objective questions directed at discovering the feelings of the students toward the videotaping experience, with or without an instructor's critique.

Correlation of Scores

In addition to the two tests just described, the writer wished to reduce the number of trials (suggested by McKee) in the post-test, but only if this could be done without damaging loss of reliability. In order to do this, the original data collected by Morrow were added to that of the writer with the resulting sample being an N of 44 for each of the control and experimental groups. Individual

scores for range and deviation were correlated with the mean score of ten trials. Time in flight was not computed because Morrow computed his time in tenths of seconds and this writer's time was computed in thousandths of seconds.

V. TREATMENT

The students were advised that they were involved in a Master's thesis study and were introduced to the candidate.

Scheduling of the students to be involved in video-taping during the class period was done by the instructor. The scheduling of the pre- and post-skill tests and the attitude test was done by the instructor and candidate.

The pre-test was administered during the first week of the winter quarter before any formal instruction in golf skills was started. The students were given verbal instructions during their first formal class period on how the skill test would be administered, and appointments were arranged for the students to take the pre-test. Because of the time involved in administering the test and the availability of the fieldhouse, the decision to administer the pre- and post-tests during the evening hours was agreed upon jointly by the class instructor and the candidate.

Both classes were tested, the second-period class the first evening and the fourth-period class the second

evening. In this manner, both classes were tested in about the same length of time. The post-test was administered during the last week of formal instruction, in the same manner.

Administering Pre- and Post-Skill Test

The pre- and post-skill tests were administered according to the procedures given by McKee's study, but with minor changes. The procedures were as follows:

1. Each student received ten trials.
2. The ball had to be in the air for at least .4 second to be counted as a fair trial.
3. At the end of each subject's ten trials the tape measure attached to the floor at the point of impact was moved to the place where the ball ended its flight, measuring the range the ball had traveled.
4. Deviation to the left or right was determined at the point where the tape measuring the range intersected the tape measuring deviation. Because of an error in the original measurement, deviation was later calculated by using millimeter graph paper. Deviation was calculated by scaling down the original deviation measurement to one foot equals one millimeter

on the graph paper. The corrected deviation
was then computed by pinpointing the original
range and deviation on the graph paper. These
points were then re-computed from a standard
point 20 feet down the intended line of flight.
The corrected deviation was at the intersec-
tion of these two points.

5. The time the ball was in flight between the
moment of impact and first touching the ground
was determined by a stop clock measuring in
thousandths of seconds.

Treatment of Experimental Group by Instructor

The instructor had been using a videotape recorder
in his classes since Fall Quarter 1966, in the same manner
as that used in this study. A group of four or five stu-
dents selected by the instructor moved to a corner of the
fieldhouse where the videotape equipment was stationed.
The remainder of the fieldhouse was designated as practice
area for the rest of the class. The instructor marked out
an area, drawing two lines on the ground at right angles
about thirty feet from the videotape equipment. The student
was instructed that he would be televised from two angles.
He would first hit three plastic balls with the television
camera recording a front view and would then change position
to hit away from the camera, again hitting three balls.

While the student was performing, the instructor recorded verbal comments concerning the student's performance into the videotape recorder. After videotaping four or five students, the instructor would gather them around the television monitor and each student would view his video replay and hear the instructor's comments. The video replay was played a second time, this time with live verbal comments by the instructor and with the use of slow motion, stop, and rewind actions to point out particular movements.

During the quarter each student in the experimental group was videotaped three times, using the procedure as described above.

Treatment of Control Group by Instructor

The instructor used the same instructional procedures for both the control and experimental groups. However, the control group was not allowed to view their replay. The students were televised on three occasions but had to recall a mental image of their performance as the instructor held a verbal critique for them.

VI. CONTROLS

Several variables had to be controlled to insure that only the videotape replay would be different between the control and experimental groups.

Instructor Bias

The instructor was not involved in the administration of either the pre- or post-skill tests. Both classes were taught by the same instructor, and the students of physical education methods were not allowed to sign up for these classes, in order to prevent contamination of instruction. Identical teaching techniques were used in both classes.

Administering Skill Test

All scores recorded were direct measurements, and each testor was instructed as to how measurements were to be taken and recorded.

Magnitude of Error of Timer

A test was administered to determine the error of the testor operating the stop clock. A building was selected, and its height was measured. The clock operator timed the flights of fifty golf balls from the moment of release from the top of the building until the moment of impact with the ground. The formula $T^2 = \dfrac{S}{\frac{1}{2}g}$ was used to determine the time of flight of a falling object from a known height, and this factor was compared with the times as measured by the clock operator.

VII. ANALYSIS OF THE DATA

It was assumed but not verified that students in

both the control and experimental groups were equal in golf skills at the outset of the experiment. For this reason, the Kruskal-Wallis One-Way Analysis of Variance by Ranks, which was applied to the difference scores of both groups taken together, was used to test the first hypothesis in terms of range, time in flight, and deviation.

The second hypothesis was tested by using the Kolmogorov-Smirnov Goodness of Fit Test.

The third hypothesis was tested by correlating the criterion scores of Morrow and this writer's combined experimental and control groups against successively accumulated individual scores; i.e., one, one plus two, one plus two plus three, one . . . four, up to nine. The Predictive Index was used to select the trial at which the criterion test could best be shortened (3:430-431).

CHAPTER IV

ANALYSIS OF RESULTS

The findings of the study are reported in this
chapter.

The purposes of this study were stated as research
or operational hypotheses, as follows: (1) that students
who view videotape replays of their own performances (the
experimental group) will significantly outscore students
who do not view their own videotaped performances (the con-
trol group); (2) that students viewing their own videotaped
performances will display positive attitudes toward this
experience at a statistical level significantly higher than
could be attributed to chance; and (3) that McKee's test
can be reduced in number of trials from ten, as prescribed,
without appreciable loss of reliability. Findings of the
study are presented in the order shown above.

I. STATISTICAL COMPARISONS

The McKee test used as the criterion of golf skill
produces three separate scores for each performer, which
are: range, deviation, and time in flight. Differences in
variance between groups were analyzed by means of the
Kruskal-Wallis One-Way Analysis of Variance by Ranks test,
which produces the statistic termed H. The use of H makes

it unnecessary to equate groups at the outset of an experiment, as previously described in Chapter III. Differences between means within groups were analyzed by the t ratio for significance of difference between means of correlated groups utilizing a one-tailed test.

Kruskal-Wallis H Test

Range. For each participant in both the control and experimental groups, the difference was calculated between T_1 and T_2. Next, these scores were ranked from poorest or least improved, with a rank of 1, to most improved, which received the highest rank. The ranking process was accomplished by considering both difference distributions as one. The resultant R values were 565.5 and 562.5 for control and experimental groups, respectively. The H value was calculated to be -8.59, indicating that in range both groups belonged to the same population; i.e., the minor differences in range scores could be attributed to chance. This is presented in Table II.

Deviation. The R values calculated for the control and experimental groups, respectively, were 569.0 and 559.0. The H value was -8.60. This meant that in deviation or error from the intended line of flight, both groups could be considered equal, and minor fluctuations could be attributed to chance. Table III presents this material.

Time in flight. The R values for control and experimental groups were 521 and 607, respectively. The H Statistic was -7.35. Thus, both groups were statistically equal in this variable, the minor variations between them being associated only with chance. Table IV presents the data.

Based on the information discussed above, it is concluded that minor differences between groups in range, deviation, and time in flight must be attributed solely to chance.

The t Ratio Test for Significance of Difference Between Means

In an effort to determine whether improvements were statistically significant among the control and experimental subjects, t ratio tests for significance of difference between correlated means were calculated for range, deviation, and time in flight. Score improvements only were considered to be worthwhile; therefore, no t ratio was calculated in the two instances where loss in mean score from T_1 to T_2 occurred. The one-tailed t was utilized.

TABLE II

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE BY RANKS
INTER-GROUP COMPARISONS:
RANGE

| | CONTROL GROUP | | | | EXPERIMENTAL GROUP | | |
T_1	diff	T_2	RANK	T_1	diff	T_2	RANK
56.1	−17.5	38.6	1.0	71.8	−15.7	56.1	2.0
57.6	−12.8	44.8	3.0	73.7	−12.7	61.0	4.0
56.6	−11.0	45.6	6.0	77.6	−11.4	66.2	5.0
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
28.3	16.2	44.5	42.0	29.6	21.2	50.8	44.0
53.4	16.3	69.7	43.0	43.4	29.6	73.0	46.0
52.8	24.9	76.9	45.0	26.0	33.1	59.1	47.0
		R = 565.5					R = 562.5

To determine the value of H the following formula
was computed:

$$H = \frac{12}{N(N+1)} \sum \frac{R_j^2}{N_j} - 3(N+1)$$

$$H = \frac{12}{2256} \left[\frac{319790}{24} + \frac{316406}{23} \right] - 144$$

H = −8.59   No significant difference

H must be 3.83 to be significant at .05 l/c.

TABLE III

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE BY RANKS
INTER-GROUP COMPARISONS:
DEVIATIONS

	CONTROL GROUP				EXPERIMENTAL GROUP		
T_1	diff	T_2	RANK	T_1	diff	T_2	RANK
4.2	-13.0	17.2	1.0	4.2	-6.2	10.4	3.0
6.1	- 8.4	14.5	2.0	6.9	-3.9	10.8	6.0
3.0	- 5.8	8.8	4.0	7.2	-3.4	10.6	7.0
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
9.6	5.6	4.0	45.0	10.8	4.6	6.2	41.0
11.3	8.0	3.3	46.0	7.8	5.3	2.5	43.0
12.3	8.7	3.6	47.0	9.6	5.4	4.2	44.0
			R = 569.0				R = 559.0

To determine the value of H the following formula
was computed:

$$H = \frac{12}{N(N+1)} \sum \frac{R_j^2}{N_j} - 3(N+1)$$

$$H = \frac{12}{2256} \left[\frac{323761}{24} + \frac{312481}{23} \right] - 144$$

H = -8.60 No significant difference

TABLE IV

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE BY RANKS
INTER-GROUP COMPARISONS:
TIME IN FLIGHT

CONTROL GROUP				EXPERIMENTAL GROUP			
T_1	diff	T_2	RANK	T_1	diff	T_2	RANK
1.900	-.896	1.004	1.0	1.440	-.596	.844	2.0
1.271	-.509	1.780	4.0	1.290	-.546	.744	3.0
1.899	-.471	1.428	5.0	1.290	-.240	1.050	6.0
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	°	.	.	.	.	.	.
.615	.763	1.378	38.0	1.184	1.276	2.460	45.0
1.239	.823	2.062	39.0	1.276	1.329	2.605	46.0
1.230	.274	2.504	44.0	1.754	1.921	2.675	47.0
			R = 521.0				R = 607.0

To determine the value of H the following formula
was computed:

$$H = \frac{12}{N(N+1)} \sum \frac{R_j^2}{N_j} - 3(N+1)$$

$$H = \frac{12}{2256} \left[\frac{271441}{24} + \frac{368449}{23} \right] - 144$$

H = -7.35 No significant difference

Range. Subjects in the experimental group improved in range, or distance the ball was hit, from a mean of 52.04 feet to 55.00 feet at T_2. The correlation between the T_1 and T_2 trials was .94. The t ratio was 3.62, significant at well beyond the .001 level of confidence. The control group averaged a lesser distance at T_2 than at T_1 and was therefore not subjected to further analysis. The statistical information for the two groups in range, deviation, and time in flight appears in Table V.

Deviation. Means of both groups improved from T_1 to T_2 as shown by diminished magnitude of error or deviation. The experimental group improved by .61 foot and the control group by .25 foot. T_1 to T_2 correlations were .83 and .73, respectively, and the t ratios were .88 and 1.22, respectively. Neither was statistically significant.

Time in flight. The mean of the experimental group increased from 1.213 seconds at T_1 to 1.704 seconds at T_2. The correlation between T_1 and T_2 was .45 and the t ratio was 2.95, significant at well beyond the .01 level of confidence. The control group's T_1 mean was superior to its T_2 mean, so no further analysis was carried out. Thus, the experimental group was able to hit the ball in such a way as to keep it in the air for a time significantly longer at T_2 than at T_1.

TABLE V

SIGNIFICANCE OF DIFFERENCES BETWEEN MEANS
INTRA-GROUP COMPARISONS

	M_1	M_2	diff	r	SE diff	df*	$\underline{t}$
RANGE							
Experimental Group	52.04	55.00	2.96	.94	.818	44	3.62
Control Group	55.25	49.13	-6.12	---	---	---	---
DEVIATION							
Experimental Group	7.90	7.29	.61	.83	.694	44	.88
Control Group	8.33	8.08	.25	.73	.205	46	1.22
TIME IN FLIGHT							
Experimental Group	1.213	1.704	.491	.45	.166	44	2.95
Control Group	1.705	1.559	-.146	---	---	---	---

*In order to be significant the $\underline{t}$ ratio must be 1.684 at the .05 level of confidence and 2.423 at the .01 level of confidence, for 44 df for a one-tailed statistical test.

As explained in Chapter III, an estimate of the reliability of the clock operator to judge time in flight of a ball was calculated by releasing 50 golf balls, one at a time, from an upper story window in Muzzall Hall on the Central Washington State College campus. The mean and standard deviation of the operator's judgment was 2.042 seconds $\pm$ .077. The free fall time was 2.031 seconds, calculated from the following formula:

$$T^2 = \frac{S}{\frac{1}{2}g} \quad \text{where:} \quad S = \text{space or distance of fall}$$
$$g = \text{gravity } (32'/\text{sec}/\text{sec})$$

Ninety-five per cent of the time the operator's judgment was calculated to be between 1.891 and 2.193 seconds. The operator's mean judgment time represented a positive error of .54%, calculated from the following formula:

$$\text{Percentage of error} = \frac{\text{Operator's time} - \text{True time}}{\text{True time}} \times 100$$

As a further illustration of the accuracy of the operator's judgment the following calculation was performed, based on the time in flight data for the experimental group, Table V:

The M_1 score was increased by .54% and the M_2 score was decreased by the same amount, thereby reducing the difference between the two to .476 from .491. Assuming no change in SE diff the $\underline{t}$ ratio was reduced from 2.95 to 2.87, which was still significant at better than the .01 level of

confidence. Although no such assumption of no change in the value of SE diff is legitimate, a lack of data makes any other assumption equally invalid.

As would be expected, the experimental group improved in all three tests from T_1 to T_2, two of them at statistically significant levels. The control group improved only in deviation, but not significantly so. Neither the writer nor the instructor is able to explain the failure of the control group to improve from T_1 to T_2.

II. ATTITUDE SCALE EVALUATION

To test the null hypothesis of no difference utilizing Morrow's attitude scale, the Kolmogorov-Smirnov goodness of fit test was applied. The attitude scale places emphasis upon the feelings of the subjects toward being televised and their reaction to the replays as an aid to learning golf skills. The Kolmogorov-Smirnov test focuses upon the greatest deviation from chance expectation.

In this section of the thesis, each question to which members of the experimental group responded is listed at the top of the respective table, after which the work appears which summarizes the responses and tests the significance of departure from chance expectation. In a brief section which follows will be found a discussion of the D value in terms of the question asked.

TABLE VI

KOLMOGOROV–SMIRNOV GOODNESS OF FIT TEST APPLIED TO
THE ATTITUDINAL QUESTIONNAIRE RESPONSES

1. The opportunity to observe and listen to a videotape replay was helpful to
   me in improving my golf skills.

*DVS	DS	D	A	AS	AVS		
0	0	0	3	14	6	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$	$F_o(X)$	
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{0}{23}$	$\frac{3}{23}$	$\frac{17}{23}$	$\frac{23}{23}$	$S_n(X)$	
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{12.32}{23}$	$\frac{2.15}{23}$	0	$F_o(X) - S_n(X)$	
.170	.333	.500	.535	.098	0	$D = \frac{diff}{total}$	

*DVS = Disagree very strongly, DS = Disagree strongly, D = Disagree
 AVS = Agree very strongly, AS = Agree strongly, A = Agree

The responses above indicate a strong tendency to accumulate on the agree
side. This test puts focus on the greatest deviation from chance, which is .535.
This figure is significant at the .01 level of confidence, indicating the help-
fulness of the videotape in improving personal golf skills.

TABLE VI (continued)

2. The critique, provided by the instructor, accompanying the videotape replays, was valuable in improving my golf skills.

DVS	DS	D	A	AS	AVS		
0	1	0	2	14	6	$N = 23$	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		$F_o(X)$
$\frac{0}{23}$	$\frac{1}{23}$	$\frac{1}{23}$	$\frac{3}{23}$	$\frac{17}{23}$	$\frac{23}{23}$		$S_n(X)$
$\frac{3.83}{23}$	$\frac{6.66}{23}$	$\frac{10.49}{23}$	$\frac{12.32}{23}$	$\frac{2.15}{23}$	$\frac{0}{23}$		$F_o(X) - S_n(X)$
.170	.289	.456	*.535	.093	0		$D = \frac{diff}{total}$

*The greatest deviation from chance is at the agree column. The D value of .535 is significant at the .01 level of confidence, which justifies the instructor critique which accompanied the videotape.

TABLE VI (continued)

3. The experience of being televised and having my replays analyzed was an enjoyable experience.[a]

DVS	DS	D	A	AS	AVS		
7	0	1	0	13	2	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		$F_0\,(X)$
$\frac{7}{23}$	$\frac{7}{23}$	$\frac{8}{23}$	$\frac{8}{23}$	$\frac{21}{23}$	$\frac{23}{23}$		$S_n\,(X)$
$\frac{3.17}{23}$	$\frac{.66}{23}$	$\frac{3.49}{23}$	$\frac{7.32}{23}$	$\frac{1.85}{23}$	0		$F_0\,(X) - S_n\,(X)$
.135	.029	.151	*.318	.080	0		$D = \frac{diff}{total}$

*Significant at the .05 level of confidence.

[a]As the subjects were completing the attitude scale several negative responses were noted. Upon inquiry it was stated that the television experience was enjoyable but embarrassing to the lesser-skilled who did not want others to view them.

The respondents indicated at a statistically significant level that being televised and having their replays analyzed was enjoyable.

TABLE VI (continued)

4. The opportunity to see my golf swing errors was made more meaningful using videotape replays, with instructor critique, than just being told about my golf swing errors.

DVS	DS	D	A	AS	AVS		
0	0	0	2	14	7	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$	F_o (X)	
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{0}{23}$	$\frac{2}{23}$	$\frac{16}{23}$	$\frac{23}{23}$	S_n (X)	
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{13.32}{23}$	$\frac{3.15}{23}$	0	F_o (X) - S_n (X)	
.170	.33	.500	*.579	.137		$D = \frac{diff}{total}$	

*Significant at the .01 level of confidence.

Here the respondents indicated, at a highly significant level of confidence, that first-hand viewing of mistakes along with the critique by the instructor was much more meaningful than merely being informed of errors.

TABLE VI (continued)

5. The experience of watching my fellow student's replay, with instructor critique, has helped me improve my golf skills.

DVS	DS	D	A	AS	AVS		
0	0	1	13	8	1	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		F_o (X)
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{1}{23}$	$\frac{14}{23}$	$\frac{22}{23}$	$\frac{23}{23}$		S_n (X)
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{10.49}{23}$	$\frac{1.32}{23}$	$\frac{2.85}{23}$	0		F_o (X) $-$ S_n (X)
.170	.333	*.456	.057	.124			$D = \frac{diff}{total}$

*Significant at the .01 level of confidence.

In this question the students indicated at a highly significant level that watching the errors of another student, with the accompanying instructor critique, was helpful in improving golf skills.

TABLE VI (continued)

6. I recommend the videotape experience of seeing oneself be provided with an instructor critique.

DVS	DS	D	A	AS	AVS		
0	0	0	7	11	5	$N = 23$	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		F_o (X)
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{0}{23}$	$\frac{7}{23}$	$\frac{11}{23}$	$\frac{5}{23}$		S_n (X)
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{8.32}{23}$	$\frac{1.15}{23}$	0		F_o (X) $-$ S_n (X)
.170	.333	*.500	.362	.050			$D = \frac{\text{diff}}{\text{total}}$

*Significant at the .01 level of confidence.

The participant response on this question constitutes statistically significant endorsement to a fellow student of the experience of seeing oneself, accompanied by instructor critique.

TABLE VI (continued)

7. I recommend the videotape experience of seeing oneself be provided without instructor critique.

DVS	DS	D	A	AS	AVS		
4	6	13	0	0	0	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		F_0 (X)
$\frac{4}{23}$	$\frac{10}{23}$	$\frac{23}{23}$	$\frac{23}{23}$	$\frac{23}{23}$	$\frac{23}{23}$		S_n (X)
$\frac{.17}{23}$	$\frac{2.34}{23}$	0	0	0	0		F_0 (X) $-$ S_n (X)
.007	.102	*1.0					$D = \frac{\text{diff}}{\text{total}}$

*Significant at the .01 level of confidence.

This question identifies the part played by the verbal critique in the video replay experience. At a highly significant level, the critique is identified as a necessary part of the experience.

TABLE VI (continued)

8. I recommend that students have the opportunity of seeing a fellow student's videotape replay with instructor critique.

DVS	DS	D	A	AS	AVS		
0	0	1	12	7	3	$N = 23$	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		F_o (X)
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{1}{23}$	$\frac{13}{23}$	$\frac{20}{23}$	$\frac{23}{23}$		S_n (X)
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{10.49}{23}$	$\frac{2.32}{23}$	$\frac{.85}{23}$	0		F_o (X) – S_n (X)
.170	.333	*.456	.101	.037			$D = \frac{diff}{total}$

*Significant at the .01 level of confidence.

The response to this question recommends at a highly significant level, that students be allowed to see fellow students in action on the video replay, accompanied by instructor critique.

TABLE VI (continued)

9. I recommend to my friends the experience of seeing oneself on videotape replay, with instructor critique.

DVS	DS	D	A	AS	AVS		
0	0	0	7	12	4	N = 23	Observed
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{15.32}{23}$	$\frac{19.15}{23}$	$\frac{22.98}{23}$		$F_o (X)$
$\frac{0}{23}$	$\frac{0}{23}$	$\frac{0}{23}$	$\frac{7}{23}$	$\frac{19}{23}$	$\frac{23}{23}$		$S_n (X)$
$\frac{3.83}{23}$	$\frac{7.66}{23}$	$\frac{11.49}{23}$	$\frac{8.32}{23}$	$\frac{15}{23}$	0		$F_o (X) - S_n (X)$
.170	.333	*.500	.362	.007			$D = \frac{diff}{total}$

*Significant at the .01 level of confidence.

This question recommends, at a highly significant level, that one's friends have the experience of viewing the video replay, with instructor critique.

III. REDUCTION OF McKEE'S TEST

McKee's test requires ten trials for each golfer in order to establish a score for range, for deviation, and for time of flight of the ball. Experience with the test, both in this study and in Morrow's which preceded it, confirm its usefulness. It is, however, quite time-consuming and perhaps unnecessarily so. It was thought that if the number of trials could be reduced per golfer without appreciably reducing the reliability of the test, this might contribute to a more widespread use of the test.

The reduced test would doubtless have two important uses in the Central Washington State College Department of Physical Education. One, it could serve as an important criterion of skill and in turn become one basis for a class mark. Two, it would serve to screen out those with golf ability who challenge the course. In both cases it would be used to assess ability following, rather than preceding, attendance in the course.

In order to accomplish the process of reducing the ten trials, zero-order correlations were calculated for range and for deviation, based on both experimental and control groups (treated separately) from the data of the present study as well as that of Morrow. For each individual in the two experimental groups, his trial one score

for range was correlated with his mean score for range;
i.e., $M = \sum 10/10$. This process was used for his deviation
score also and the same process was followed for each indi-
vidual in the two control groups. The next correlation was
the mean of trials one and two with the mean of ten. The
next correlation was the mean of trials one, two, and
three with the mean of ten. This process of accumulating
trials successively continued through trial nine. Table
VII shows the correlations of these trials with the mean
of ten for both experimental and control groups, for range.
Table VIII is the same table but for the deviation corre-
lations.

As can be seen by an examination of Tables VII and
VIII, both for control and experimental groups, the r's
increased in magnitude in a rather orderly progression, in
most cases, as would be expected. Thus, the more trials
that were averaged and correlated with the mean of ten, the
higher the relationship. This stairstep progression of
relationship necessitated a decision as to the point at
which no further trials would be added.

Clarke (3:430-431) suggested for such a problem the
use of the predictive index, referred to by some statisti-
cians as an index of forecasting efficiency. It converts
the correlation coefficient into a percentage by means of
the following formula:

$$\text{Predictive Index} = 1 - \sqrt{1 - r^2}$$

It was obvious by inspection of Tables VII and VIII that more than four trials would be required. At the same time, however, there was understandable reluctance to go as high as eight or nine trials. It was decided to base the decision as to selection of the last trial largely on the percentage amount by which the addition of successive trials increased, coupled with a diminished percentage amount upon the addition of another trial. The percentage of increase was computed by the following formula:

$$\text{Percentage increase} = \frac{\text{high PI} - \text{low PI}}{\text{low PI}} \times 100$$

In Table VII it is seen that the correlation of .88 is .03 greater for trial 1 . . . 5 than the r of .85 for trial 1 . . . 4 for the control group. The respective predictive indexes were .525 and .473, and the percentage increase amounted to 10.9%. The addition of a trial (1 . . . 6) raised r to .98, the predictive index to .801, and amounted to a percentage increase of 52.2%. Successive r's were lower, so the process was stopped for this group and this variable at trial six.

TABLE VII

CORRELATION OF SUCCESSIVE ACCUMULATED TRIALS
WITH [a]CRITERION SCORE:
RANGE

	CONTROL GROUP				EXPERIMENTAL GROUP		
r	PI	[b]% increase	Trials		r	PI	% increase
.62	.216	–	1		.50	.134	–
.74	.327	–	1 + 2		.40	.083	–
.79	.387	–	1...3		.70	.286	–
.85	.473)		1...4		.79	.387)	
.88	.525)	10.9	1...5		.86	.490)	26.6
.98	.801)	52.2	1...6		.93	.632)	28.9
.93	.632	–	1...7		.95	.688)	8.8
.90	.564	–	1...8		.96	.720	–
.95	.688	–	1...9		.99	.859	–

N = 44

[a]Criterion score = the sum of 10 trials divided by 10.

[b]% increase = $\dfrac{\text{high PI} - \text{low PI}}{\text{low PI}} \times 100$.

TABLE VIII

CORRELATION OF SUCCESSIVE ACCUMULATED TRIALS
WITH [a]CRITERION SCORE:
DEVIATION

	CONTROL GROUP		Trials	EXPERIMENTAL GROUP		
r	PI	[b]% increase		r	PI	% increase
.38	.072	-	1	.40	.083	-
.50	.134	-	1 + 2	.50	.134	-
.62	.216	-	1...3	.68	.267	-
.80	.400)		1...4	.79	.387)	
		26.7				18.1
.87	.507)		1...5	.84	.457)	
		15.4				14.8
.91	.585)		1...6	.88	.522)	
		17.6				11.0
.95	.688)		1...7	.91	.585)	
		10.0				17.6
.97	.757)		1...8	.95	.688)	
.99	.859	-	1...9	.97	.757	-

N = 44

[a]Criterion score = the sum of 10 trials divided by 10.

[b]% increase = $\dfrac{\text{high PI} - \text{low PI}}{\text{low PI}}$ x 100.

In Table VII the correlation at trial 1 . . . 5 was
.86 and at trial 4, .79, an increase of .07. The predictive
indexes in the same order were .490 and .387, and the
increase in percentage by adding the fifth trial was 26.6%.
The addition of trial six raised r to .93, a gain of .07.
The predictive index raised to .632 which was a 28.9%
increase. The addition of trial seven raised r by only .02,
the predictive index to .688 and the percentage increase by
only 8.8%. Thus, because trial seven represented a diminish-
ing return for the additional time and effort expended, six
trials will henceforth be used in the range test.

Academically speaking, a process identical to that
just described was followed in selecting the final trial
for the deviation score, as seen in Table VIII. In actu-
ality, both range and deviation scores result from each
trial, so since trial six had been selected from the range
data, the deviation score would also be based on six trials
in the future, unless convincing evidence to the contrary
emanating from the deviation data dictated that both range
and deviation should be selected in the future from a dif-
ferent total number of trials. The latter was not the case,
however, and the decision to choose trial six for the devia-
tion score seems sound as seen by an inspection of the
increases in predictive index and in percentage of increase
in successive predictive indexes.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY AND CONCLUSIONS

It was hypothesized at the outset (1) that begin-
ning golf students who viewed their own videotaped replays
would significantly outscore students who did not view
their replays; (2) that students who viewed their own
videotaped replays would display positive attitudes toward
this experience at statistical levels exceeding reasonable
accountability by chance; and (3) that the criterion test
of golf skill could be reduced in number of trials without
appreciable loss of reliability.

Intra-Group Statistical Comparisons

Comparisons between the two groups were made by use
of the Kruskal-Wallis one-way analysis of variance by ranks
test. Application of this test to the difference scores
for range, deviation, and time in flight for the two groups
indicated that both groups could be considered from the same
population in all three variables and therefore that differ-
ences in variance were transient and chance-related.

Inter-Group Statistical Comparisons

The t ratio test of significance between correlated
groups was utilized to test the M_1 to M_2 changes in range,

deviation, and time in flight. In range the experimental group hit the ball farther at M_2 than at M_1, the difference being statistically significant. The control group regressed and, because of there being no interest in loss of proficiency, were not further analyzed.

Both groups improved in deviation but neither group significantly.

The experimental group increased significantly their mean time in flight, but the control group again regressed and was not further analyzed.

Magnitude of Error of Timer

The operator of the millisecond clock was found to be remarkably accurate in judging time of flight. His error was calculated to be +.54%.

Attitude Scale

As anticipated, students who had viewed a videotaped replay of themselves believed that the experience was beneficial. In each of nine questions the responses exceeded chance expectation at better than the .01 level of confidence with one exception where the level reached was .05.

Reduction of McKee's Golf Skills Test

By use of zero-order correlations it was determined that the mean of six trials was optimally related to the

mean of ten trials (the criterion) when test administration times were mutually considered. The judgment was based on r's converted to predictive indexes and on the percentage increase in predictive efficiency resulting from successively adding trials. The correlation of the mean of six trials with the mean of ten trials accounted for anywhere from 75% to 96% of the variance in the test.

II. CONCLUSIONS

The results from Chapter IV have resulted in the following conclusions.

1. The viewing of one's own videotape replays as compared to not viewing the replays showed no significant difference between the two in any of the tests used.

2. Beginning golf students have a favorable attitude toward use of videotape replays in aiding them to learn and perform golf skills.

3. The criterion skill test may be shortened to six trials and still be adequately reliable.

III. RECOMMENDATIONS FOR FURTHER RESEARCH

1. Angle of impact of the ball was not computed in this study and should possibly be included in future studies.

2. An attempt should be made to validate the attitude scale.

3. The correlations of the accumulated mean scores against the criterion score were based on a limited number of subjects. Future studies may wish to add to the total number of scores, to further validate the shortening of the criterion test.

4. If videotape replays are to be used more in physical education, more studies of this nature are needed. Only through research and proper evaluation can the true judgment of worth be placed on such an instructional aid.

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