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The Effectiveness of Two Types of Visual Feedback on Performance of Selected Uneven Parallel Bar Skills

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THE EFFECTIVENESS OF TWO TYPES OF VISUAL FEEDBACK ON PERFORMANCE OF SELECTED UNEVEN PARALLEL BAR SKILLS

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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WDM

This study is dedicated

to my

MOTHER AND FATHER

who made my education possible

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The purpose of this study was to determine the effectiveness of two types of visual feedback on performance of selected uneven parallel bar skills. The subjects were 30 female college undergraduates enrolled in gymnastics and tumbling courses in the Fitness and Lifetime Activities Program (non-majors) or the Professional Skills Program (HPER majors) at South Dakota State University. Videotape replay feedback and teacher demonstration feedback were assigned to the two experimental groups with the third group serving as the control. Treatment for the experimental subjects consisted of videotape replay of skill performance for one group and teacher demonstration of the skill for the other group. Data analysis included judge objectivity among the raters, reliability and reproducibility assessments, and a one-way analysis of variance to determine whether significant mean changes had occurred between the groups. All statistical tests were conducted at the .05 level. A high level of objectivity was found between the raters. Reliability coefficients and reproducibility of the data were generally high for the ratings. Nonsignificant F-ratios were found between the groups. Therefore, within the constraints of this study it did not appear that the use of videotape replay had an effect on the performance of uneven parallel bar skills.

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CHAPTER I

INTRODUCTION

Significance of the Study

In order to facilitate effective and efficient learning of motor skills, physical educators have been searching for different methods of instruction. With the advancement of modern technology the development of audiovisual equipment has been added to the variety of instructional aids available to the practitioner.

Research has been conducted using a variety of audiovisual aids in the instruction and acquisition of motor skills. During the instruction of motor skills audiovisual aids have been used to provide the learner with expert demonstrations of the skill. Motion pictures and loop films have been utilized providing the learner with visual demonstrations of skills in tumbling, bowling, and badminton. (4:307, 5:569, 18:187)

Additionally, audiovisual aids have been utilized during the acquisition of motor skills providing the learner with greater insight into their performances of the prescribed skills. The use of motion pictures and graph-check-sequence pictures have been used to facilitate the learning of baseball and golf skills. (33:594, 36:232)

In more recent years, the use of the videotape replay unit (VTR) has been used to provide students with immediate knowledge (feedback) of skill performance. Studies have been conducted using the VTR

in various gymnastics, badminton, archery, baseball, and swimming skills. (2:38, 15:669, 24:433, 25:34, 30:46, 29:1060, 36:502)

Cratty has suggested that the development of videotape feedback systems and their minimal comparative cost have encouraged physical educators and coaches to employ them when teaching motor skills. (7:155) The importance of the VTR is that it provides the learner with immediate knowledge of performance or feedback concerning his performance. Penman observed that this device can be used as a medium to provide immediate reinforcement or feedback in the instruction of motor skills. (10:45) Drowatzky emphasized the importance of feedback in learning when he stated that without feedback any change in performance would be impossible. (9:99)

Research concerning the actual value of the use of audiovisual aids in the learning of motor skills has presented controversial results. The present investigator decided to investigate the effectiveness of the VTR in the acquisition of selected uneven parallel bar gymnastics skills.

Statement of the Problem

The purpose of this study was to compare the effectiveness of two types of visual feedback on the performance of selected uneven parallel bar skills.

Hypothesis

It was hypothesized that there will be no significant difference in performance attained on selected uneven parallel bar skills between members of the three groups.

Scope of the Study

This experiment was conducted at South Dakota State University, Brookings, South Dakota, during the spring semester of 1978. The subjects in this study were 30 female students who were currently enrolled in gymnastics and tumbling courses in the Fitness and Lifetime Activities Program (non-major students) and the Professional Skills Program (HPER major students). The subjects were selected on a voluntary basis and received instruction during 12 individual class periods over a period of three weeks.

The HPER major students (n = 20) were pre-tested twice prior to the treatment period and were then assigned to one of two experimental groups. Subjects who were assigned to experimental group one (n = 10) received VTR feedback during the treatment period. Subjects who were assigned to experimental group two (n = 10) received teacher demonstration visual feedback during the treatment period.

The non-major students (n = 19) were also pre-tested twice prior to the treatment period. Subjects (n = 10) with scores similar to the scores of the subjects of the two experimental groups were then matched and assigned to the control group. Members of the control

group did not receive any treatment during the three week treatment period.

Limitations

In conducting this study the following limitations were recognized:

1. The initial skill levels of the subjects were highly variable.

2. The subjects' motivation or desire to learn was not measureable.

3. No attempt was made to control outside activities of the subjects.

4. The members of the three groups were college female students.

Terminology

The following terms were defined for use in this study:

Audiovisual aids. Audiovisual aids pertain to educational materials such as filmed, taped, or televised presentations, that present information in both audible and visible form. (17:14)

Feedback. Feedback is a return of part of the output, or response, to the input which may lead either to a revision of the response just made or to a confirmation of the response as being correct. (9:85)

Front support position. While in the front support position the body is in a state of balance on the low bar. The arms are fully

extended, the hands are grasping the bar with a regular grip, and the bar is resting on the front of the thighs.

HPER major students. HPER major students are those who were registered at South Dakota State University as majors in Health, Physical Education, and Recreation during the spring semester of 1978, and were required to take a one semester course in gymnastics and tumbling skills.

Knowledge of results. Knowledge of results is the process through which information about one's performance is provided to the learner's senses or is modified or supplemented and thereby is a factor in determining subsequent action. (9:218)

Mixed grip. Mixed grip refers to a type of hand grip on the bar in which one hand has a regular grip while the other hand has a reverse grip.

Non-major students. Non-major students are those who were registered at South Dakota State University as majors in areas other than Health, Physical Education, and Recreation during the spring semester of 1978. These students were required to enroll in two courses in the Fitness and Lifetime Activities Program, and chose to register for a course in gymnastics and tumbling skills.

Regular grip. Regular grip refers to a type of hand grip on the bar in which both hands are grasping the bar with the back of the hands facing toward the individual and the thumbs hooked around the bar.

Reverse grip. Reverse grip refers to a type of hand grip on the bar in which both hands are grasping the bar with the palms of the hands facing toward the individual and the thumbs hooked around the bar.

Pendulum swing. Pendulum swing refers to a swinging body which undergoes partial rotation about a center of rotation. (5:434)

Videotape replay unit (VTR). The videotape replay unit is an audiovisual aid consisting of a video camera, video recorder, and closed circuit television used to visually record and immediately reproduce movements on magnetic tape.

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of related literature was conducted in areas pertinent to this study to increase the present writer's understanding of the design and procedures required for the conduct of this study. The review of related literature was conducted in four areas: the role of feedback in motor learning, studies in the use of audiovisual aids in motor skill acquisition, knowledge of mechanical principles in the learning of motor skills, and rating scale construction.

The Role of Feedback in Motor Learning

Oxendine recommended that the physical educator should possess a thorough knowledge of the learning process in order to enhance the efficiency of teaching motor skills. (27:5) In order to maximize efficiency and effectiveness of learning during the instruction of motor skills, different areas related to the learning process, the learner, and conditions for learning have been investigated. An important consideration in the teaching of motor skills is the type of information given to the student concerning performance. (19:99) This is often referred to as knowledge of performance, knowledge of results, or feedback. (27:56) Singer defined feedback as information the individual receives from his performance which allows him to profit from his experience. (32:42)

In emphasizing the importance of feedback in the acquisition of motor skills, Drowatzky stated:

> The learning of a motor skill involves receiving input about a past situation, processing the information and its meaning, forming a response, and finally evaluating the effects of one's response. After the evaluation of the response is completed, judgements are formed concerning the response and the need for modifications in future responses. In order to perform this evaluative process, information in the form of feedback is required. (9:85)

Feedback can be acquired in different ways. In the performance of many motor skills, feedback is received through internal sources. This type of feedback is defined as information which is naturally present in a task, and is termed intrinsic feedback. (9:89) Examples of intrinsic feedback may be observed in the basketball player visually sensing the ball successfully going through the hoop and the bowler seeing all the pins being struck down. This type of feedback provides immediate knowledge of success or failure.

In some motor skills it is beneficial to the performer to obtain feedback from external sources such as instructors or audiovisual aids. Skills such as swimming and gymnastics offer a limited amount of visual information or intrinsic feedback. Therefore, an external source can be useful in providing information concerning skill performance. This type of feedback is often referred to as artificial or augmented feedback. (9:89)

Feedback can also be considered in a temporal sense during skill acquisition. Information provided to the performer during the performance phase of the skill is termed, concurrent feedback. This type of feedback includes information present throughout the

performance of the skill. If information concerning performance is withheld until the task completion phase of instruction or following performance, it is described as terminal feedback. (9:89)

In order for the feedback provided to the learner to be most effective it should conform to certain guidelines. Oxendine stated that feedback must be meaningful to the learner, specific in nature, and presented closely following skill performance. (27:58)

Audiovisual Aids in Motor Skill Acquisition

Brumbach and Gray investigated the use of loop films as a supplemental aid in the teaching of badminton skills. The purpose of this investigation was to determine the effect of daylight projection of loop films on the badminton playing ability of male college students. The subjects in this study were 60 male undergraduates enrolled in four beginning badminton classes at the University of Oregon. Classes were conducted three times per week for a 10 week period.

Except for the viewing of the loop films by the experimental group, both groups were taught in the traditional manner, which consisted of explanation, demonstration, and practice of the skills.

These investigators concluded that: (1) the use of loop films was a practical aid for teaching badminton skills, (2) the viewing of loop films appeared to hasten the learning of the subjects, and (3) an early learning advantage gained by the subjects who viewed the loop films was not maintained as they continued to play badminton. (5:569)

Watkins attempted to evaluate the effectiveness of motion pictures as an instructional aid in the correction of batting faults among baseball players. The subjects for this study included 20 members of the varsity baseball squad at the State University of Iowa.

The subjects were filmed on three separate occasions for evaluation purposes. They were subsequently placed in rank order according to scores received on the initial test, and were randomly assigned to either the control group or the experimental group. Members of the experimental group viewed the most recent films of their batting techniques once per week. The film was shown entirely without interruption, then reshown and each subject's batting faults were identified and instruction for their remediation was given. Each member of the experimental group received three minutes of instruction during the film viewing. During the regular batting practice period both groups received an equal amount of batting instruction.

The investigator concluded that: (1) the subjects who viewed motion pictures made improvements in the correction of batting faults, (2) the use of motion pictures is of value as a mode of instruction for highly skilled performers, and (3) the greatest number of batting errors were corrected for the experimental group during the initial three weeks of instruction. (36:232)

Thompson conducted an investigation using graph-check-sequence pictures as an instructional aid in the teaching of selected golf skills. The purpose of this study was to analyze the effect of

immediate external feedback in the learning of the golf drive and the five-iron approach shot.

Eighty university females who met the criterion for beginning level golfers were subjects in this study. Subjects participated during an 11-week period with three hours per week given to class instruction.

Prior to the instruction, the Scott Motor Ability Test was administered to each student. The control group and the experimental group of each class received identical instruction and practice time; however, the graph-check-sequence camera was used to photograph movement patterns of each member of the experimental group. During the treatment period the instructor moved to each subject to give individual assistance. When the instructor approached a member of the experimental group, he provided a maximum of three minutes of performance analysis for each subject. All pictures were retained by the instructor and were available to the subjects for further inspection.

Three skills tests were administered during the treatment period to determine the effect of the immediate external feedback on the learning of the golf drive and the five iron approach shot. The Vanderhoof Drive Test was administered at the end of the treatment period, and the Vanderhoof Five Iron Approach Test was administered at the midpoint and at the end of the treatment period. The investigator concluded that the use of the graph-check-sequence pictures facilitated the learning of the five iron approach shot and the drive. (34:594)

Plese investigated the use of the videotape replay unit in the instruction of gymnastics skills. The purpose of this study was to compare the results of teaching selected gymnastics skills using the videotape instant replay with the traditional teaching approach.

Subjects for this study were 199 male junior high school students. The subjects were placed into two groups and were assigned to one of two treatments. Subjects attended practice sessions twice per week for a period of seven weeks. The skills taught were a series of 11 parallel bar skills.

All sessions began with an explanation of the skill followed by a demonstration. The only difference between the two groups was the use of the videotape replay device. This was used to evaluate gymnastics performance of the members of the experimental group. Members of both groups received the same explanation and demonstration of the skills.

Plese concluded that the use of the videotape replay unit allowed the experimental group to advance more rapidly to more difficult skills. (31:103)

Penman, Bartz, and Davis conducted a study concerning the use of the videotape replay unit in the teaching of trampoline skills. The purpose of this study was to examine the effects of teaching trampoline skills with and without a videotape replay unit.

Subjects for this study were 50 freshman students at Washington State University. These subjects were randomly assigned to these classes through the use of a computer. Subjects were randomly assigned

to either control or experimental groups. Both groups were taught a 12-week unit in beginning trampoline skills.

The control and experimental groups were taught in the same room, with the same instructor, and at the same time of the day. The control group met on Monday and Wednesday and the experimental group met on Tuesday and Thursday. The investigators developed lesson plans which they believed would utilize the videotape replay unit to the best advantage. Both groups were taught the same trampoline skills; however, experimental group members were exposed to the use of the videotape replay unit. The treatment period lasted for 12 weeks, or 24 treatment periods. Each treatment period lasted for approximately 35 minutes.

During the last treatment period each subject was evaluated. The post-test consisted of the performance of two routines of the skills which were learned on the trampoline. The performances were evaluated by a three man jury. The sum of the three judges' scores was used as the final score for each subject, and the means of the two groups were then compared. Based upon the group mean scores it was concluded that there was no benefit in using the videotape replay unit in the instruction of beginning trampoline skills to this group of subjects. (30:1062)

Morgan investigated the use of verbal cues, videotape feedback, verbal cues and videotape feedback, and no feedback, on the learning of the butterfly arm stroke in swimming. The subjects in this study were 92 college women enrolled in beginning swimming. Subjects were

randomly assigned to one of the four treatment groups. An adaptation of Hewitt's glide test was administered to measure power and speed. Testing was conducted at the beginning and the end of the treatment period. The treatment period lasted for three meetings, each 60 minutes in length. A fourth meeting was used for administration of the post-test.

In order to standardize instructions to the groups, all explanations and demonstrations were recorded on videotape. Group I heard a taped recording of five specific verbal cues determined essential for proper execution of the prescribed skill four times. Group II viewed themselves four times on the videotape monitor. Group III had access to both the taped recording of the verbal cues and the pictures of themselves on the videotape monitor four times. Group IV received neither verbal nor videotape feedback.

The investigator concluded that: (1) groups utilizing the videotape replay unit improved significantly on tests of both power and speed, and (2) the control group improved significantly on the speed tests. (24:433) Additionally, the investigator concluded that the videotape replay unit improved the learning process, but that due to individual variability, it was difficult to develop valid tests for the traits measured. (24:433)

Beebe conducted an experiment involving the use of four different methods of feedback on the learning of selected gymnastics skills. The four different methods of feedback were: conventional method, videotape replay method, conventional plus videotape replay method,

and conventional plus videotape replay with verbal analysis method. The skills chosen for the experiment were the flank and squat vaults.

The subjects for this study were 116 female members of the seventh and eighth grade physical education classes at Penwood Junior High School during the academic year of 1973-74. The subjects ranged from 11 to 14 years of age. All subjects who fulfilled screening requirements of no previous gymnastics training participated in the study.

The experiment took place over a 6-week period and subjects met for 50 minutes for 10 treatment periods. The initial three periods involved introductory lessons in the mechanics of running, jumping, take-off, and landing. The purpose of the introductory lessons was to allow adequate time to learn and practice vaulting skills. The remaining seven treatment periods were used for pre-testing (two periods), treatment periods (five periods), and post-testing (one period).

The investigator concluded that: (1) videotape replay used to provide feedback has no significant effect on the learning of selected gymnastics skills among beginners on the junior high school level, and (2) in terms of time, cost, and equipment requirements, the verbal feedback method is more efficient than the videotape replay method of providing feedback to students. (2:138)

Meyers conducted a study to compare the effect of four different methods of feedback in programmed instruction on the learning of archery skills among 80 ninth grade boys. All subjects were pre-tested

using the AAHPER Archery Skill Test in order to determine level of archery skill. Only subjects who scored under the 50th percentile were classified as beginners and were allowed to participate in this study.

The subjects were then randomly assigned to one of the four treatment groups and were again pre-tested. At the end of the treatment period the subjects were tested on two occasions. The mean scores of both pre- and post-tests were used for comparative analysis.

The treatment period consisted of six lessons in archery shooting. The different treatments were: written checklists, written checklists plus terminal augmented verbal feedback, written checklists plus terminal augmented visual feedback (VTR), and written checklists, terminal augmented verbal and visual feedback (VTR).

Testing in both pre- and post-tests consisted of the AAHPER Archery Skills Test. This involved the shooting of two ends of six arrows each at a 48 inch target at distances of 10, 20, and 30 yards, a total of 36 arrows for each subject.

Meyers concluded that: (1) the use of written checklists was as beneficial by itself as when verbal, visual, and verbal-visual feedback were added to the program, and (2) the most ideal form of feedback for one student is not always the best for another student. (20:29)

Gasson examined the relative effects of teaching badminton to beginners with and without instant videotape replay. Twenty-two female and 21 male students were assigned to two coeducational badminton

classes. In order to equate the sexes in each group, the female students were assigned to groups after all males had been placed.

The members of the experimental group were videotaped from two different camera locations. Experimental subjects were divided into groups of four members. During this time, the subjects were videotaped from court level for one minute per stroke per subject. Five strokes were taught during the experiment, and each subject was videotaped while executing the five strokes as the shuttle was hit to them. Immediately after the four subjects in the first experimental subgroup were videotaped, they viewed the playback for approximately four minutes while the instructor offered suggestions relative to their performance.

Members of the experimental group were also videotaped during mixed doubles games for a five minute period. The games were videotaped from a balcony position. Immediately after the five minute recording, the subjects viewed the film with comments supplied by the instructor.

The control group received the same sequence of teaching as the experimental group. The only difference between the two treatments was that the instructor commented during the actual performance for the control group instead of during videotape replay as for the experimental group. At the conclusion of the treatment period the subjects of both groups were again tested using the Miller Badminton Wall Volley Test. The investigator concluded that the findings did not establish the effectiveness of videotape replay as a significant

instructional aid in the teaching of beginning badminton to university students. (12:502)

James analyzed (1) the effect of visual feedback (VTR) compared with verbal feedback in the learning of beginning trampoline skills, and (2) the effect of verbal ability. (15:669) Subjects in this study consisted of 18 males whose ages ranged between 11 and 12 years. Assignment of subjects to one of two groups was based on matched performances of the skills as assessed by two judges and by general physical ability as determined through the use of a five-point rating scale. This study was conducted during 11 one-hour sessions, meeting twice weekly.

The members of the experimental group (n = 8) and the control group (n = 10) learned four basic drops and a seven bounce routine during the treatment period. The experimental group was shown visual feedback of performance via the VTR, while the control group received verbal feedback only. In order to determine the effect of subject's verbal ability in the interpretation of feedback, the Mill Hill Vocabulary Test was given prior to the treatment period.

James concluded that: (1) the videotape feedback group scored higher (although not significant) than the verbal group on the four skills and the seven bounce routine, (2) verbal feedback was helpful to subjects with higher verbal ability, (3) videotape feedback was helpful to subjects of both high and low verbal ability, and (4) more effective and efficient feedback may be supplied to learners with a wide range of verbal ability using the visual channel. (15:670)

Brown and Messersmith conducted a study to measure the relative progress of tumbling classes taught with and without the use of movie pictures. The subjects for this study were freshman male students currently enrolled in two classes at Southern Methodist University in which tumbling was being taught. An experimental group (n = 23) and a control group (n = 20) were taught by the same instructor, each with identical total instructional time using the same instructional units. Both groups met three times per week for 17 class sessions.

The experimental group viewed motion pictures of experienced tumblers executing selected tumbling stunts. The experimental group later viewed motion pictures of themselves performing the same selected stunts.

Initially, all subjects were administered the Metheny Revision of the Johnson Test to determine the equality of the two groups. At the end of the treatment period the progress of the two groups was determined by performance in a 10 event battery of stunts. At the end of the study the investigator concluded that subjects were highly motivated when they were filmed and given the opportunity to view their performance. (4:307)

Penman analyzed the effectiveness of teaching beginning tumbling with and without an instant videotape recorder. The subjects for this study were 130 freshman college physical education students. From this number, two groups of 25 subjects were randomly assigned to the control and experimental groups. Both groups were taught in the same room, by the same instructor during the same hour of the day. The

control group met on Monday and Wednesday and the experimental group met on Tuesday and Thursday. The study was conducted over a period of approximately 35 minutes each.

During the treatment period members of the experimental group viewed videotaped performances of themselves performing the tumbling skills. The control group received only verbal feedback by the instructor. Testing of all subjects took place during the last class period. The subjects were required to learn a combination of tumbling stunts which consisted of three tumbling passes.

The performance of all subjects was evaluated by a four man jury consisting of experts in the area of gymnastics. Each judge evaluated each of the three tumbling passes of all subjects of both groups. The sum of the ratings of the four judges was used as the final subject score. Penman concluded that a lack of statistical significance between performance of the two groups may have been due to the fact that the actual practice time was less for the experimental group because they spent time viewing the videotape monitor. (29:46)

Lockhart attempted to determine the value of motion pictures as an aid to learning bowling skills. Subjects of both the experimental and control groups were freshman college beginning women bowlers. Control and experimental groups were developed randomly. Instruction during the treatment period was administered by two experienced teachers who had previous experience in the use of instructional films. Each instructor taught two control groups and two experimental groups.

The only difference between the instruction of the two groups was the addition of the film used only with the experimental groups.

Lockhart concluded that: (1) the rate of improvement in the learning of the members of the experimental group was more consistent than that of the controls, and (2) although the experimental group and control groups began with practically the same skill level, at the third week of instruction members of the experimental group surpassed the controls and remained ahead of them throughout the remaining treatment period. (18:187)

Muhr examined the effects of the use of the portable videotape recorder in the teaching of batting skills to college junior varsity baseball players. Subjects in this study were 17 members of the 1972 University of Arizona Junior Varsity Baseball Team. The subjects were randomly assigned to two groups. The experimental group received visual feedback through the use of the portable videotape recorder plus the traditional coaching method. Members of the control group received only the traditional method of coaching.

The treatment period was five weeks in duration. Subjects met for 30 to 40 minutes per treatment, three times per week. All subjects were videotaped on the first and last days of the treatment period for comparative analysis.

The investigator concluded that: (1) the portable videotape recorder was an effective learning aid in the correction of batting errors, (2) traditional coaching technique improved batting significantly, but not at the level nor the speed that batting was improved

when coaching was augmented with the portable videotape recorder, and (3) the effects of the portable videotape recorder were greatest in the early stages of learning. (25:34)

Fourteen studies concerning the use of audiovisual aids in the acquisition of motor skills were reviewed. A significant improvement in learning through the use of audiovisual aids was reported in seven studies. Specific benefits included the hastening of early learning with highly skilled individuals and increased levels of motivation among learners. In those studies where no significant findings were found, individual variability and the amount of time required for viewing, were cited as the primary experimental limitations.

Knowledge of Mechanical Principles In the Learning of Motor Skills

Toth examined the effects of knowledge of mechanical principles on transfer of learning selected gymnastics movements. Gymnastics skills were taught to two groups of students using two different methods of instruction. The control group was taught using the practice method which consisted of verbal explanation and demonstration of the skill followed by participation or practice of the skill. The experimental group was taught by the principle inclusion method, which included the practice method as well as instruction and application of a mechanical principle underlying the skill to be learned. Both groups were taught the same skills by the same instructor using the same apparatus. (35:575)

At the end of the treatment period, the two groups were evaluated by a panel of gymnastics judges. The results of the statistical analysis were not significant. Toth concluded that this lack of a significant difference was due to either (1) the beginning level of the subjects, and/or (2) the limited amount of time allowed for administration of the treatment. (35:575)

Papscy conducted a similar study to analyze the effect of understanding a specific mechanical principle on the learning of a motor skill. Two groups were taught the motor skill using two different methods of instruction. The control group was given the practice method, while the experimental group was instructed using the principle inclusion method.

Both groups were taught a particular handball skill, and all subjects learned this skill to a predetermined level of mastery. Both groups were then tested on a bunting skill utilizing the same underlying mechanical principle as in the handball skill. This test was used to establish the ability of the subject to transfer the underlying mechanical principle to a similar motor skill. (28:2364)

Results of this study indicated that: (1) subjects taught by the principle inclusion method learned the skill at a faster rate than the practice group, (2) subjects taught by the principle inclusion method were better able to retain the learned skill than members of the practice group, and (3) the principle inclusion method of instruction was advantageous to subjects with a lower intelligence quotient. (28:2364)

Buck analyzed the effect of knowledge of mechanical principles on the learning of a trampoline skill using the videotape replay unit as an evaluation tool. Two groups were taught a trampoline skill (swivel hips) utilizing two different methods of instruction. The control group was taught by the practice method while the experimental group was taught by the principle inclusion method. (86:2145)

The subjects were exposed to the same skill, instructor, and equipment. The only difference was in the teaching method employed by the investigator. The subjects practiced for a total of 10 class periods. At the end of the treatment period the subjects were evaluated by a panel of qualified gymnastics judges. At the same time, each individual was videotaped for further evaluation. The videotape was used to later compare the techniques of the two groups. Based on the individual scores and mean scores of the two groups, Buck concluded that the teaching of mechanical principles to learners of the trampoline skill increases the degree of skill at which the learners perform over students who have not been taught the mechanical principles. (6:2146)

McCloy stated that if instructors would utilize the known mechanical principles which govern the quality of movement, they could more effectively direct and accelerate the learning of pupils, and could more readily recognize and correct errors made by their students. (21:54) Fisher and Jenson have reported that certain natural laws and principles of mechanics influence all motor performances. If maximum

movement quality is the goal, then the performer must correctly apply the laws and principles which influence that performance. (11:239)

The following is a list of mechanical principles adapted from kinesiology textbooks which were applicable to the series of gymnastics uneven parallel bar skills taught during the treatment period in the present study:

Mechanical Principle 1 - Gravity Affecting Pendulum Swing

As the pendulum swings downward, the forces of gravity increase the speed of the pendulum. Conversely, as the pendulum swings upward, the forces of gravity decreases the speed of the pendulum until it reaches zero. The speed of the pendulum is greatest at the bottom of the arc and least at the ends of the arc. (37:435)

Mechanical Principle 2 - Length of the Lever

The height of the pendulum swing may be affected by lengthening the radius of rotation on the downswing and by decreasing the radius on the upswing. (37:437)

Mechanical Principle 3 - Increase of Rotation

The decrease in radius should be initiated when the center of gravity of the body is directly under the axis of rotation. Since the speed of pendulum swing is greatest at the bottom of the arc, the shortening of the radius to increase rotation is greatest at this point. (37:437)

Mechanical Principle 4 - Ends of the Pendulum Arc

Gravity affects the pendulum during both upswing and backswing slowing it considerably until a zero point of velocity is attained. At this point the pendulum changes direction of swing and the force of gravity is momentarily neutralized by the upward momentum. (37:439)

Mechanical Principle 5 - Frictional Forces

Frictional forces oppose the movement of the hands rotating around the bar and tend to strengthen the grip of the hands when the swing is in the direction of the palms and weakens when the direction is the reverse. (37:439)

Mechanical Principle 6 - Center of Gravity-Center of Rotation

When performing a mounting exercise involving swinging, the center of gravity must be brought as near as possible to the center of rotation. (37:438)

Mechanical Principle 7 - Center of Gravity-Center of Rotation

When swinging in support, the center of gravity should be at the point of support. By doing this it takes less effort to keep the body against the bar while turning because the torque between the center of gravity of the body and axis of rotation is kept at a minimum. (37:439)

Mechanical Principle 8 - Centripetal Forces

When centripetal force ceases to act on a swinging performer, his body will obey Newton's First Law of Motion and fly off tangent to the arc of the swing at that instant. (37:439)

Mechanical Principle 9 - Flight of the Center of Gravity

The path of motion of the body's center of gravity is determined by three factors: the angle of release, the force of gravity, and the force of projection. (37:439)

Mechanical Principle 10 - Stability

A body is balanced when its center of gravity is over its supporting base. (3:50)

Mechanical Principle 11 - Rotation

Rotational movement of the body as a whole may be slowed by lengthening the lever and accelerated by shortening the lever. (37:411)

Mechanical Principle 12 - Twisting

A performer who is rotating about a horizontal axis in the air may initiate a twist about the vertical axis by tilting the body to one side. (3:443)

Mechanical Principle 13 - Equilibrium

Equilibrium of a body or object is obtained when each force acting on the body is balanced by an equal but opposite force or force component. (26:188)

Mechanical Principle 14 - Energy Transfer

> Maximum transfer of energy requires the most efficient use of force-production motions in the body and the maximum range of motion at the point of contact with the instrument or object. (26:197)

Mechanical Principle 15 - Potential Energy

> The ability to perform work due to either its position above some base surface or to an elastic distortion of the object. (26:198)

Mechanical Principle 16 - Energy Transformation

> Almost all human motions represent a series of transformations from one form of energy to another, and the stereotype of perfect form is usually that one in which energy transformations are carried out most smoothly and efficiently. (26:198)

It appears that certain natural laws and mechanical principles govern all motor performances. Authorities generally agreed that if physical educators were aware of mechanical principles, they could recognize and correct execution errors, and more efficiently direct and accelerate learning. Two researchers confirmed the value of teaching mechanical principles in the instruction of motor skills stating that it improved the quality of skill performance and increased the rate of learning.

Rating Scale Construction

Within the physical education curriculum are many important variables which cannot be measured objectively. (1:555) Examples of these variables include measurements in the affective domain such as sportsmanship, attitudes, interests, and appreciations. (1:555)

Barrow stated that when no objective measures exist for a given trait, observational techniques are used. (1:555)

According to Barrow, rating devices are one of the best methods for recording observations and focusing the attention of the instructor on the more important aspects of the variable or trait being measured. (1:555) Gronlund defined the rating scale as a device used for systematically recording observers' judgements concerning the degree to which the quality or trait is present. (13:20) Barrow characterized the rating scale as a subjective estimate which brings order to the processes of observations and self-appraisal and which provides for quality of the trait being examined. (1:585)

Barrow suggested that in addition to using the rating scale to measure intangible factors in physical education, it may also provide a more effective means of measuring student achievement in skill and form in athletics. Barrow, Landers, and Montoye have observed that rating scales are used to measure performance during physical activities in diving, gymnastics, wrestling, and dance. (1:556, 17:85, 22:191) One example of the use of rating scales in athletic competition is the International Gymnastics Federation Code of Points. (19)

Hunsicker and Loken conducted a study concerning the objectivity of judging conducted at the National Collegiate Athletic Association Gymnastics Meet in 1950. The data used for analysis were scores obtained by five judges. Only scores of the top six gymnasts in each event were used. Specifically, the data included the score which each of the five judges gave the gymnast, plus the sum of the middle three

scores for each gymnast, and the order of place of the gymnast. Intercorrelations of the five judges were determined for all six events. (14:423) The gymnasts were re-scored using the sum of the points awarded by the five judges rather than the middle three scores. (14:423) The placement of the first six gymnasts in each event was compared with the placement under the traditional middle three score system.

The results indicated that the judges agreed with one another to an acceptable degree. Only one correlation was below .80, 50 correlations were .85 or above, and the remaining nine correlations were between .80 and .85. These investigators concluded that the consistency of the judges would probably compare favorably with subjective opinion of five experts rating any other physical or motor trait. (14:424)

Additionally, these researchers attempted to determine whether using the sum of the judges ratings would alter the final standings in each event. It was found that in using this method of scoring, changes in the placement of gymnasts would occur. (25:424) This led these investigators to challenge the traditional middle three score systems for the scoring of gymnastics.

Ten years later, Faulkner and Loken conducted a follow-up study concerning judging objectivity at the National Collegiate Athletic Association Gymnastics Meet. The investigators stated that within the 10-year time span, the number of judges had been reduced to four, the number of events had been increased from six to eight, and the

International Gymnastics Federation had instituted many procedures designed to increase the objectivity of judges. The purpose of the study was to evaluate the effect of the changes on the objectivity of judges ratings in the various events.

These investigators concluded that: (1) the agreement among judges in the parallel bars, tumbling, and floor exercise appeared to be exceedingly low in spite of the efforts of governing bodies to increase the objectivity of judging, and (2) the objectivity of judgements in the parallel bars and tumbling had deteriorated in the past decade. (10:485)

During the 1970 National Collegiate Athletic Association Gymnastics Meet at Temple University, Johnson attempted to analyze the level of objectivity of judging. The investigator concluded that a continuing need for reevaluation of the rules and judging procedures was required to increase the discriminative qualities of the test. Johnson also suggested the possible use of mechanical aids such as the videotape replay unit as an aid to judges. (16:455)

Landers suggested several alternatives to the traditional method of gymnastics judging in order to improve objectivity among gymnastics judges. First, gymnasts for each event could be paired as in tennis, golf, or wrestling. This would increase the objectivity of gymnastics judging since it would reduce the judging to a matter of deciding the better of the two routines instead of discriminating the quality of six or more routines. (17:85) A second alternative would be to make changes in International Gymnastics Federation rules. Various scales

of difficulty could be developed to provide a more realistic estimate of performers among beginning and intermediate level performers. (17:85) Finally, Landers suggested that judges should be responsible for only one of the three areas of difficulty, composition, or execution. (17:86)

Wilson evaluated the objectivity, validity, and reliability of gymnastics judging. The events considered for this study were uneven parallel bars and side horse vault routines from the 1972 Canadian Womens European Trials Competition. The performances were recorded on videotape with cameras located at the front and back of the apparatus.

Four weeks later, five of the competition judges and 10 additional judges scored the videotape performances on the uneven parallel bars for each of the 10 gymnasts and 10 of the 20 randomly selected vaults. (38:169) The competition scores of the five judges during competition indicated a very high objectivity for the uneven parallel bars and a moderate to low level of objectivity for the side horse vault. (38:172)

Wilson concluded that: (1) the judges' reliability on repeated videotape replay scores was high for the uneven parallel bars, perhaps due to the small sample size, and (2) from negative and low correlations, the videotape replay unit was of little value in judging the side horse vault. (38:173)

The type of rating scale employed in judging and scoring gymnastics is a numerical scale. (1:569) Barrow described this type of rating scale as one that assigns score values to the various levels of

the scale. (1:569) Gronlund stated that the simplest type of rating scale is one in which the judge checks or circles a number to indicate the degree to which a characteristic is present. (13:418) The usual range in a numerical rating scale is from one to five, with five indicating the highest level of achievement. A numerical rating scale of one to 10 is employed when greater discrimination is desired. (1:569)

Barrow has recommended that steps in the construction of home-made rating devices to insure validity and reliability should include: (1) a determination of purpose for the rating, (2) an identification of traits, definitions, and terms to be used, (3) a division of traits into sub-traits, (4) the selection of categories to be included, (5) the selection of appropriate point values, and (6) the preparation of the rating sheet. (1:557-561)

Gronlund observed that some of the more common errors in the use of rating scales have included: (1) a general tendency to rate all individuals at approximately the same position on the scale, (2) the emergence of a halo effect, and (3) the occurrence of logical error, which results when two characteristics are rated as more similar or dissimilar than they actually are. (13:425-426)

Barrow suggested that proper procedures for the use of rating scales prior to their administration should include: (1) a discussion of the rating scale by the judges, (2) the selection of unobstructed observation points, and (3) the provision of a training period for each of the judges. (1:562-563)

Rating scales appear to be the only valid measure of skill in the sport of gymnastics. There are differing opinions, however, regarding the objectivity and reliability of gymnastics rating scales used for gymnastics competition. One writer suggested that judges should be responsible for assessing performance in only one area (e.g. execution). Steps in the construction of rating scales, procedures for their administration, and common errors in the use of rating scales were reviewed.

Four areas of related literature were reviewed by the present investigator. The first area involved the role of feedback in motor skill acquisition. It was observed that feedback can be an important component in the learning process. Studies were also reviewed relative to the use of audiovisual aids in motor skill acquisition. Conflicting results concerning the value of audiovisual aids in motor skill acquisition were found. A third area of concern was the amount of emphasis which should be given to pertinent mechanical principles in the instruction of motor skills. Several writers emphasized the importance of teaching about mechanical principles in the development of quality movement. Two researchers confirmed the value of teaching mechanical principles in the instruction of motor skills. One researcher concluded that the beginning level of the students and limited amount of time for instruction can influence the value of teaching mechanical principles in the instruction of motor skills. The last area reviewed concerned the construction of rating scales. It was

stated that rating scales can be useful for assessing performance in non-tangible traits such as skill and attitudes. Conflicting results were found among researchers concerning the objectivity and reliability of rating scales used in gymnastics competition.

CHAPTER III

METHODS AND PROCEDURES

This chapter contains a description of the organization of the study, source of the data, administration of the treatment, and collection of the data.

Organization of the Study

The purpose of this study was to compare the effectiveness of two types of visual feedback on performance of selected uneven parallel bar skills. Assessment was based on skills acquired over a period of three weeks (April 17, 1978 to May 5, 1978). The skills selected included a series of gymnastics maneuvers on the uneven parallel bars. The subjects who participated in this study were 30 female South Dakota State University HPER major students and non-major students who were currently enrolled in gymnastics and tumbling courses. All pre-testing took place the week prior to the treatment period.

The HPER major students (n=20) enrolled in gymnastics and tumbling courses were placed in rank order according to mean scores obtained on the two pre-tests. The subjects were then placed into one of two equated groups using a stratified random allocation procedure. The two groups were randomly assigned to one of the two treatments over a three week period.

The non-major students (n=19), who were enrolled in gymnastics and tumbling courses, were placed in rank order according to mean

scores obtained on the two pre-tests. Scores similar to these attained by members of the experimental groups were matched and these subjects (n = 10) formed the control group which did not receive any type of instruction in the skills being tested during the three week period.

Post-testing of the three groups took place during the week following the completion of the treatment period. Both pre- and post-tests involved the same judges, the same number of skills, and the same criteria for assessment of performance. The list of mechanical errors for each skill utilized for assessment purposes appears in Appendix A.

The VTR was utilized as an evaluation aid for both the pre- and post-tests. This procedure allowed the panel of judges to observe the performance of the skills from the same angle so that all observations were the same for each judge.

Source of the Data

The subjects for this study were 30 female college students at South Dakota State University who were enrolled in gymnastics and tumbling courses as either non-major or HPER major students. The non-major students (n = 10) were enrolled in gymnastics and tumbling courses offered in the Fitness and Lifetime Activities Program. The HPER major students were enrolled in the gymnastics and tumbling course offered in the Professional Skills Program, which is required in order to fulfill HPER major requirements for graduation. A table of subject characteristics for members of the three groups appears in Appendix B.

Administration of the Treatment

Testing for subjects of the control group was conducted in the Gymnastics Room of the HPER Center at South Dakota State University. Testing and treatments for subjects of the experimental groups were conducted in the Weight Training Room of the HPER Center at South Dakota State University. Similar equipment was used for both the control and experimental groups. The control group used the Nissen uneven parallel bars equipped with fiberglass bars while the experimental groups used the Gym Master uneven parallel bars equipped with wooden bars.

Initially, a standardized set of instructions was read to the entire group being tested. These instructions are presented in Appendix C. Following the explanation of the skill, four demonstrations of the skill were presented to the group via a VTR tape which consisted of a performance by a South Dakota State University Varsity Gymnast. After the four demonstrations were presented, the entire group was isolated from the testing area.

Each subject was tested separately without any instructions or feedback concerning her performance. Subjects were allowed two attempts for each skill.

After all subjects were individually tested, the entire group was called into the testing area to receive verbal explanations and visual demonstrations of the next skill. The same format was used for each of the six uneven parallel bar skills for each testing group.

Treatment for experimental group one. The subjects of this group (n = 10) were taught six gymnastics skills on the uneven parallel bars. The group was sub-divided into two groups. Each sub-group (n = 5) met for approximately 20 minutes per day, four days per week, for three weeks.

Each sub-group received two days or two periods of instruction, practice time, and feedback for each skill. The instructional sequence was as follows: beginning skill (days one and two), intermediate skill (days three and four), and advanced skill (days five and six). The same instructional sequence was used for the final six treatment periods. The instructional sequence is presented in Appendix D.

During the instruction phase of each skill all subjects of each group were read a verbal explanation of the skill followed by four visual demonstrations of the skill via a VTR tape, which consisted of a performance by a South Dakota State University Varsity Gymnast. All explanations and demonstrations were the same as those used during all testing periods. All subjects were isolated from the practice area to insure that a learning effect would not result from observing performances and hearing feedback given to members of the sub-group.

Each subject was allowed two trials of the skills which were recorded by the VTR, followed by a maximum two minute feedback period consisting of both verbal and visual feedback provided by the present investigator. Two additional trials of the skills were allowed, followed by a maximum two minute feedback period consisting of both

verbal and visual feedback provided by the present investigator. This was followed by the execution of two additional trials.

During the trial phase the investigator did not supply the subject with any information concerning the nature of the skill, manual guidance, nor feedback concerning skill performance. During the feedback phase of the practice period the investigator supplied the subject with a videotape replay of her prior performances with supplementary constructive comments concerning mechanical errors observed in her performances.

Treatment for experimental group two. The subjects for this group (n = 10) were taught the same six gymnastics skills on the uneven parallel bars, which were provided for experimental group one. This group was also sub-divided into two groups. Each sub-group (n = 5) met for approximately 20 minutes per day, four days per week, for three weeks.

Each sub-group received two periods of instruction, practice time, and feedback for each skill. The six skills were taught to this group using the same instructional sequence used for experimental group one. These are presented in Appendix D.

During the instructional phase of each skill all members of each sub-group were given a verbal explanation of the skill followed by four visual demonstrations of the skill via a VTR tape which consisted of a performance by a South Dakota State University Varsity Gymnast. The verbal explanations and visual demonstrations were the same used for all testing periods and treatments for experimental

group one. The subjects were isolated from the practice area to insure that a learning effect would not result from observations of performances or hearing feedback given to members of the sub-group.

Each subject was allowed two trials of the skill, followed by a maximum two minute feedback period consisting of both verbal and visual feedback provided by the present investigator. Two additional trials of the skill were allowed, followed by a maximum two minute feedback period consisting of both verbal and visual feedback provided by the present investigator, and a final two trials of the skill.

During the trial phase of the practice period the instructor did not supply the subject with any information concerning the nature of the skill, manual guidance, nor feedback concerning skill performance. During the feedback phase of the practice period, the investigator supplied the subject with two teacher demonstrations of the skill with constructive comments concerning mechanical errors in each subject's performance. After each subject completed the practice period of the skill, another subject was called to the practice area and followed the same format for trials and feedback.

Treatment for the control group. The subjects of this group ($n = 10$) were exposed to verbal explanations, and visual demonstrations during the pre- and post-tests. During the treatment period these subjects were not given any instructions, feedback, or practice time for the skills tested.

Collection of the Data

The following procedures were used by the investigator to familiarize the subjects with the study:

1. During the orientation period each potential subject was given a handout containing the purpose of the study and a consent form for the treatment period. This is presented in Appendix E.

2. Prior to the administration of the pre- and post-tests, verbal explanation and four visual demonstrations via a VTR tape which consisted of a performance by a South Dakota State University Varsity Gymnast were provided for all subjects.

3. During the pre- and post-tests, subjects being tested were isolated from the rest of the group in order to prevent a learning effect from occurring among other group members.

For comparative analysis of the three groups, data were collected from individual pre- and post-tests of the uneven parallel bar gymnastics skills test.

Pre-test. Subjects were pre-tested twice in regularly scheduled class periods during the week prior to the treatment period. The investigator read a verbal explanation of the skill and then presented four visual demonstrations via a VTR tape which consisted of a performance by a South Dakota State University Varsity Gymnast to the entire group of subjects. Each subject was tested on the first skill prior to the explanation, demonstration, and testing of the second skill. This procedure was followed throughout the administration of the pre-tests.

Each subject was allowed two attempts for each skill during the testing periods. During the testing periods the VTR was utilized to record each performance. The VTR was then observed by a panel of three judges for assessment purposes.

Post-test. Subjects were post-tested during the week immediately following the treatment period. The investigator read a verbal explanation of the skill and then presented four visual demonstrations of the skill via a VTR tape which consisted of a performance by a South Dakota State University Varsity Gymnast. The materials used for the explanations and demonstrations were the same as used in the pre-tests. Each subject was individually tested on the first skill prior to the explanation and demonstration of the second skill. This procedure was followed throughout the administration of the post-tests.

Each subject was allowed two attempts for each skill during the testing periods and the VTR was utilized to record each performance. The VTR was then observed by the same panel of three judges for assessment purposes.

Videotape replay unit. The videotape equipment used for recording performances consisted of (1) a Sony Solid State Videorecorder, model number AV-3650, (2) a Sony Video Camera, model number ACV 3200, (3) a Sony TV Zoom Lens, and (4) a General Electric Closed Circuit Television, model number 4TH31B1.

Assessment of performance. The judges who assessed performance for both pre- and post-tests were two assistant gymnastics coaches from South Dakota State University and the present investigator, who also

served as assistant gymnastics coach at South Dakota State University during the 1977-78 academic year. All three judges had participated in intercollegiate gymnastics and were considered knowledgeable in the area of gymnastics.

Prior to the pre-testing of the subjects, the judges became familiar with the zero to seven point numerical rating scale. The mechanics of each skill were discussed and a practice session followed in order to familiarize the judges with the use of the rating device. A list of mechanical errors for each skill appears in Appendix A, the rating scale appears in Appendix F, and a sample score sheet appears in Appendix G.

Assessment of performance for both pre-tests was conducted during two meetings of the three judges. Each skill was mechanically reviewed prior to its assessment. Each subjects' performance for the first skill was judged before assessment of the second skill was attempted.

Assessment of performance for both post-tests was conducted during two meetings of the three judges following the treatment period. The same procedures were followed in judging as had been used for the pre-test.

CHAPTER IV

ANALYSIS AND DISCUSSION OF RESULTS

In this chapter the procedures employed are discussed in the following sections: (1) Organization of the Data for Analysis; (2) Analysis of the Data; and (3) Discussion of the Results.

Organization of the Data for Analysis

The purpose of this study was to examine the effectiveness of two types of visual feedback on performance of selected uneven parallel bar skills. The results from this investigation emerged from two pre-tests and two post-tests of 30 South Dakota State University undergraduate female students. All subjects completed the entire program (two pre-tests, three weeks of treatment, and two post-tests) and generated usable data to test the hypothesis.

The data collected in this study were analyzed using three statistical procedures. The first analysis was performed to determine judge objectivity of the three raters for all six skills and for pre- and post-tests. A one-way analysis of variance (ANOVA) was performed to determine whether any significant differences in scores between raters had occurred. (33:99-105) The .05 level of probability was accepted as a minimum level needed for rejection.

A second analysis was performed to determine the reliability and reproducibility of the uneven parallel bar skills test utilized in this study. The Pearson Product-Moment correlation technique was

utilized for determining reliability with a dependent t-test utilized to determine reproducibility. (23:193)

The last analysis, a one-way analysis of variance, was performed to determine whether any significant change occurred in uneven parallel bar skill performance from pre-tests to post-tests between members of the three groups. (33:99-105) The .05 level of probability was accepted as the minimum level needed for rejection of the hypothesis.

Analysis of the Data

The analysis of the data is presented under the following sections: (1) Characteristics of the subjects; (2) Judge objectivity; (3) Reliability and reproducibility of the data; and (4) Analysis of group differences.

Characteristics of the subjects. Characteristics of the subjects appear in Table I. The mean age for each group ranged from 18.8 years for the control group to 19.9 years of age for the videotape replay (VTR) feedback group, with an overall group mean of 19.3 years. The maximum difference in gymnastics experience occurred between the control group (3 yes/7 no) and the VTR feedback group (1 yes/9 no). The overall group gymnastics experience was 6 yes/24 no.

TABLE I

CHARACTERISTICS OF THE SUBJECTS

Group	Age (years)		Gymnastics Experience (yes/no)
Control	$\bar{X}$	18.8	
	SD	.6	3/7
n = 10	Range	18.0-20.0	
Videotape Replay	$\bar{X}$	19.9	
Feedback	SD	.7	1/9
n = 10	Range	19.0-21.0	
Teacher	$\bar{X}$	19.3	
Demonstration	SD	1.0	2/8
Feedback	Range	18.0-21.0	
n = 10			
Total	$\bar{X}$	19.3	
	SD	.9	6/24
N = 30	Range	18.0-21.0	

Judge objectivity. The one-way analysis of variance procedure (ANOVA), using the mean differences between the raters scores for all 30 subjects (for each skill and pre- and post-tests), was utilized to determine if significant differences had occurred among the raters assessments (Tables II and III). Results of the ANOVA indicated no significant differences among the raters for any of the skills on either the pre- or post-tests. The reliability correlation coefficient during the pre-test ranged from r = .63 to 1.00 except for a .46 correlation found between judge one and judge two for skill three.

The correlation coefficient for the mean of the sum of the six skills combined on the pre-test was r = .82 to .97. The reliability correlation coefficient during the post-test ranged from r = .94 to 1.00. The correlation coefficient for the mean of the sum of the six skills combined on the post-test was r = .97 to .99.

TABLE II

PRE-TEST JUDGE OBJECTIVITY (N = 30)

Variable	$\bar{X}$	SD	$\bar{X}\Delta$	SEΔ	r	F[a]
J1-PreX-Sk1[b]	1.72	1.60	.12	.23	.65	
J2-PreX-Sk1	1.60	1.27				
J1-PreX-Sk1	1.72	1.60	.06	.16	.84	.12
J3-PreX-Sk1	1.78	1.56				
J2-PreX-Sk1	1.60	1.27	.18	.17	.80	
J3-PreX-Sk1	1.78	1.56				
J1-PreX-Sk2	2.50	1.41	.03	.03	1.00	
J2-PreX-Sk2	2.53	1.55				
J1-PreX-Sk2	2.50	1.41	.07	.05	1.00	.01
J3-PreX-Sk2	2.57	1.61				
J2-PreX-Sk2	2.53	1.55	.04	.03	.99	
J3-PreX-Sk2	2.57	1.61				
J1-PreX-Sk3	3.28	1.17	.03	.34	.46	
J2-PreX-Sk3	3.25	1.37				
J1-PreX-Sk3	3.28	1.17	.25	.25	.63	.34
J3-PreX-Sk3	3.53	1.76				
J2-PreX-Sk3	3.25	1.37	.28	.21	.75	
J3-PreX-Sk3	3.53	1.76				

TABLE II--Continued

Variable	$\bar{X}$	SD	$\bar{X}_\Delta$	SEΔ	r	F[a]
J1-PreX-Sk4[b]	1.67	1.39	.15	.13	.87	
J2-PreX-Sk4	1.52	1.02				
J1-PreX-Sk4	1.67	1.39	.04	.08	.95	.12
J3-PreX-Sk4	1.63	1.29				
J2-PreX-Sk4	1.52	1.02	.11	.14	.81	
J3-PreX-Sk4	1.63	1.29				
J1-PreX-Sk5	3.10	2.63	.13	.29	.80	
J2-PreX-Sk5	2.97	2.08				
J1-PreX-Sk5	3.10	2.63	.07	.07	.99	.05
J3-PreX-Sk5	3.17	2.61				
J2-PreX-Sk5	2.97	2.08	.20	.28	.81	
J3-PreX-Sk5	3.17	2.61				
J1-PreX-Sk6	3.95	3.31	.20	.14	.98	
J2-PreX-Sk6	3.75	3.02				
J1-PreX-Sk6	3.95	3.31	.20	.14	.98	.10
J3-PreX-Sk6	4.15	3.73				
J2-PreX-Sk6	3.75	3.02	.40	.28	.92	
J3-PreX-Sk6	4.15	3.73				
J1-Pre	2.70	1.63	.10	.17	.82	
J2-Pre	2.60	1.31				
J1-Pre	2.70	1.63	.11	.79	.97	.13
J3-Pre	2.81	1.72				
J2-Pre	2.60	1.31	.21	.17	.86	
J3-Pre	2.81	1.72				

[a] $F = (2,27).05 = 3.35$

[b] J1=Judge One; J2=Judge Two; J3=Judge Three; PreX=Pre-Test mean
Sk1=Skill One (Drop Front Hip Circle)
Sk2=Skill Two (Front Support Front Hip Circle)
Sk3=Skill Three (Free Front Hip Circle Mount)
Sk4=Skill Four (Sole Circle Shoot Off Dismount)
Sk5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Sk6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Pre=Mean of the sum of the six skills

TABLE III

POST-TEST JUDGE OBJECTIVITY (N = 30)

Variable	$\bar{X}$	SD	$\bar{X}\Delta$	SEΔ	r	F[a]
J1-PostX-Sk1[b]	1.73	1.33	.00	.02	1.00	
J2-PostX-Sk1	1.73	1.34				
J1-PostX-Sk1	1.73	1.33	.04	.05	.98	.01
J3-PostX-Sk1	1.77	1.39				
J2-PostX-Sk1	1.73	1.34	.04	.05	.98	
J3-PostX-Sk1	1.77	1.39				
J1-PostX-Sk2	2.57	1.61	.03	.03	1.00	
J2-PostX-Sk1	2.60	1.75				
J1-PostX-Sk2	2.57	1.61	.13	.09	.97	.05
J3-PostX-Sk2	2.70	1.88				
J2-PostX-Sk2	2.60	1.75	.10	.10	.96	
J3-PostX-Sk2	2.70	1.88				
J1-PostX-Sk3	3.70	1.92	.05	.11	.97	
J2-PostX-Sk3	3.75	2.25				
J1-PostX-Sk3	3.70	1.92	.25	.15	.99	.10
J3-PostX-Sk3	3.95	2.66				
J2-PostX-Sk3	3.75	2.25	.20	.12	.98	
J3-PostX-Sk3	3.95	2.66				
J1-PostX-Sk4	1.97	1.66	.05	.08	.97	
J2-PostX-Sk4	2.02	1.61				
J1-PostX-Sk4	1.97	1.66	.35	.11	.96	.35
J3-PostX-Sk4	2.32	1.97				
J2-PostX-Sk4	2.02	1.61	.30	.13	.94	
J3-PostX-Sk4	2.32	1.97				

TABLE III--Continued

Variable	$\bar{X}$	SD	$\bar{X}_\Delta$	SEΔ	r	F[a]
J1-PostX-Sk5[b]	3.83	3.15	.07	.11	.98	
J2-PostX-Sk5	3.90	3.08				
J1-PostX-Sk5	3.83	3.15	.50	.16	.98	.20
J3-PostX-Sk5	4.33	3.73				
J2-PostX-Sk5	3.90	3.08	.43	.19	.91	
J3-PostX-Sk5	4.33	3.73				
J1-PostX-Sk6	3.70	2.69	.15	.11	1.00	
J2-PostX-Sk6	3.85	3.24				
J1-PostX-Sk6	3.70	2.69	.05	.05	1.00	.20
J3-PostX-Sk6	3.75	2.86				
J2-PostX-Sk6	3.85	3.24	.10	.07	1.00	
J3-PostX-Sk6	3.75	2.86				
J1-Post	2.92	1.52	.06	.04	.99	
J2-Post	2.98	1.61				
J1-Post	2.92	1.52	.22	.08	.99	.14
J3-Post	3.14	1.82				
J2-Post	2.98	1.61	.16	.08	.97	
J3-Post	3.14	1.82				

[a] $F_{(2,27)}.05 = 3.35$

[b] J1=Judge One; J2=Judge Two; J3=Judge Three; PostX=Post-Test Mean
Sk1=Skill One (Drop Front Hip Circle)
Sk2=Skill Two (Front Support Front Hip Circle)
Sk3=Skill Three (Free Front Hip Circle Mount)
Sk4=Skill Four (Sole Circle Shoot Off Dismount)
Sk5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Sk6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Post=Mean of the sum of the six skills

Reliability and reproducibility of the data. Two tests were administered, on two separate test days, for both of the pre- and post-testing phases of the investigation. Reliability of the pre- and post-tests was evaluated by the Pearson Product-Moment correlation technique. Test-retest reliability correlation coefficients for the control group (n = 10) during pre-tests were r = .54 to 1.00 (Table IV). A test-retest analysis of skill six was conducted and revealed the highest correlation (r = 1.00) while skill one demonstrated the lowest correlation (r = .54). A correlation coefficient for skill three was not calculated due to all subjects receiving the same score during pre-test two. The pre-test correlation coefficient for the mean of the sum of the six skills combined was r = .99. The test-retest reliability correlation coefficients for the VTR feedback group (n = 10) during pre-tests were r = .93 to 1.00 (Table V). Analysis of skills one and six were calculated and demonstrated the highest correlation coefficient (r = 1.00) while skill four demonstrated the lowest correlation (r = .93). Correlation coefficients for skills two and three were not calculated due to all subjects receiving the same scores on pre-test one for skill three and all subjects receiving the same scores on both pre-tests for skill two. The pre-test correlation coefficient for the mean of the sum of the six skills combined was r = .98. Results of the zero-order correlational analysis for the teacher demonstration feedback group (n = 10) were computed and ranged from r = .96 to 1.00 for the pre-tests (Table VI). Correlation coefficients were calculated for skills three and six and demonstrated the highest correlation

TABLE IV

PRE-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Control Group

Variable	Pre-Test One		Pre-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.63	1.34	2.43	1.86	.80	.51	.54	1.58
Skill 2	2.73	2.32	2.67	2.76	.94	.77	.55	1.21
Skill 3	3.40	1.27	3.00	0.00	.40	.40	---	1.00
Skill 4	1.53	1.22	1.87	1.47	.34	.23	.87	1.43
Skill 5	2.87	2.52	3.27	2.73	.40	.23	.97	1.77
Skill 6	4.50	4.74	4.50	4.74	.00	.00	1.00	0.00
Pre	2.78	1.62	3.12	2.02	.34	.15	.99	2.25

[a] $t_{(9).05} = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Pre=Mean of the sum of the six skills

TABLE V

PRE-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Videotape Replay Feedback Group

Variable	Pre-Test One		Pre-Test Two					
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}\Delta$	SEΔ	r	t[a]
Skill 1[b]	1.33	1.05	1.37	1.16	.04	.03	1.00	1.33
Skill 2	2.00	.00	2.00	.00	.00	.00	---	0.00
Skill 3	3.00	.00	3.80	2.53	.80	.80	---	1.00
Skill 4	1.50	.97	1.63	1.17	.13	.14	.93	0.94
Skill 5	3.00	1.94	3.33	2.16	.33	.21	.96	1.63
Skill 6	3.20	.63	3.40	1.27	.20	.20	1.00	1.00
Pre	2.34	.75	2.59	1.34	.25	.20	.98	1.28

[a] $t_{(9)}.05 = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Pre=Mean of the sum of the six skills

TABLE VI

PRE-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Teacher Demonstration Feedback Group

Variable	Pre-Test One		Pre-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.70	1.58	1.73	1.58	.03	.08	.99	0.43
Skill 2	2.80	2.53	2.00	.00	.80	.80	---	1.00
Skill 3	3.60	1.90	3.40	1.27	.20	.20	1.00	1.00
Skill 4	1.47	1.17	1.63	1.46	.16	.11	.99	1.46
Skill 5	2.93	2.52	3.07	2.74	.14	.26	.96	0.51
Skill 6	3.90	2.85	4.20	3.80	.30	.30	1.00	1.00
Pre	2.73	1.75	2.67	1.58	.06	.07	1.00	0.88

[a] $t_{(9)}.05 = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Pre=Mean of the sum of the six skills

(r = 1.00) with skill five demonstrating the lowest correlation (r = .96). A correlation coefficient for skill two was not calculated due to all subjects receiving the same score during pre-test two. The pre-test correlation for the mean of the sum of the six skills combined was r = 1.00. Test-retest reliability correlation coefficients for all subjects (N = 30) were r = .33 to .97 during the pre-tests (Table VII). Results of the zero-order correlational analysis indicated skill six with the highest correlation (r = .97) and skill three (r = .33) with the lowest correlation coefficient. The pre-test correlation coefficient for the mean of the sum of the six skills combined was r = .96.

Test-retest reliability correlation coefficients during the post-test were calculated for the control group (n = 10) and were r = .33 to 1.00 (Table VIII). Results of the zero-order correlational analysis were computed and indicated skill six with the highest correlation (r = 1.00) and skill three (r = .33) with the lowest correlation. The post-test correlation coefficient for the mean of the sum of the six skills combined (r = .93) was lower than during the pre-tests. The test-retest correlation coefficients for the VTR feedback group (n = 10) during the post-test were r = .63 to .99 (Table IX). Results of the zero-order correlational analysis indicated skill five (r = .99) with the highest correlation and skill two (r = .63) with the lowest correlation coefficient. Correlation coefficients for skills three and six were not calculated due to all subjects receiving the same scores on both post-tests. Test-retest reliability correlation coefficients for

TABLE VII

PRE-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (N = 30)

Variable	Pre-Test One		Pre-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.56	1.30	1.84	1.57	.28	.18	.78	1.62
Skill 2	2.51	1.95	2.56	1.73	.05	.38	.36	0.12
Skill 3	3.33	1.30	3.40	1.61	.07	.31	.33	0.21
Skill 4	1.50	1.09	1.71	1.33	.21	.97	.92	2.19
Skill 5	2.93	2.26	3.22	2.47	.29	.13	.95	2.21
Skill 6	3.87	3.15	4.03	3.49	.16	.12	.97	1.41
Pre	2.62	1.41	2.79	1.63	.17	.89	.96	2.00

[a] $t_{(29)}.05 = 2.04$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Pre=Mean of the sum of the six skills

TABLE VIII

POST-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Control Group

Variable	Post-Test One		Post-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	2.23	1.62	1.93	1.51	.30	.23	.89	1.30
Skill 2	3.00	2.11	2.47	1.48	.53	.53	.61	1.00
Skill 3	4.50	3.17	4.40	2.95	.10	1.12	.33	0.09
Skill 4	2.30	.75	2.13	1.69	.17	.33	.82	0.50
Skill 5	4.20	3.13	3.93	3.26	.27	.35	.94	0.77
Skill 6	4.40	4.43	3.70	2.21	.70	.70	1.00	1.00
Post	3.44	2.11	3.09	1.96	.35	.25	.93	1.40

[a] $t_{(9)}.05 = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Post=Mean of the sum of the six skills

TABLE IX

POST-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Videotape Replay Feedback Group

Variable	Post-Test One		Post-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.73	1.55	1.40	1.27	.33	.41	.59	0.81
Skill 2	2.73	2.32	3.53	3.24	.80	.80	.63	1.00
Skill 3	3.00	.00	3.00	.00	.00	.00	---	0.00
Skill 4	2.50	2.07	2.10	1.97	.40	.42	.79	0.92
Skill 5	4.47	3.06	4.53	3.48	.06	.21	.99	0.32
Skill 6	3.00	.00	3.00	.00	.00	.00	---	0.00
Post	2.91	1.21	2.93	1.42	.02	.13	.97	0.17

[a] $t_{(9)}.05 = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Post=Mean of the sum of the six skills

the teacher demonstration feedback group (n = 10) during the post-tests were r = .67 to 1.00 (Table X). Results of the zero-order correlational analysis indicated skills three and six (r = 1.00) with the highest correlations and skill one (r = .67) with the lowest correlation coefficient. A correlation coefficient for skill two was not calculated due to all subjects receiving the same score during the second post-test. The post-test correlation coefficient for the mean of the sum of the six skills combined was r = .98. The analysis of the test-retest correlation coefficient for all subjects (N = 30) during the post-tests demonstrated a lesser range (r = .59 to .93) than during the pre-test (Table XI). Results of the zero-order correlational analysis indicated skill six (r = .93) with the highest correlation and skill two (r = .59) with the lowest correlation coefficient. The post-test correlation coefficient for the mean of the sum of the six skills combined was r = .95.

Nonsignificant t-values were calculated for all other tests. Test-retest t-values of 0.00 were noted for the following measures: (1) control group, pre-test skill six, (2) VTR group, pre-test skill two, and (3) VTR group, post-test skill three. The resultant t-values of 0.00 were due to all subjects receiving the same score on one of the tests.

TABLE X

POST-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (n = 10)

Teacher Demonstration Feedback Group

Variable	Post-Test One		Post-Test Two		$\bar{X}_\Delta$	SE_Δ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.73	1.55	1.44	1.37	.29	.38	.67	0.79
Skill 2	2.00	2.53	2.00	.00	.80	.80	---	1.00
Skill 3	3.90	2.85	4.00	3.16	.10	.10	1.00	1.00
Skill 4	1.83	1.74	1.73	1.73	.10	.07	.99	1.41
Skill 5	3.80	3.95	3.20	3.80	.60	.68	.85	0.89
Skill 6	4.20	3.80	4.30	4.11	.10	.10	1.00	1.00
Post	2.91	1.75	2.78	1.68	.13	.12	.98	1.08

[a] $t_{(9)}.05 = 2.26$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Post=Mean of the sum of the six skills

TABLE XI

POST-TEST RELIABILITY AND REPRODUCIBILITY FOR PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (N = 30)

Variable	Post-Test One		Post-Test Two		$\bar{X}\Delta$	SEΔ	r	t[a]
	$\bar{X}$	SD	$\bar{X}$	SD				
Skill 1[b]	1.90	1.54	1.59	1.36	.31	.20	.73	1.60
Skill 2	2.58	1.80	2.67	2.09	.09	.33	.59	0.27
Skill 3	3.80	2.46	3.80	2.48	.00	.36	.68	0.00
Skill 4	2.21	1.82	1.99	1.75	.22	.17	.86	1.28
Skill 5	4.16	3.30	3.89	3.44	.27	.26	.91	1.03
Skill 6	3.87	3.31	3.67	2.66	.20	.24	.93	0.84
Post	3.09	1.69	2.93	1.64	.16	.10	.95	1.50

[a] $t_{(29)}.05 = 2.04$

[b] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
Post=Mean of the sum of the six skills

Analysis of group differences. The one-way analysis of variance procedure (ANOVA), using the mean differences between pre- and post-test values, was utilized to determine if significant differences had occurred among the three groups (Table XII). Results of the ANOVA technique of the mean differences indicated nonsignificant F-ratios among the three groups for all six skills and for the mean of the sum of the six skills combined.

Discussion of the Results

Within the limitations of the present study, it was concluded that neither the teacher demonstration feedback method nor the VTR feedback method had a significant effect on the performance of the uneven parallel bar skills. This finding is in agreement with Penman, Bartz, and Davis of 1968. These investigators conducted a similar study utilizing 50 freshman college students over a treatment period of 12 weeks for a total of 24 treatment periods. The subjects were taught a series of trampoline skills and received either teacher demonstration feedback or VTR feedback. The investigators concluded that the use of the VTR had no significant effect on the learning of the trampoline skills. (30:1062) Beebe, in 1974, conducted an experiment utilizing the VTR as an instructional aid during the instruction of vaulting gymnastics skills to 116 seventh and eighth grade female students. This investigator concluded that the VTR had no significant effect on the learning of the prescribed skills. (2:13S) Penman, in 1969, also

TABLE XII

MEAN CHANGES IN PERFORMANCE OF UNEVEN PARALLEL BAR SKILLS (N = 30)

Variable	Group[b]	Pre-Test $\bar{X}$	Pre-Test SD	Post-Test $\bar{X}$	Post-Test SDΔ	$\bar{X}\Delta$ -	F[a]
Skill 1[c]	Control	2.03	1.41	2.08	1.52	.05	
	VTR Feedback[d]	1.35	1.11	1.57	1.26	.22	.26
	Teacher Demonstration	1.72	1.57	1.58	1.33	-.14	
Skill 2	Control	3.20	2.24	2.73	1.62	-.47	
	VTR Feedback	2.00	0.00	3.13	2.52	1.13	2.43
	Teacher Demonstration	2.40	1.27	2.00	0.00	-.40	
Skill 3	Control	3.17	0.53	4.45	2.49	1.28	
	VTR Feedback	3.40	1.27	3.00	0.00	-.40	2.26
	Teacher Demonstration	3.50	1.58	3.95	3.00	.45	
Skill 4	Control	1.70	1.30	2.22	1.64	.52	
	VTR Feedback	1.57	1.05	2.50	1.91	.73	.73
	Teacher Demonstration	1.55	1.31	1.78	1.74	.23	
Skill 5	Control	3.07	2.60	4.07	3.15	1.00	
	VTR Feedback	3.16	2.03	4.50	3.26	1.34	.64
	Teacher Demonstration	3.00	2.60	3.50	3.72	.50	

TABLE XII--Continued

Variable	Group[b]	Pre-Test $\bar{X}$	Pre-Test SD	Post-Test $\bar{X}$	Post-Test SDΔ	$\bar{X}\Delta$	F[a]
Skill 6[c]	Control	4.50	4.74	4.05	3.32	-.45	
	VTR Feedback[d]	3.30	0.95	3.00	0.00	-.30	1.05
	Teacher Demonstration	4.05	3.32	4.25	3.95	.20	
All	Control	2.94	1.80	3.26	2.00	-.33	
	VTR Feedback	2.46	1.04	2.92	1.30	.46	.61
	Teacher Demonstration	2.70	1.67	2.84	1.70	.14	

[a] $F_{(2,87)}.05 = 3.10$

[b] n = 10 per group

[c] Skill 1=Skill One (Drop Front Hip Circle)
Skill 2=Skill Two (Front Support Front Hip Circle)
Skill 3=Skill Three (Free Front Hip Circle Mount)
Skill 4=Skill Four (Sole Circle Shoot Off Dismount)
Skill 5=Skill Five (Sole Circle Shoot Off Half Turn Dismount)
Skill 6=Skill Six (Low Bar-Sole Circle Shoot Off Half Turn-High Bar)
All=Mean of the sum of the six skills

[d] VTR = Videotape replay

concluded that the VTR had no significant effect on the learning of tumbling skills among 50 freshman college students over a period of 24 treatments during 12 weeks. (29:46) Conversely, in 1967 Plese concluded that the use of the VTR had a significant effect on the learning of parallel bar skills among 199 male junior high school students over a period of seven weeks for 14 treatment periods. Plese also stated that the use of the VTR allowed the student to advance more rapidly to more difficult skills. (31:103) Brumbach and Gray, in 1967, conducted an experiment utilizing loop films in the instruction of badminton skills to 60 male undergraduate college students during a 10-week period consisting of 30 treatments. These investigators concluded that the use of the audiovisual aid appeared to hasten learning during the early stages. (5:569) Muhr, in 1972, also concluded that significant VTR learning effects were greatest during the early stages of learning in an experiment involving the correction of batting faults among 17 college junior varsity baseball players during a 3-week period consisting of 15 treatments. (25:34)

Perhaps one possible reason for the differences in the results of Plese, Brumbach and Gray, and Muhr and the present investigation was due to the limited amount of trials allotted for each skill in the present study. According to Drowatzky, the instruction of closed motor skills, such as gymnastics skills, requires repetitive practice of the skill in order to obtain movement consistency. (9:53) The present investigation allotted only 12 trials of each skill which may have influenced the nonsignificant results of skill acquisition.

Additionally, if assessment of skill acquisition were conducted at intervals throughout the present study as Brumbach and Gray, Watkins, Thompson, and Muhr did, then perhaps the effects of the two types of feedback could have been analyzed from a temporal perspective. (3:569, 25:34, 34:594, 36:232)

The uneven parallel bar skills test utilized in this study had a high reliability for the mean of the sum of the six skills combined for both the pre-tests ($r = .96$) and the post-tests ($r = .95$). Similar findings were reported by Wilson who conducted an experiment in order to assess the reliability of judges scores during repeated replays of videotaped routines of the 1972 Canadian Womens European Trials Competition. Test-retest correlation coefficients between the judges scores of uneven parallel bar routines averaged $r = .96$. (38:172) The dependent t-test utilized to analyze reproducibility revealed significant t-values between the two pre-tests for all 30 subjects for skill four ($t = 2.19$) and skill five ($t = 2.21$). A learning effect and increased level of motivation may have contributed to the better performance on the second test.

A one-way analysis of variance of the mean differences of raters scores for each of the six skills revealed nonsignificant differences among the raters during all assessments of both pre- and post-tests. This finding is in complete agreement with Hunsicker and Loken who conducted an investigation concerning the objectivity of judges at the National Collegiate Athletic Association Gymnastics of 1950. These investigators compared the scores of the six events of the five judges

using only the top six gymnasts scores in each event. The investigators concluded that the correlation coefficients indicated that the judges agreed with one another to an acceptable degree and that the consistency of these judges would probably compare favorably with subjective assessments of experts rating any other physical or motor trait. (14:424) However, Faulkner and Loken noted that the objectivity of judging at the 1960 National Collegiate Athletic Association Gymnastics Meet had produced lower correlation coefficients and suggested the continual need for revision of criteria for assessment purposes. (10:485) Johnson conducted a similar study in 1970 based on scores obtained from the 1970 National Collegiate Athletic Association Gymnastics Meet. This investigator also concluded that the need for reassessment of rules and judging procedures was required to increase discriminative qualities of the test. (16:455) Perhaps one reason for the high objectivity among judges of the present study was due to the construction of the rating scale by limiting the raters responsibility to only one area as suggested by Landers. (16:86)

A one-way analysis of the mean differences in the uneven parallel bar skills test scores revealed that a nonsignificant mean difference existed between the groups pre-test and post-test scores. The present investigator's hypothesis which stated that there would be no significant difference in performance attained on selected uneven parallel bar skills between members of the three groups was failed to be rejected.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this investigation was to investigate the effectiveness of two types of visual feedback on the performance of selected uneven parallel bar skills. Assessment of performance was measured by a zero to seven point rating scale based on mechanical errors.

Summary

Thirty female undergraduate students enrolled in gymnastics and tumbling courses in either the Fitness and Lifetime Activities Program for non-majors or the Professional Skills Program for Health, Physical Education, and Recreation majors at South Dakota State University during the spring semester of 1978, and were assigned to three groups using the stratified random allocation method according to pre-test results. The replicated pre-testing and post-testing assessments consisted of a zero to seven point rating scale administered by three raters both before and after the three week treatment period. Treatment for the experimental group consisted of videotape replay feedback (VTR) following skill performance for the six uneven parallel bar skills. The second experimental group received the same treatment except the instructor supplied the subjects with visual demonstrations of the skills. The control group participated in only the testing phases of the investigation.

Data analysis included an objectivity assessment among the three raters, a reliability and reproducibility assessment, and a one-way analysis of variance to determine if any significant mean changes had occurred among the groups. The .05 level of probability was chosen to accept group differences as statistically significant.

Conclusions

Under the conditions of the present study, and within the limitations described, the following conclusions were drawn:

1. There were no significant differences in mean changes from pre- to post-test among the three groups.

2. There was a high correlation coefficient range ($r = .82$ to .97) for the mean of the sum of the six skills combined for objectivity among the raters during the pre-test.

3. There was a high correlation coefficient range ($r = .97$ to .99) for the mean of the sum of the six skills combined for objectivity among the raters during the post-test.

4. There was a high correlation coefficient range for reliability ($r = .96$ to 1.00) for the mean of the sum of the six skills combined during the pre-tests.

5. There was a high correlation coefficient range for reliability ($r = .93$ to .98) for the mean of the sum of the six skills combined during the post-tests.

6. There was a generally high reproducibility for the pre- and post-tests conducted throughout the assessment of skill performances.

Implications

Several investigators have concluded that the use of the VTR in the acquisition of motor learning hastens early learning. Within the limitations of the present investigation, this investigator has concluded that the VTR has no significant effects on motor skill acquisition when the number of trials of the skill are limited to 12.

Recommendations

In consideration of the results of this study the following recommendations are made:

1. That a similar study be conducted allowing a greater number of skill executions for each maneuver.

2. That a similar study be conducted with performance assessment conducted at intervals throughout the treatment period.

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APPENDIX A

Mechanical Errors

APPENDIX A

Mechanical Errors

Skill 1 - Drop Front Hip Circle

1. The upper thighs should be resting on the low bar.
2. The hands should move outward releasing the grip of the bar.
3. The body should bend or pike at the waist as it reaches a position parallel to the floor.
4. Simultaneous to the piking action, the hands should reach under and around the low bar.
5. The point of rotation should be at the waist around the low bar.
6. The body should lengthen as it reaches the front support position.
7. The skill should end in the front support position.

Skill 2 - Front Support Front Hip Circle

1. The hands should grasp the low bar with a regular grip.
2. The hands should be shoulder width apart.
3. The body should be fully extended.
4. The arms should be fully extended.
5. The body should bend or pike at the waist as it reaches a position parallel to the floor.
6. The point of rotation should be at the waist around the low bar.
7. The body should lengthen as it reaches the front support position.
8. The skill should end in a front support position.

Skill 3 - Free Front Hip Circle Mount

1. The body should be extended with the arms extended overhead at take-off.
2. Contact with the low bar should be made with the upper thighs.
3. The body should be fully extended at the moment of contact.
4. Immediately following contact of the body with the bar, the body should bend or pike at the waist.
5. Simultaneous to the piking action, the hands should reach under and around the low bar.
6. The point of rotation should be at the waist around the low bar.
7. The body should lengthen as it reaches the front support position.
8. The skill ends in the front support position.

Skill 4 - Sole Circle Shoot Off Dismount

1. The body should be resting on the low bar at the waist.
2. The arms should be slightly flexed.
3. The shoulders should learn forwards.
4. The hips and legs should be thrust upwards and backwards.
5. The feet should be placed on the low bar at the height of the swing.
6. The feet should be placed as close as possible to the hands in a straddle position.
7. The legs should be fully extended.
8. The point of rotation should be at the hands and feet around the low bar.

9. As the body reaches the end of the pendulum swing the feet should come off the low bar.
10. The body should be fully extended through the hips.
11. Simultaneously, the bar should be thrust behind the head as the hand grip is released.
12. The angle of release should be high.
13. The skill should end in an erect stand with the legs together.

Skill 5 - Sole Circle Shoot Off Half-Turn Dismount

1. The body should be resting on the low bar at the waist.
2. The arms should be slightly flexed.
3. The shoulders should lean forwards.
4. The hips and legs should be thrust upwards and backwards.
5. The feet should be placed on the low bar at the height of the swing.
6. The feet should be placed as close as possible to the hands in a straddle position.
7. The legs should be fully extended.
8. The point of rotation should be at the hands and feet around the low bar.
9. As the body reaches the end of the pendulum swing the feet should come off and low bar.
10. The body should be fully extended through the hips.
11. The initiation of the twist should be executed before the release of the low bar by tilting the hips outward and turning the head in the same direction.

12. Simultaneously, the bar should be thrust behind the head as the hand grip is released.
13. The angle of release should be high.
14. The half-turn should be completed before contact with the floor.
15. The skill ends in an erect stand with the legs together.

Skill 6 - Low Bar-Sole Circle Shoot Off Half-turn High Bar

1. The body should be resting on the low bar at the waist.
2. The arms should be slightly flexed.
3. The shoulders should lean forwards.
4. The hips and legs should be thrust upwards and backwards.
5. The feet should be placed on the low bar at the height of the swing.
6. The feet should be placed as close as possible to the hands in a straddle position.
7. The legs should be fully extended.
8. The point of rotation should be at the hands and feet around the low bar.
9. As the body reaches the end of the pendulum swing the feet should come off the low bar.
10. The body should be fully extended through the hips.
11. The initiation of the twist should be executed before the release of the low bar by tilting the hips outward and turning the head in the same direction.
12. Simultaneously, the bar should be thrust behind the head as the hand grip is released.

13. The half-turn should be completed before both hands grasp the high bar.
14. The hands should grasp the high bar with a mixed grip.
15. The skill ends in a long hang position.

APPENDIX B

Subject Characteristics

APPENDIX B

Subject Characteristics

Group	Subject Number	Age	Gymnastics Experience
Control	01	18	No
	03	19	No
	04	19	No
	05	20	No
	06	19	Yes
	14	18	Yes
	16	19	No
	19	19	No
	20	18	No
	22	19	Yes
Experimental Group One	27	20	Yes
	29	20	No
	32	21	No
	35	19	No
	36	20	No
	38	19	No
	40	21	No
	42	19	No
	44	20	No
Experimental Group Two	26	18	No
	28	21	No
	30	19	No
	31	19	No
	33	20	No
	34	18	No
	37	19	Yes
	41	19	Yes
	43	19	No

APPENDIX C

Skill Instruction

APPENDIX C

Skill Instruction

Skill 1 - Drop Front Hip Circle

1. From front support position on the low bar facing the high bar with the hands grasping the high bar and the low bar resting on the upper thighs. The hands should be spread as wide as possible.
2. The body should be fully extended. Allow the hands to move outward so the grip of the high bar is released.
3. The body should begin to drop fully extended in a downward and forward direction.
4. The hands should begin to reach downward and forward to grasp the low bar with a regular grip.
5. Simultaneous to this action, the body should bend or pike at the waist as it reaches a position parallel to the floor.
6. The body should be rotating at the waist around the low bar.
7. The body should lengthen from the pike position as it reaches the front support position.
8. Move to the front support position.

Skill 2 - Front Support Front Hip Circle

1. From front support position on the low bar facing the high bar with the hands assuming a regular grip on the low bar.
2. The body should be fully extended and the bar should be resting on the upper thighs.

3. The arms should be fully extended and the chest should be projected outward.
4. Allow the body to drop forward and downward.
5. As the body reaches a position parallel to the floor a pike or bend at the waist should be obtained.
6. The body should be rotating at the waist around the low bar.
7. The body should lengthen from the pike position as it reaches the front support position.
8. Move to the front support position.

Skill 3 - Free Front Hip Circle Mount

1. With a reuther board placed in front of the low bar facing the high bar, run and take-off the reuther board with the body fully extended and the arms extended overhead.
2. Contact of the body with the low bar should be made with the upper thighs. The body should still be fully extended with the arms extended overhead.
3. Immediately following the contact of the body with the low bar, the body should bend or pike at the waist.
4. Simultaneous to the piking action, the arms should reach forward and downward for the low bar grasping it with a regular grip.
5. The body should be rotating around the low bar at the waist.
6. The body should lengthen from the pike position as it reaches the front support position.
7. Move to the front support position.

Skill 4 - Sole Circle Shoot Off Dismount

1. From the front support position on the low bar with the hands grasping the low bar with a regular grip. The body should be facing outwards away from the high bar.
2. The body should be resting at the waist on the low bar with the arms slightly flexed.
3. Lean forward with the shoulders over the low bar and push the hips and legs backward and upward. The body should be rotating through the shoulder joint.
4. As the hips and legs raise upward place the feet on the low bar outside of the hands in a straddle position. The feet should be placed as close as possible to the hands on the low bar.
5. The feet should be placed on the low bar before the body begins it's pendulum swing downward.
6. Allow the body to drop backwards and downwards keeping the straddle position as tight as possible. The body should be rotating on the hands and feet around the low bar.
7. As the body reaches the end of the pendulum swing on the upswing allow the toes to come off the low bar. The legs should be extended upward and outward from the hips.
8. When the body is fully extended from the hips the hand grip should be released with the arms fully extended behind the head.
9. The angle of release should be high so that the body is projected upward rather than outward.
10. Move to an erect stand with the legs together and the arms extended overhead.

Skill 5 - Sole Circle Shoot Off Half-Turn Dismount

1. From the front support position on the low bar with the hands grasping the low bar with a regular grip. The body should be facing outwards away from the high bar.
2. The body should be resting at the waist on the low bar with the arms slightly flexed.
3. Lean forward with the shoulders over the low bar and push the hips and legs backward and upward. The body should be rotating through the shoulder joint.
4. As the hips and legs raise upward place the feet on the low bar outside of the hands in a straddle position. The feet should be placed as close as possible to the hands on the low bar.
5. The feet should be placed on the low bar before the body begins it's pendulum swing downward.
6. Allow the body to drop backwards and downwards keeping the straddle position as tight as possible. The body should be rotating on the hands and feet around the low bar.
7. As the body reaches the end of the pendulum swing on the upswing allow the toes to come off the low bar. The legs should be extended upward and outward from the hips.
8. As the hips are fully extended initiate the twist by rotating the hips outward and turn the head in the same direction.
9. When the body is fully extended from the hips the hand grip should be released with the arms fully extended behind the head.

10. The angle of release should be high so the body is projected upward rather than outward.
11. The half-turn should be completed before contact with the floor is made.
12. Move to an erect stand with the legs together and the arms extended overhead.

Skill 6 - Low Bar-Sole Circle Shoot Off Half-Turn-High Bar

1. From the front support position on the low bar with the hands grasping the low bar with a regular grip. The body should be facing towards the high bar.
2. The body should be resting at the waist on the low bar with the arms slightly flexed.
3. Lean forwards with the shoulders over the low bar and push the hips and legs backwards and upwards. The body should be rotating through the shoulder joint.
4. As the hips and legs raise upward place the feet on the low bar outside of the hands in a straddle position. The feet should be placed as close as possible to the hands on the low bar.
5. The feet should be placed on the low bar before the body begins it's pendulum swing downward.
6. Allow the body to drop backwards and downwards keeping the straddle position as tight as possible. The body should be rotating on the hands and feet around the low bar.

7. As the body reaches the end of the pendulum swing on the upswing allow the toes to come off the low bar. The legs should be extended upward and outward from the hips.
8. As the hips are fully extended initiate the twist by rotating the hips outward and turn the head in the same direction.
9. When the body is fully extended from the hips the hand grip should be released with the arms fully extended above the head.
10. The angle of release should be high so the body is projected upward rather than outward.
11. The half-turn should be completed before both hands grasp the high bar.
12. The hands should grasp the high bar with a mixed grip.
13. Move to a long hang position.

APPENDIX D

Teaching Sequence

APPENDIX D

Teaching Sequence

Day	Skill	Variation	Degree of Difficulty
1-2	Front Hip Circles	Drop Front Hip Circle	Beginning
3-4		Front Support Front Hip Circle	Intermediate
5-6		Free Front Hip Circle Mount	Advanced
7-8	Sole Circles	Sole Circle Shoot Off Dismount	Beginning
9-10		Sole Circle Shoot Off Half-Turn Dismount	Intermediate
11-12		Low Bar-Sole Circle Shoot Off Half-Turn-High Bar	Advanced

APPENDIX E

Experimental Subject Informed Consent Form

APPENDIX E

Experimental Subject Informed Consent Form

Dear Student,

You have the opportunity to be part of a research project conducted by one of the graduate assistants in the Health, Physical Education, and Recreation Department of South Dakota State University. I will be investigating the effectiveness of two types of visual feedback on the performance proficiency of selected gymnastics uneven parallel bar skills.

If you decide to take part in this study it will be extremely important that you do not miss any class periods during the weeks of April 17, 1978 to May 5, 1978.

I appreciate the effort this will require of you and hope you will benefit from participating in this study. If there are any questions concerning your participation in this study please feel free to consult with me.

Sincerely,

Wes McCloskey

Wes McCloskey

- -

Listed below is a description of the experiment in which you have expressed an interest in participating:

1. The purpose of this study is to investigate the effectiveness of two types of visual feedback on performance proficiency on selected gymnastics uneven parallel bar skills.
2. You will be given two pre-tests and two post-tests to assess your performance proficiency of the selected skills.
3. You will be practicing these skills four days per week for approximately twenty minutes per practice session for a period of three weeks.
4. You will be asked to demonstrate skills commonly found in basic collegiate level gymnastics classes.
5. You will be randomly assigned to one of three groups.
6. You will recieve the test results of yourself, your group, and the study.
7. You are free to withdraw from the study at any time.

DATE __________ SIGNATURE ________________

PHONE __________ ADDRESS ________________

WITNESS ______________ ADDRESS ________________

APPENDIX F

Rating Scale

APPENDIX F

Rating Scale

SKILL LEVEL	WEIGHTING FACTOR
Beginning	1.0
Intermediate	2.0
Advanced	3.0

POINT VALUE	DEFINITION
7	Perfect mechanical execution of the skill
6	One mechanical error in the execution of the skill
5	Two mechanical errors in the execution of the skill
4	Three mechanical errors in the execution of the skill
3	Four mechanical errors in the execution of the skill
2	Five or more mechanical errors in in the execution of the skill
1	Incomplete execution of the skill

Skill	Weighting Factor	7	6	5	4	3	2	1
Beginning	1.0	7.0	6.0	5.0	4.0	3.0	2.0	1.0
Intermediate	2.0	14.0	12.0	10.0	8.0	6.0	2.0	2.0
Advanced	3.0	21.0	18.0	15.0	12.0	9.0	6.0	3.0

APPENDIX G

Sample Rating Sheet

APPENDIX G

Sample Rating Sheet

Subject Number	Skill Number	Weighting Factor	Trial One	Trial Two	Best Score	Final Score
01	1	1				
	2	2				
	3	3				
	4	1				
	5	2				
	6	3				
03	1	1				
	2	2				
	3	3				
	4	1				
	5	2				
	6	3				
04	1	1				
	2	2				
	3	3				
	4	1				
	5	2				
	6	3				
05	1	1				
	2	2				
	3	3				
	4	1				
	5	2				
	6	3				

APPENDIX H

Raw Data

Subject Number	Group Number	Judge Number	Pre-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
01	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
03	1	1	1	4	2	3	1	2	3
		1	2	4	6	3	1	2	3
		2	1	4	2	3	1	2	3
		2	2	4	6	3	1	2	3
		3	1	4	2	3	1	2	3
		3	2	5	6	3	1	2	3
04	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
05	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
06	1	1	1	4	8	3	1	2	3
		1	2	5	8	3	3	4	3
		2	1	5	10	3	1	2	3
		2	2	4	8	3	2	4	3
		3	1	4	10	3	1	2	3
		3	2	4	8	3	5	4	3
14	1	1	1	1	2	3	4	2	3
		1	2	5	2	3	4	4	3
		2	1	1	2	3	2	4	3
		2	2	5	2	3	4	4	3
		3	1	1	2	3	2	2	3
		3	2	4	2	3	2	4	3

Subject Number	Group Number	Judge Number	Pre-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
16	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
19	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
21	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
22	1	1	1	1	2	9	5	10	18
		1	2	5	8	3	5	12	18
		2	1	1	2	3	5	10	18
		2	2	5	8	3	5	10	18
		3	1	1	2	9	4	10	18
		3	2	5	10	3	5	10	18
27	2	1	1	6	2	3	5	10	6
		1	2	7	2	15	6	12	6
		2	1	1	2	3	2	4	3
		2	2	1	2	3	2	2	3
		3	1	6	2	3	5	10	6
		3	2	6	2	15	6	12	12
42	2	1	1	1	2	3	2	4	3
		1	2	1	2	3	2	4	3
		2	1	1	2	3	2	4	3
		2	2	1	2	3	3	6	3
		3	1	1	2	3	2	4	3
		3	2	1	2	3	2	4	3

Subject Number	Group Number	Judge Number	Pre-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
32	2	1	1	1	2	3	2	4	3
		1	2	1	2	3	1	4	3
		2	1	1	2	3	2	4	3
		2	2	1	2	3	2	4	3
		3	1	1	2	3	2	4	3
		3	2	1	2	3	1	4	3
29	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	2	4	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	2	4	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	2	4	3
38	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
45	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
35	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
36	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3

Subject Number	Group Number	Judge Number	Pre-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
40	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
44	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
41	3	1	1	7	10	3	5	10	12
		1	2	6	2	3	6	10	15
		2	1	5	10	3	4	10	9
		2	2	5	2	3	5	10	12
		3	1	5	10	3	5	10	15
		3	2	5	2	3	6	12	18
37	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	4	2	12	1	2	3
		2	2	5	2	9	2	6	3
		3	1	5	2	12	1	2	3
		3	2	6	2	9	2	4	3
26	3	1	1	1	2	3	2	2	3
		1	2	1	2	3	2	2	3
		2	1	1	2	3	2	4	3
		2	2	1	2	3	2	2	3
		3	1	1	2	3	2	4	3
		3	2	1	2	3	2	2	3
39	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3

Subject Number	Group Number	Judge Number	Pre-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
28	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
33	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
30	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
34	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
31	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
43	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3

Subject Number	Group Number	Judge Number	Post-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
01	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
03	1	1	1	3	2	3	1	2	3
		1	2	1	2	3	2	2	3
		2	1	3	2	3	1	2	3
		2	2	1	2	3	2	2	3
		3	1	4	2	3	1	2	3
		3	2	1	2	3	2	2	3
04	1	1	1	1	2	3	3	6	3
		1	2	1	2	3	3	6	3
		2	1	1	2	3	3	6	3
		2	2	1	2	3	3	6	3
		3	1	1	2	3	4	8	3
		3	2	1	2	3	4	8	3
05	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
06	1	1	1	4	6	9	4	6	3
		1	2	4	2	9	2	8	3
		2	1	4	6	9	3	6	3
		2	2	4	2	9	4	6	3
		3	1	5	10	12	6	10	3
		3	2	4	2	12	6	10	3
14	1	1	1	5	2	12	4	4	3
		1	2	4	2	3	1	2	3
		2	1	4	2	9	3	6	3
		2	2	4	2	3	1	2	3
		3	1	4	2	12	5	6	3
		3	2	4	2	3	1	2	3

Subject Number	Group Number	Judge Number	Post-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
16	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
19	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
21	1	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
22	1	1	1	4	6	3	5	10	15
		1	2	4	6	9	5	10	9
		2	1	4	6	3	5	10	18
		2	2	4	6	9	5	10	12
		3	1	5	8	3	6	12	18
		3	2	5	8	12	6	12	9
27	2	1	1	5	2	3	6	10	3
		1	2	1	10	3	7	12	3
		2	1	5	2	3	6	10	3
		2	2	1	10	3	6	10	3
		3	1	5	2	3	6	12	3
		3	2	1	10	3	7	14	3
42	2	1	1	1	2	3	4	6	3
		1	2	1	2	3	1	6	3
		2	1	1	2	3	5	6	3
		2	2	1	2	3	1	6	3
		3	1	1	2	3	5	6	3
		3	2	1	2	3	1	6	3

Subject Number	Group Number	Judge Number	Post-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
32	2	1	1	4	8	3	2	6	3
		1	2	5	10	3	1	6	3
		2	1	5	10	3	4	8	3
		2	2	5	10	3	3	8	3
		3	1	4	10	3	3	6	3
		3	2	5	8	3	1	8	3
29	2	1	1	1	2	3	6	6	3
		1	2	1	2	3	4	6	3
		2	1	1	2	3	5	8	3
		2	2	1	2	3	5	8	3
		3	1	1	2	3	5	8	3
		3	2	1	2	3	5	8	3
38	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
45	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
35	2	1	1	1	2	3	1	4	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	4	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	4	3
		3	2	1	2	3	1	4	3
36	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3

Subject Number	Group Number	Judge Number	Post-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
40	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
44	2	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	2	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	3	2	3
41	3	1	1	5	2	3	6	14	15
		1	2	1	2	3	6	14	15
		2	1	5	2	3	6	12	15
		2	2	1	2	3	6	14	18
		3	1	4	2	3	7	14	15
		3	2	1	2	3	7	14	15
37	3	1	1	5	2	9	1	2	3
		1	2	5	2	12	1	2	3
		2	1	5	2	12	1	2	3
		2	2	5	2	15	1	2	3
		3	1	4	2	15	1	2	3
		3	2	6	2	12	1	2	3
26	3	1	1	1	2	3	3	8	3
		1	2	1	2	3	2	2	3
		2	1	1	2	3	3	8	3
		2	2	1	2	3	2	2	3
		3	1	1	2	3	4	10	3
		3	2	1	2	3	5	2	3
39	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	3	2	3
		3	2	1	2	3	1	2	3

Subject Number	Group Number	Judge Number	Post-Test Number	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6
28	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
33	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
30	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
34	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
31	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3
43	3	1	1	1	2	3	1	2	3
		1	2	1	2	3	1	2	3
		2	1	1	2	3	1	2	3
		2	2	1	2	3	1	2	3
		3	1	1	2	3	1	2	3
		3	2	1	2	3	1	2	3