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AUTHOR	Zebas, Carole J.
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ABSTRACT

This study focuses on changes occurring in selected mechanical components of high school girls performing the standing broad jump, and collects data pertaining to the effects of monetary reward and videotape feedback upon the following components: (a) distance jumped, (b) maximum angle of knee flexion, (c) maximum angle of hip flexion, (d) hip extension at takeoff, (e) knee extension at takeoff, (f) linear velocity of the wrist before takeoff, (g) angular velocity of the upper arm, (h) linear velocity of the center of gravity during takeoff, (i) angle of center of gravity at takeoff, and (j) angle of center of gravity at landing. The subjects of the study were 30 high school girls who ranked at or above the 80th percentile in the standing broad jump item of the AAHPER Youth Fitness Test. Each girl was filmed executing the standing broad jump on two separate occasions. On the second try the girls were randomly assigned to one of three groups. One group of 10 girls was treated with the videotape feedback experimental factor, while the second group of 10 girls was treated with a one dollar monetary reward experimental factor. The third group served as a control group. Results indicated that neither a monetary reward nor videotape feedback affects distance jumped or the mechanical efficiency of a performer executing the standing broad jump. (Author/JS)

between the means of the two trials for each group.

2. Mean length of distance jumped ranged from 75.50 inches to 78.30 inches. The longest individual jump recorded was 91.75 inches and the shortest individual jump recorded was 65.75 inches.

3. No significant difference in maximum angles of knee flexion was found between the groups in each of the two trials. No significant difference in maximum angles of knee flexion was found between the means of the two trials for each group.

4. Mean maximum angles of knee flexion ranged from a low of 97.47 degrees to a high of 104.73 degrees.

5. No significant difference for maximum angles of hip flexion was found between the groups in each of the two trials. No significant difference in maximum angles of hip flexion was found between the means of the two trials for the control and reward groups. However, a significant difference in maximum angle of hip flexion was found between the means of the two trials for the videotape group.

6. Mean maximum angles of hip flexion ranged from a low of 77.53 degrees to a high of 85.81 degrees.

7. No significant difference in hip extension measurements at take-off was found between groups in each of the two trials. No significant difference in hip extension measurements at

Need for the Study

A teacher's concern for his pupils in the learning and performing stages of a skill is three-fold. First, he must recognize various aspects of a mechanically efficient movement. Secondly, he must know how to communicate the steps in learning the proper sequence of the skill to his student. Thirdly, he must know how to arouse or stimulate the student to produce the desired movement.

In recent years, cinematographical analysis has provided the researcher with a more precise measurement of human motion. High speed film, capable of slowing motion down considerably, has enabled the discovery of facts never before observed with the naked eye. These observations have resulted in the establishment of more scientific and detailed information concerning the efficient execution of a skill. The reduction and synthesis of data into workable form have enabled the teacher to make practical application of this knowledge.

General opinion has supported the values inherent in extrinsic motivators when used as arousal or stimulation devices. Rewards are considered to be one of the most valued techniques in this respect.

A second type of extrinsic motivator is visual feedback. Most experts have agreed that it can motivate, reinforce, and/or regulate behavior. Robb stated:

> It regulates in that it provides moment-to-moment information relevant to the organization of the next response phase. It can be reinforcing in that information rewarding an acceptable performance increases the probability of repeating a similar performance. It is motivating in the sense that information stimulates the operator to try harder on subsequent trials.[7]

Since rewards and visual feedback are important to learning and performance, the following questions were considered to be central to the present investigation:

1. Does a monetary reward affect performance as measured by the distance jumped?

2. Does a monetary reward affect mechanical performance?

3. Does videotape feedback affect performance as measured by distance jumped?

4. Does videotape feedback affect mechanical performance?

5. What differences do occur, if any, with the use of monetary rewards or videotape feedback?

6. Does the use of monetary rewards or videotape

feedback have positive or negative effects upon performance?

7. What are the implications for motor skill learning?

Limitations

The nature of the study contained several limitations:

1. Measurement error in the plotting of anatomical landmarks was impossible to completely eradiate.

2. Monetary rewards and visual feedback may not have been the only incentive factors affecting the performance of the students.

3. The movement itself, or the laboratory situation, may have provided intrinsic motivation.

4. The movement action was in a two-dimensional plane as recorded by the camera. Some of the three-dimensional movements may not have been assessed accurately.

Procedures

Thirty high school girls from Bloomington, Indiana, who ranked at or above the 80th percentile in the standing broad jump item of the AAHPER Youth Fitness Test, were selected as subjects. Each girl was filmed executing the standing broad jump on two separate occasions. The first filming session, which was also a videotaping session, did not involve either of the two experimental factors. The second filming session involved the application of one of the experimental conditions. After randomly being assigned to one of three groups, one group of 10 girls was treated with the videotape experimental factor, while the second group of 10 girls was treated with the reward experimental factor. The third group of 10 girls served as a control group.

Data Collection Procedures

During the first meeting of the investigator at the two schools with the girls who participated in the study, a general description of the experimental procedure was discussed. Care was exercised in not revealing the exact nature of the reward or videotape procedures.

At the first filming session, the girls were shown the testing laboratory and again given a general description of the experimental procedures. Then the anthropometrical measurements were recorded for each subject. While one subject was being filmed, the others remained in a hall outside the laboratory door. Upon entering the laboratory, each girl was given specific directions as follows:

"You will be given three warm-up jumps on the mat. The fourth and fifth jumps will be filmed and videotaped. Be sure to keep your toes behind the white tape take-off line. In landing, keep your weight forward. The jump will be measured where the heels land, the one closest to the take-off line being marked. If you should step back or fall back, the jump will be disallowed."

Then the filming was completed, the subjects were asked to confirm the date of the second filming session and then were asked to leave. The results of the jumps were not made known to the subjects.

Upon completion of the first filming session, each girl was randomly assigned to one of three groups; (1) control; (2) reward; or (3) videotape. Each group contained 10 subjects.

Prior to the second filming session, the girls were not informed as to which group they were assigned. When the girls in the control group were filmed, the instructions given at the first filming session were repeated. Each girl was allowed three warm-up jumps and was filmed performing the fourth and fifth jumps. Upon leaving the laboratory, the subjects were cautioned not to discuss the procedures of the filming session with anyone.

The girls in the reward group were given the instructions to take three warm-up jumps as was done in the first filming session. They were also told that the fourth and fifth jumps were to be filmed. Prior to the execution of the fourth and fifth jumps, a reward of one dollar was offered for a jump better than either of the two jumps previously recorded during the first filming session. Results of the jump were not given until after the fifth jump had been made. Upon leaving the laboratory, the girls were cautioned against revealing the procedures followed during the session.

The girls in the videotape group were called in individually and asked to review a videotape of themselves taken at the first filming session. Each subject was shown her performance at two different speeds--normal and slow motion. Then a model which had previously been taped was shown using the same procedure, first at normal speed and then in slow motion. The subject was asked to notice particularly the action of the arm swing, knee flexion, the extension or "reach" at take-off, and the angle of landing or the "stretch". She was then shown a replay of her performance. After reviewing the videotape, the subject was requested to take three warmup jumps after which the fourth and fifth jumps were filmed. She was reminded to think of the things she had observed in the film. Upon completion of the filming, she was cautioned against revealing the procedures followed during the session to any of the other girls.

A LOCAM camera, loaded with Tri-X reversal black and white film and placed perpendicular to the line of action, was employed in the filming. A computer-aided cinematographical analysis was conducted to reduce and synthesize the data. Through the Purdue University School of Engineering Photogrammetry Laboratory, a Larr-V Digital Coordinatograph digitizer was made available for use in analyzing the film data. This enabled the segmental endpoints to be plotted and punched out in the proper order and formatted on computer cards. The FILMAT Computer Program, developed by Dr. Barry T. Bates, Biomechanics Laboratory, Indiana University, was then used as an aid in further reduction of the data.

Statistical Procedures

Inferential statistical analyses were used to determine the behavioral characteristics of the experimental conditions. They also served to describe the probability of the same results occurring again under similar circumstances. Descriptive statistics were used to describe the characteristics of the scores for each variable. The mean and standard deviation were the primary sources of communicating facts about each group of scores.

The tests for correlated samples were computed to test the significance of the differences between the means of Trial 1 and Trial 2 for each group: control, videotape, and reward. The null hypothesis that there are no differences between the means was assumed to be true. The .05 level of significance was the criterion for the rejection or retention of the null hypothesis.

A one-way analysis of variance was employed to test the significance of the differences between the means of the three groups on each of 10 variables. The null hypothesis that there are no differences between the means was assumed to be true. The .05 level of significance was the criterion for determining the rejection or retention of the null hypothesis.

Findings

Within the limitations and purpose of the study, the following results were found:

1. No significant difference in distance jumped was found between the groups in each of the two trials. No significant difference in distance jumped was found

between the means of the two trials for each group.

2. Mean length of distance jumped ranged from 75.50 inches to 78.30 inches. The longest individual jump recorded was 91.75 inches and the shortest individual jump recorded was 65.75 inches.

3. No significant difference in maximum angles of knee flexion was found between the groups in each of the two trials. No significant difference in maximum angles of knee flexion was found between the means of the two trials for each group.

4. Mean maximum angles of knee flexion ranged from a low of 97.47 degrees to a high of 104.73 degrees.

5. No significant difference for maximum angles of hip flexion was found between the groups in each of the two trials. No significant difference in maximum angles of hip flexion was found between the means of the two trials for the control and reward groups. However, a significant difference in maximum angle of hip flexion was found between the means of the two trials for the videotape group.

6. Mean maximum angles of hip flexion ranged from a low of 77.53 degrees to a high of 85.81 degrees.

7. No significant difference in hip extension measurements at take-off was found between groups in each of the two trials. No significant difference in hip extension measurements at

take-off was found between the means of the two trials for each group.

8. Mean hip extension angles at take-off ranged from a low of 174.84 degrees to a high of 180.85 degrees.

9. No significant difference in knee extension angles at take-off was found between groups in each of the two trials. No significant difference in knee extension angles at take-off was found between the means of the two trials for each group.

10. Mean knee extension angles ranged from a low of 165.73 degrees to a high of 171.93 degrees.

11. No significant difference in linear velocities of the wrist was found between groups in each of the two trials. No significant difference in linear velocities of the wrist was found between the means of the two trials for each group.

12. Mean linear velocities of the wrist ranged from 26.47 feet per second to 30.98 feet per second.

13. No significant difference in angular velocities of the arm was found between groups in each of the two trials. No significant difference in angular velocities of the arm was found between the means of the two trials for each group.

14. Mean angular velocities of the upper arm ranged

from 240.44 degrees to 311.63 degrees.

15. No significant difference in the linear velocities of the center of gravity during take-off was found between groups in each of the two trials. No significant difference in the linear velocities of the center of gravity during take-off was found between the means of the two trials for each group.

16. Mean linear velocities of the center of gravity during take-off ranged from 8.80 feet per second to 9.97 feet per second.

17. No significant difference in angles of take-off was found between groups in each of the two trials. No significant difference in angles of take-off was found between the means of the two trials for each group.

18. Mean angles of take-off ranged from 50.35 degrees to 53.75 degrees.

19. No significant difference in the angles of landing was found between groups in each of the two trials. No significant difference in the angles of landing was found between the means of the two trials for each group.

20. Mean angle of landing scores ranged from 60.05 degrees to 63.05 degrees.

Conclusions

Performance, as judged in the study, was determined by motivational and mechanical factors. Within the limitations of this study, the following conclusions seem to be warranted.

1. A monetary reward does not affect distance jumped by a performer executing the standing broad jump.

2. A monetary reward does not affect the mechanical efficiency of a performer executing the standing broad jump.

3. Videotape feedback does not affect distance jumped by a performer executing the standing broad jump.

4. Videotape feedback does not affect the mechanical efficiency of a performer executing the standing broad jump.

Implementations

The standing broad jump test is one of the items included in the AAHPER Youth Fitness Test. This is a battery of tests which measures elements of strength, agility and endurance in running, jumping and throwing events. Maximum performances on each item from each student are highly desirable. The teacher can assist the student in obtaining optimal results by employing various motivational techniques. The purpose of this study was to investigate the effects of two motivational techniques employed in the standing broad jump.

The monetary reward, as a motivational technique, has met with success through the years. Although in this study a monetary reward was not shown to produce statistically significant results in standing broad jump performance, the value of this technique cannot be discounted entirely. The reward given did produce scores which indicated gains in distance jumped. In the standing broad jump item of the AAHPER Youth Fitness Test an increase of one inch or more may make a change in the percentile ranking achieved. As a motivational technique, a disadvantage of the monetary reward lies in its impracticality in a school situation. Other material rewards or verbal encouragement in the form of praise may better serve the purpose of motivating the students to perform at optimal levels.

The videotape feedback as a motivational technique, did not produce the desired results in distance jumped, but showed favorable improvements in mechanical performance. The results of the study indicated that videotape feedback was not statistically effective or significant in standing broad jump performance. Its value as a motivator may be indirect in nature. It may serve as an instructional tool for improving mechanical techniques which, in turn, should help to improve upon the distances jumped.

As a motivational technique, a disadvantage of using videotape feedback as a motivator lies in the fact that students tend to be overly conscious of form; thereby, sacrificing distance. An additional disadvantage is the possibility of a school system lacking videotape equipment or lacking available personnel to operate the equipment.

The two motivational techniques investigated in this study can be used with some reservation in standing broad jump performances. The monetary reward, because of its impracticality, may not be as feasible an another technique. The videotape feedback seems to be better suited to use as an instructional tool. Its availability to the teacher may dictate its overall usefulness