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Impact Of Feedback Based On Simi Motion Information In Some Bio Kinematics Variables And Achievement Of Youth Shot Put

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Abstract

The significance of this discovery resides in emphasizing mechanical aspects involved in effective shot put, by highlighting immediate and instantaneous correction of body position using information obtained by the researcher using a Simi Motion device, for performance to conform to mechanical conditions felt by teacher or instructor, which inherently requires understanding nature of information. Mechanics of this activity are designed to enhance technical performance in accordance with correct mechanical requirements. Technical and mechanical performance must be integrated to achieve training objective and optimal shot put performance. This research aimed to determine the technical performance level andBiomechanical factors influencing shot put efficiency in the two research groups. It also utilized semi-motion technology as a tool to obtain performance data and correct mechanical information for the participants experimental group. The study aimed to determine how this approach affected the development of certain mechanical variables in both research groups. The study was conducted on a sample of 10 young shot putters under 20 years of age participating in Iraqi Athletics Championships. These students had been divided up into two groups: a control group and an experimental team . The researcher conducted pre-tests on both groups and recorded their shot put performance on video. Speed, launch angle, approach angle, and release angle were calculated. Training program using feedback was implemented using simi device motion. Results were summarized as an improvement in every mechanical factor as well as an increase in technical performance and accomplishment.

Keywords: Feedback, Biomechanical Variables, Technical Performance, Mechanical Conditions, Achievement.

Introduction

shot put activity consists of several interconnected technical stages that the instructor, especially when teaching beginners , is supposed to understand. This understanding is gained after acquiring information about the performance through visual observation. Or providing auditory information for performing this activity and giving the necessary corrections during performance. This information can contribute to developing the biomechanical conditions under which the Performance is meant to be used to improve learning and its outcomes and hold onto them.

Performance . Performance is meant to be used to improve learning and its outcomes and hold onto them. This information is provided from an external source such as a coach, teacher, mirror, or video device , and can be verbal or nonverbal (1:5-6). Schmidt, citing Noha, classified feedback into several types, including dynamic feedback (sensory feedback), static feedback (referring to the results of success or failure, given at the end of the performance, and always externally sourced) (2:18), and supplementary feedback. Reinforcement feedback is provided to the learner when sensory feedback is insufficient , supplementing it with auditory and visual stimuli, and includes both immediate and delayed feedback.

By immediate feedback we mean giving feedback to the learner after each motor task, where the learner is given the result of each response immediately after the motor task is completed. As for delayed feedback, it means giving the learner the result of each response after a specific period of time (2:19).

Based on the principle of the senses receiving information obtained by the learner for the purpose of modifying his performance, feedback was divided into auditory feedback, which means receiving information through the sense of hearing (the ear), and audiovisual feedback, which means receiving information through the senses of hearing and sight (the ear + the eye) (3:15).

Fadel Al-Azirjawi presented on behalf of Holland 1991 holding classifies the types of feedback as follows (4: 179)

Feedback is frequently provided either immediately following the accomplishment of the movement or activity, or after the movement is finished. This is because it is preferable to provide feedback as soon as possible. Typically, it manifests as data regarding the performance and the outcome (KR). (KP, 2:20)

Some studies conducted by Lindahl (1945) and Tiffin and Rogers (1943) on kinematic feedback have indicated that they analyzed models for studying the foot of factory workers in the cutting machine process and determined the most influential model for foot movement through measurements of the most skilled workers by using two models and adding two new workers with feedback about their foot pattern. (6: 374)

According to Tutel, Carlton, and Antonio (1990), if the learner receives feedback, it should

be divided into three categories: knowledge gained through observation about errors; the digital image of the model plus knowledge gained through observation; and the digital image of feedback on the movement plus knowledge gained through the image. The digital image here refers to the quantitative analysis of the movement. (6:376)

Researcher suggests that kinetics can be a type of information about the motor system used in learning. By recording force and measuring effort, it is possible to sense the required force and correct the necessary exertion during that effort. (7:143) It is possible to make players understand what amounts of force they can exert on the ground and its direction (it should be inclined and not vertical). As a result of this force, we find that the reaction against the ground can be broken down into two components, one horizontal and the other vertical, according to the requirements of the performance and the path of the player's center of gravity during this performance. Through an emphasis on the proper mechanical conditions for the performance, this can be conveyed to the player as information that can be utilized during the performance and enhanced throughout training. Giving this information on a regular basis can help repeat good performance coordination and make the necessary adjustments to the neuromuscular mechanism. (7: 146).

To accomplish the pushing weight's objective of reaching the greatest horizontal distance

Regarding the weight, three key elements were found that need to be highlighted and are (8:10:(the projectile's launch angle, launch speed, and point at

This is the height above the ground at which the missile is fired. The speed at which the

Weight is one of the most significant factors in reaching the intended result.

mechanical elements that influence the journey distance. Therefore, successful technical performance is characterized by the weightlifter's muscular force exerted to achieve the greatest possible distance (work = force × distance) and the shortest possible time at the moment of release (force = time × force). This is due to the weight's launch speed being

directly correlated with the force flowing through the center of gravity of the weight; the

The speed and release efficiency increase with the combined force, and in the right path (9:201-202). Another important factor is the weight's launch angle.

role in deciding the intended result, both influencing and being impacted by the launch

The launch point's height and speed. While T. Nett indicates that this angle ranges from 40° to 42°, Smolinsky asserts that it ranges from 41° to 43° (9: 221). The third mechanical variable affecting the projectile's flight path is the height of the launch point, which depends on the athlete's height. The length of his arm is also crucial since the instrument or object's launch is impacted by the body's extension when pushing or throwing. Since Hochmuth demonstrated a direct (positive) relationship between an increase in launch speed and body extension, this also implies an increase in launch speed, which necessitates synchronized performance and kinetic coordination between the body parts and the push simultaneously. In other words, body measurements have a significant impact on the throwing distance; the higher the arm, the greater the throw distance. Height of point of release of weight is second in importance only to launch speed and angle of release. Height plays a significant role here, as height can increase launch distance by a few centimeters (10:343).

The significance of the study arises from the necessity of highlighting the mechanical elements that go along with the shot put exercise by indicating the correction

Determining the body posture by ocular inspection in a quick and rapid manner

in order for the performance to align with the mechanical circumstances that the instructor or teacher perceives.This initially necessitates determining the type of mechanical information of this activity to improve beginning students' learning in physical education facilities such that. The objective of the educational process integrates technical and mechanical performance.procedure is completed..

While the researcher in the field of biomechanics believes it is crucial to refer to all the mechanical aspects accompanying the technical performance and to emphasize their role in the integration of the technical performance, the current educational process either does not emphasize achieving the mechanical conditions of performance or may not mention them at all. As a result, the researcher aimed to establish the groundwork for the use of visual aids in error diagnosis and feedback regarding the points that need to be adjusted in accordance with the mechanical variables, presenting them in the form of corrective information to work on mastering the skill performance correctly and so that the student has the technical information related to the practical application to practice it correctly after graduation.

The purpose of the study was to determine the two research groups' technical proficiency and the biomechanical aspects of the shot put. Additionally, it sought to ascertain the impact of this tool on the development of certain biomechanical variables for both study groups and to employ a computer as a visual tool to correct the biomechanical information connected to the shot put effectiveness for the experimental group.

The investigator believed that there were statistically significant variations between the pretest and post-test for a few shot put biomechanical factors for the two study groups.

The post-tests of the two studies varied statistically significantly. groups competing in the shot put

Research Methodology

The problem's nature required the experimental approach because of its appropriateness. Twenty pupils were chosen by the researcher from the Institute of Physical Education in

They were split into two groups at random via purposeful sampling: an experimental

group and a control group, each consisting of ten students, as shown in Table (1). The

%11.17of the 179 students in the initial research population were included in the sample. Uniformity

was guaranteed for the sample in terms of age, height, weight, and performance level, as demonstrated in Table 1. Additionally, the researcher divided the sample into two groups to guarantee equivalency.

in the pre-test performance level and accomplishment characteristics, as seen in Table (2).

Table (1)

The study sample with a skewness coefficient is shown by the normal distribution for anthropometric measures and the research sample's performance.

Variables	Measurement unit	Mean	Median	St.d	Skewness Coefficient
Height	Meter	1.75	1.77	0.058	-0.202
Age	Year	17.60	17	1.667	1.548
Weight	Kg.	67.45	66	7.674	0.448

Table (2)

When it comes to performance and accomplishment evaluation, the two groups are equal.

Variables	Measurement unit	Control group		Experimental group		Calculated (t) value	Sig. level	Sig. type
		Mean	St.d	Mean	St.d			
Shot put performance	Degree	9.87	6.91	31.72	2.19	0.962	0.341	Insig.
Shot put achievement	Meter	8.69	1.05	8.61	0.98	0.675	0.076	Insig.

Significant at an error level of less than 0.05 and 18 degrees of freedom

After splitting the two groups according to the factors, Table (2) indicates their equivalency of performance and accomplishment assessment for two independent samples utilizing the (t) test.The significance level of the (t) values was higher than the error level (0.05), which showed that the variations in these factors were random.

The researcher used an HP laptop , laser discs , photos , films , two high-speed video cameras (210 fps) for analysis , and video cameras (24 fps) for recording and playback.

addition to using the internet , observation and experimentation are used for scientific research and studies. Similar and related - motion analysis software.

To ensure that every tester started from the same place, the researcher included four instructional sections on how to hold the weight, how to throw, and how throwing relates to pushing the weight. In order to aid and acquaint the students with the nature of carrying out this activity, models of champions were exhibited in films during the two weeks of introductory educational units, which were delivered at a pace of two units per week.

In compliance with international law, the researcher administered technical performance assessments by giving each student three chances to complete each of the tasks being studied, and videography was done. Through the Kinovea initiative, each student's creative performance will be captured on film for subsequent examination and assessment by experts. These are the mechanical characteristics associated with technical performance that may be extracted and measured:

-Launch speed variable: It measures the separation between the point of gravity just after the flight (eight consecutive photos) and the center of gravity just before it leaves the shooter's hand. The launch speed in meters per second (m/s) is obtained by dividing the launch distance by the time of transition, which is immediately recorded by the computer.

- Launch angle: Measured directly by a computer in degrees between the side that represents the tool's launch distance between the two places of its center of mass before and after launch and the line that connects the tool's center of mass horizontally and parallel to the ground.

- Approach and thrust angles are measured between the point of support of the foot and the center of gravity of the body, as well as between the line that connects the center of gravity of the thrower's body mass at the moments of the throwing posture and the final throw.

Motor skills test

Technical and numerical performance level for shot put and digital performance. Tools used: Measuring tape. Performance Description: The athlete stands in the throwing circle with their back to the throwing sector, then curls up and slides backwards to reach the throwing position, then throws, releases, and balances after pushing the weight forward for the longest distance. Test Instructions: The weight must drop inside the throwing sector, which has an angle of 32.94°, and the athlete cannot touch the ground outside the circle or cross the halting board. Every athlete is given three chances, and their best effort is noted. Recording: The tape is passed through the center of the circle from the inner border of the iron frame or the stop plate to the closest mark the weight has left. The digital level is represented by this distance.

Creating the technical performance assessment form: Based on the advice of experts, the following technical performance evaluation form was created, which displays the grade for each step of the movement performance in lifting the weight:

-Field 1: order of subjects.

-Field 2: stage of rounding (15 degrees)

-Field 3: stage of sliding (25 degrees)

-Field 4: tossing as well as the throwing phase (50 degrees)

-Field 5: Phase of stabilization and balance (10 degrees)

The technical performance scores were assigned to the participants according to their assessment of its importance, with a maximum score of (100) for the entire activity. The

Instructors at the College of Physical Education assessed technical performance.

Al-Jadriya Campus of the University of Baghdad, who are experts and knowledgeable in track and field. Slow-motion and standard-motion footage were used for this assessment.

video records of the two groups' technical performance levels. Average of assessors'

After that, scores were determined.

Pre – tests

On February 19, 2025, pre-tests were administered to the experimental and control groups. After the researcher became familiar with the curriculum prepared by the first-year teachers for the Field and Park course, and the time allocated for teaching the activity in its entirety by the institute which consists of eight teaching units, each lasting ninety minutes, the researcher separated each of the two teaching units per week into three primary sections: a 20-minute preparing segment, a 60-minute instructional and practical session, and a 10-minute conclusion component. The findings of the researcher in photographing and collecting images and data related to the practical activity study was then approved. The shot put exercise was used as a model and framework for the activity, relying on accurate and practical sources. This was then translated into images depicting the stages of the activity's performance. In order to identify technical and mechanical mistakes, make the required adjustments, and repeat the exercise, participants watched their performance. Feedback was provided both during and after the performance. Participants were also recorded and could review their performances via video at their convenience. These recordings were withheld from the control group, as this was the specific feedback methodology. For eight weeks, the curriculum was executed with two units each week, for a total of sixteen units. Each unit's practical element included feedback.

Post-tests

On 2/21/2025, post-tests were administered under the identical settings as the pre-tests for the experimental and control study groups, respectively.

Results, and Discussion

value of the pre- and post-tests in the two study groups' technical performance evaluation ratings for the shot put exercise

Table (3)

Showing (t) valuable of the two study groups' pre- and post-test technical performance evaluation ratings for the shot put exercise

Groups	Pre-test		Post-test		F	Fh	Calculated (t) value	Sig. level	Sig. type
	Mean	St.d	Mean	St.d					
Experimental weight (degree)	31.72	2.19	51.71	2.17	19.99	3.57	5.60	0.000	Sig.
Control weight (degree)	29.87	6.91	35.04	8.74	5.17	2.76	1.87	0.043	Sig.
Experimental achievement of weight (m)	8.61	0.98	11.45	0.34	2.84	0.46	6.161	0.000	Sig.
Control weight achievement officer (m)	8.69	1.05	9.50	0.95	0.81	0.40	1.992	0.065	Insig.

Significant at error level < (0.05) and degrees of freedom (9)

The significant levels between the pre- and post-tests in assessing the weightlifter's technical performance were (0.000) for the experimental group and (0.043) for the control group, as indicated in Table (3) above. Under nine degrees of freedom, all of these values are below the error threshold of 0.05. The experimental group's weightlifting performance level was (0.000), which is less than the error level of (0.05) under nine degrees of freedom, but the control group's performance level was (0.065), which is higher than the error level of (0.05) under nine degrees of freedom. In Table (4), the researcher displays the weightlifter's performance assessment score disparities between the two research groups' post-tests.

Table (4)

Showing (t) value and degree of significance between the two research groups' post-tests of performance evaluation scores for accomplishment and weight

Groups	Control		Experimental		Calculated (t) value	Sig. level	Sig. type
	Mean	St.d	Mean	St.d			
Pushing a weight (degree)	35.04	8.74	51.71	2.17	6.450	0.002	Sig.
Pushing a weight (meter)	9.50	0.95	11.45	0.34	5.75	0.000	Sig.

Significance level < 0.05; significant at 18 degrees of freedom

Table (5)

Showing (t) value for mechanical variables of weight thrust for the experimental and control groups between the pre-test and post-test

Groups	Group	Pre-test		Post-test		F	Fh	Calculated (t) value	Sig. level	Sig. type
		Mean	St.d	Mean	St.d					
Launch speed	Ex.	8.57	0.98	10.65	0.53	2.08	0.64	3.23	0.046	Sig.
	Co.	8.67	0.94	8.89	0.67	0.22	0.23	0.95	0.861	Insig.
Launch angle	Ex.	29.5	5.7	34.65	3.19	5.15	1.73	2.97	0.031	Sig.
	Co.	28.70	4.8	30.54	4.3	1.84	1.54	1.19	0.061	Insig.
Support angle	Ex.	89	6.4	71.6	2.15	17.4	3.51	4.95	0.000	Sig.
	Co.	91	7.4	88.5	4.8	2.5	1.87	1.33	0.765	Insig.
Push angle	Ex.	87.8	5.4	76.8	1.6	11	2.57	4.27	0.000	Sig.
	Co.	88.3	6.9	86.3	3.8	2	2.94	0.68	0.098	Insig.

Significant at error level < (0.05) and degrees of freedom (9)

According to Table (4), the computed (t) values were at a significance level of (0.002) for the evaluation test of the accomplishment weight (0.000) and in support of the initial assessments for the experimental group as well.

There was a significant difference between the experimental and control groups' learning of the technical performance of the weight, according to the examination of the skill performance post-test scores in Table (3). The development is ascribed to the mechanical feedback that the researcher used with the experimental group and the practical lessons that the control group was exposed to. These lessons, which are based on the gradual progression of skills from easy to difficult, the organization of lesson units, the resources available, explanation and presentation, increasing the number of repeated attempts at performance, investing time and effort, and the feedback used, are designed to develop performance within the specificity of these institutes. Regarding the experimental group, the findings demonstrated a definite improvement in the degree of technical performance. The use of additional feedback based on the mechanical principles of performance in the process of learning the skill of pushing the weight as an educational tool that has an important effect in conveying information and giving the learner a sense of movement in following the sequence of skill performance also had a clear effect (11: 29).

Correcting the image of the movement and the motor action, as well as increasing the element of excitement and desire to perform through diversification of educational methods, are the results of understanding and mastering skills through slow motion and normal recording, with an emphasis on overcoming mechanical and technical errors (12: 79).

Watching a model of the movement through a computer display screen and comparing it with the actual performance of the members of this group, and verbally correcting the nature of the movement to be mechanically corrected, has contributed to acquiring the skill through watching the model of the movement and emphasizing the identification of errors. This is in line with the findings of (Aileen Wadih, 1987) that the educational approach aids in the rapid acquisition of motor skills since learners can follow the elements of the skill, mimic it, and pinpoint its strengths and weaknesses by watching and practicing the model performance, which helps to eliminate incorrect movements and reinforce the correct ones (13: 194). The use of instructional aids, such as visual aids, in the presentation of the skills is also responsible for the pupils in the experimental group's evident advantage. Additionally, the skill's gradual presentation made it easier to identify, diagnose, and reinforce mistakes, which helped to improve fine motor coordination and hasten the acquisition of new skills. Since skill presentation "has a significant impact on the development of fine motor coordination, ensuring consistency with the explanation and clarification" (14: 78), this was accomplished by concentrating on the motor sequence of the skill. This in turn led to an improvement in numerical performance, which is consistent with Jamal Imam's findings in his study that the use of audiovisual educational aids improved the learner's clarity of vision when dealing with movement, resulting in an improvement in both skill level and numerical performance (15: 118).

The significance level values for the speed of release with the weight between the pre- and post-tests were as follows, as indicated in Table (5) above: (0.046) for the experimental group, which is less than the error level of (0.05) under 9 degrees of freedom; and (0.861) for the control group. It exceeds the 0.05 error level under nine degrees of freedom. The experimental group's angle of release was (0.031), which is less than the error level of (0.05) under nine degrees of freedom; the control group's angle of release was (0.061), which is more than the error level of (0.05) under nine degrees of freedom. Lastly, the experimental group's angle of release was (0.000), which is below the error level of (0.05). For control (0.098), which is more than the error level (0.05) and 9 degrees of freedom, and under 9 degrees of freedom. In Table (6), the researcher displays the findings of the variations in the mechanical variables of weight thrust between the two study groups' post-tests.

Table (6)

displaying the significant levels and (t) value between the two study groups' post-tests for the mechanical variables of weight thrust

Groups	Control		Experimental		Calculated (t) value	Sig. level	Sig. type
	Mean	St.d	Mean	St.d			
Launch speed	8.89	0.67	10.65	0.53	3.77	0.002	Sig.
Launch angle	30.54	4.3	34.65	3.19	5.61	0.001	Sig.
Support angle	88.5	4.8	71.6	2.15	4.55	0.000	Sig.
Push angle	86.3	3.8	76.8	1.6	4.91	0.032	Sig.

Significant at error level ≤ (0.05) and 18 degrees of freedom.

Table (6) above shows that for the variables of speed, launch angle, support angle, and propulsion, the significant levels between the post-tests of the two control groups were (0.002), (0.001), (0.000), and (0.0032), respectively. These values are all below the error level of (0.05). This shows that the post-tests for these variables showed substantial differences in favor of the experimental group. The members of this group were able to follow the proper execution of arm and trunk motions within their suitable kinetic trajectories and in a seamless sequence that provides the necessary kinetic momentum for these components to attain the required speed thanks to their practical training. As one of the laws of conservation of momentum, this speed is subsequently transferred to the weight, which must be accomplished in accordance with the proper pathways. As a result, the mechanical feedback was effective. The researcher focused on the individualized group, whose objective was to improve their speed and angle of release while lifting the weight . Thus, the characteristics of their motor performance were considered to enable them to choose the appropriate performance , as were their psychological characteristics (16: 254) . The researcher concludes with the conclusion that the experimental group's development of speed and angle of release was directly impacted by the elements pertaining to the performance instructions included in the feedback given to them, as well as on adopting appropriate angles for performance during support and pushing. This aligned with achieving the performance objective for the individuals in this group in the post-tests, and significantly better than the control group. Some studies have indicated that direct feedback

... It has a significant impact when paired with skill training, which incorporates components for improving motor awareness and timing (17: 67–68). The researcher notes that the variable has improved as skill performance has improved. The experimental group 's release speed and the angle of release were proportional to this speed during the final push phase, compared to the control group.

This suggests that the training course, which included corrections to body trajectories and postures, and emphasized correcting incorrect postures by providing corrective information or diagnosing them on a display screen , focused on improving the internal structure of the release speed variable. In order to enhance the weight's acceleration and stretch the body's center of gravity trajectory at the moment of release, the angles of support were reduced. This allowed the body's routes to be imprinted in the neural system. This provided the experimental group with an edge in these variables, which is in line with several research' findings (18: 105–108). I concur with this. (Brumley 1993) in that trainees' abilities and self-confidence may be developed via the use of internal modeling and streamlined instruction (19: 87).

Conclusions

Members of the experimental group found the feedback approach that accompanied kinematic characteristics to be useful and impactful, particularly in reaching the digital level. Kinematic features developed from the weight's launch speed and angle, which in turn led to a remarkable development in their technical performance. Use of mechanical feedback helped experimental group to become accustomed to normalizing and correcting motor pathways, resulting in a positive impact on development of their learning outcomes and enabling them to perform the skill accurately. Emphasis on kinematic variables of movement increased the muscular awareness of learning through movement, which affected the accuracy of performance. Experimental group developed a sense of adopting appropriate physical positions for body, which indicated correct muscular response represented by action of muscles working on joints of angles of shoulder, elbow and trunk.

Recommendations

Teachers conducting the teaching process and trainers working in the field of training can both benefit from feedback content related to kinematic factors. This method's input material may be used to build skills utilizing feedback based on kinematic elements in other games, particularly ones with closed skills. Attention and emphasis on use of motion analysis by coaches and linking it to biomechanical variables and technical performance to achieve the best possible results. Conducting similar research that focuses on practical training aspect accompanying kinematic aspects on an advanced group of players to develop complex and motor skills based on three sciences of training, learning and biomechanics. Beginners and juniors developing the rest of physical abilities, shot putter must possess appropriate strength, speed and agility to achieve success in applying these skills.

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