SOME MAJOR BIOMECHANICS FACTORS AND THEIR LINK TO VERTICAL PUNCH RESPONSE SPEED FROM THE BOTTOM OF THE YOUNG BOXING PLAYERS

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Abstract

The study is divided into four chapters, the first of which provided an overview of the study's significance and discussed the role of biomechanics in assessing sports actions, finding flaws, and overcoming them. The boxing sport, which is characterized by precise movements of the arms, legs, and torso, also is mentioned by the researcher. In this sport, the speed of the kinetic response is greatly influenced by the reactions. The primary objective of the research is to identify the biomechanical factors that go along with the vertical punch from the bottom and their relationship to the player's kinetic response through skill analysis. If the player can master this movement, they can master the other movements as well, which helps them play at a high level. The study aims to quantify the percentage contribution of various biomechanical variables to the speed of kinetic reaction as well as the relationship between various biomechanical variables and the speed of their kinetic response. The research sample is represented by young players in boxing, where the researcher used video imaging and biomechanical analysis to extract the results, and the researcher concluded that there is a significant relationship between each of the speed of the kinetic response and the variable of the angle of the elbow at the moment of preparing the arm, as well as a significant relationship between the speed of the kinetic response and the variable of arm speed.

Keywords: Sports exercise. Biomechanics factors. Vertical punch. Young boxing players.

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Introduction

The concept of biomechanics is linked to kinetic analysis, and the person involved in kinetic analysis must have knowledge of the scientific foundations of movement and in accordance with the mechanical laws affecting the required kinetic performance. As a result, biomechanics contributes to the study of human movement in a scientific and analytical study. In order to achieve excellent kinetic performance, individuals in charge of the performance must be aware of the flaws that permeate it and work to eliminate them by coming up with the best possible solutions [1]. Since "analysis is regarded as one of the most sincere sciences in assessment and direction" (1:17). The scientific studies conducted by researchers and people with an interest in sports employing guidelines, theories, and scientific tests, including biomechanical analysis, are what led to the athletic accomplishments and the high level attained by athletes in a variety of sporting events. It relies on video and cinematographic equipment, and connects them to high-tech devices, to help describe movement, find interrelated relationships in kinetic performance, and give accurate results [2]. And among these programs is the (Dart Fish) program, which is a global program and relied upon in many international laboratories specialized in biomechanical analysis, which leads us to obtain accurate outputs in everything related to the characteristics of the kinetic path. The researcher dealt with the sport of boxing, which, like other sports, depends on scientific fields as a basis for its development and access to high levels. It is distinguished from other types of other sporting activities by the different technical movements of the arms [3]., torso, and legs, whether these movements are single, double, or compound, in which the reaction force plays a major role in accuracy, speed, in addition to attention, focus, and joint flexibility, in order to be able to respond quickly and kinesthetic well [4].

Through the researcher's follow-up to many games and looking at many sources, the researcher noticed that there is a clear weakness by the players in performing the vertical punch from the bottom and the speed of its kinetic response. Therefore, the researcher decided to analyze some biomechanical variables for this skill in order to identify the importance of the analysis. The movement, which in turn helps in finding the weaknesses of the players and treating them, which helps in developing performance and achieving a high level in the boxing game [5,6].

Aims of the study to determine the relationship between a few biomechanical factors that influence the speed of the kinetic reaction in the vertical punch from the bottom. Determine the percentage of some biomechanical variables' contributions to the speed of the kinetic reaction and the vertical punch from the bottom.

Research methodology and field procedures:

Research Methodology: the descriptive approach with the analytical method was used in the research because it takes into account "the reality of accidents and things, and the clarification or description of the facts does not depend on assessing the present facts as they are, but deals with analysis and interpretation for the purpose of drawing important conclusions to correct this reality" (96:2).

Research sample:

The sample can be defined as "the part that represents the community of origin, as well as the model on which the researcher conducts the entire axis of his currency" (84:3).

The Etisalat Club and Sports Mail players made up the research sample, and six players were specifically chosen to represent the club's top elite across all weight categories. A homogeneity was made for the sample in terms of (age, weight, height, training age) as it was adjusted using the torsion coefficient (178:7).

Research propositions

The kinetic reaction speed and some biomechanical factors significantly correlate with the vertical punch from the bottom. The percentage of several biomechanical variables that contribute to the vertical punch from the bottom and the speed of the kinetic reaction show a substantial link.

Research areas:

a) The human field: which consists of six young athletes from the Sports Post Club and Etisalat.

b) The temporal field: from July 2 until July 12, 2021.

c) The geographical filed: the boxing ring at the Redemption Exchange in Sadr City.

Results

We note from Table 1 that the coefficient of skewness is confined between 3 and -3 which indicates that the research sample is moderately distributed, which indicates the homogeneity between the research sample in the variables (age, height, weight, training age) (Table 1).

Tables 2 the arithmetic mean, standard deviation, skewness coefficient, and the research sample show the study variables (Table 2).

Equipment and tools used in the research:

Data collection methods: Arabic sources and observation and analysis.

Equipment and tools used:

High-speed analysis camera (3) Casio type, with a frequency of (1000) images / second. Three (3) holders. A computer. Scale drawing. Medical scale. Punching bag. A stop watch and Boxing gloves.

Table 1: Shows the arithmetic mean, standard deviation, and skewness coefficient for the research sample.

Variables	skewness coefficient	Median	Standard deviation	Arithmetic mean
the age	0	24.5	3.503	24.5
height	0.319	164	8.596	164.91
weight	0.556	65.75	15.267	68.583
training age	-0.284	9.2	1.37	9.33

Table 2: Shows that the coefficient of skewness is confined between 3 and -3, which indicate that the sample was distributed moderately, which indicate the homogeneity between the members of the research sample with the variables of the study**.**

No.	Variables	Skewness coefficient	Median	Standard deviation	Arithmetic Mean	Measuring unit
1	Arm attachment angle	-0.93	39.5	4.805	38	degree
2	arm speed	0.82	4.475	1.982	5.025	m/sec
3	Punch performance time	-1.92	0.144	0.025	0.128	sec
4	shoulder speed	0.351	1.805	0.598	1.875	m/sec
5	hip speed	0.63	1.155	0.571	1.27	m/sec
6	angular velocity of the arm	-0.853	916	190.714	861.716	Min/sec
7	Sum of linear velocities hand, shoulder, hip	0.914	7.38	2.412	8.115	m/sec
8	Kinetic response speed	0.17	0.745	0.134	0.733	sec

Table 3: Shows the correlation of the study variables with the kinetic response speed.

biomechanical variables	Kinetic response speed
Elbow angle moment of setting	0.587*
linear arm speed	0.839*
Punch time	0.677*
shoulder speed	0.025
hip speed	0.04
The angular velocity of the arm	0.468
Total linear speed (hand, shoulder, hip)	0.674*

The software used: Dartfish program for the analysis of biomechanical variables.

The studied biomechanical variables: arm elbow angle, Arm speed, Shoulder speed, Hip speed, arm angular velocity, sum of linear speeds (hand, shoulder, hip) and speed of kinetic response.

The steps to conduct the experiment:

Exploratory experience: The researcher conducted her exploratory experiment on a sample of three players who are not part of the research sample in order to determine the validity of the performance of the research and to prevent issues that could arise during the practical field procedures. The experiment included testing the players' kinetic response times and their performance on a punching bag. The dimensions and heights of the experiment were fixed with the analysis cameras so that the cameras could capture every detail of the technical movement of the skill. The experiment was then photographed by two Casio cameras at a speed of (1000) photos per second.

Kinetic response speed test: The researcher measured the research sample's kinetic response speed using the kinetic response scale device developed by (Al-Morjani) (4:39), where two attempts were given to each player in the research sample, and the best attempt was chosen, and the results were recorded on a data collection form.

The purpose of the test: to measure the speed of kinetic response

The tools used: the equipment employed included a chair with a table, a stick with numbers ranging from (1-100), an opaque plastic tube with a support on the back of the chair, an electric coil attached to electrical lines, a lamp, and an operating switch. Figure (1) depicts this device.

Description of the performance: the tested player sits on the chair, facing the light bulb, with one of his hands resting on the table, and he is ready to hold, provided that the wrist joint is resting on the table, so that the player cannot lower the hand below the level of the table, and his gaze is directed toward the unlit lamp. When the lamp is turned on, the player grabs the stick that appears from inside the opaque plastic tube.

Performance conditions:

a) Hold the stick and hold on to the number reached by the hand when performing the action.

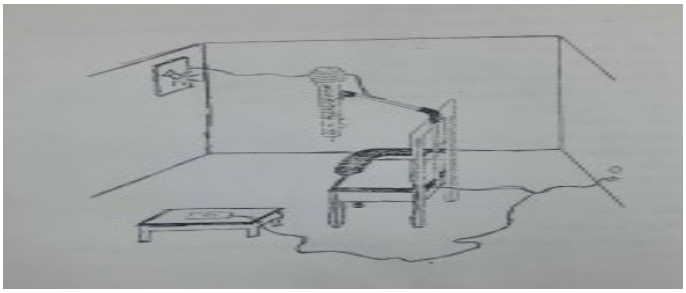

Figure 1: Shows the kinetic response speed device.

Figure 2: Shows a photograph of the research sample on a punching bag.

b) Keeping the hand still and resting it on the table.

c) The player gets two chances, with the best one being recorded.

Recording: When the catch is made from the bottom, the player prefers to record the reading that is reached.

Conducting the main experiment

On July 8, 2021, the researcher carried out her primary study at the Etisalat Club and Sports Post stadium. Phosphorous markers were applied to the boxers' joints (shoulder, elbow, and hip), they were weighed, a kinetic reaction speed test was performed, and players' images were placed on sleeve bags.

Videography: the players on the sleeve bag with the biomechanical variables were filmed by the researcher using videography to prevent errors, and the footage was loaded into the dartfish program to extract the relevant data. Three cameras were used to record the sample, each at a speed of one (1000) frames per second [10]. The first camera was fixed to the top of the sleeve bag, which had a height of four meters. The second camera was four meters to the boxer's right, and the third camera was four meters to the boxer's left.

The software used:

The researcher employed the drat fish program, which has since been embraced by numerous labs with a focus on biomechanical analysis. As the video enters the program to extract the variables directly, this software replaces many of the previous phases.

Statistical processors:

The following mathematical treatments were used: mean (101:5), standard deviation (96:6), coefficient of skewness (101:5), simple coefficient of skewness (210:5).

Presentation and analysis of results:

Presentation and discussion of the connections between the kinetic response speed and the research variables.

The tabular value was 0.75 at a significance level of 0.05**.** The elbow angle variable at the time of arm preparation emerged as a significant correlation between each of the kinetic response speed and the research variables, as shown by the results in Table (3), which displays the correlations of the research variables with the kinetic response speed. The calculated value was (0.587), which is higher than the tabular value of (0.576) at a level of significance (0.05) and a degree of freedom (n-2) (200:7), indicating that the research sample's elbow angle was suitable and that, as a result of their experience, they were able to obtain the best kinetic response speed. They share the same research characteristics. Abu El-Ela confirms that the speed of the kinetic response depends on the ability of the player in what is entrusted to him (182:8), and from the same table we notice a significant correlation between the variable speed of the linear arm and the speed of the kinetic response, where the calculated value was (0.839) is greater than the tabular value of (0.57) at the level of significance (0.05) and the degree of freedom (N-2) and this shows that the research sample's arm speed was good since they implemented the kinetic response speed variable promptly and had good kinetic speed. Any delay in performance would lengthen the reaction time, which will slow the speed of the kinetic response. Additionally, we observe from the table that there is an apparent significant correlation between the time variable of punch performance and the speed of the kinetic response, as shown by the calculated value of (0.677), which is greater than the tabular value of (0.57) at the level of significance (0.05) and the degree of freedom (n- 2). This shows the high potential in the level of punch performance and provides evidence that the research sample was distinguished by the accuracy of attention and focus. The researcher also confirms that time plays a significant role in achieving the speed of the kinetic response, so the shorter the performance time, the faster the kinetic response increases. We also note from the above table that there is a significant correlation between the sum of the linear speeds of the hand, shoulder and hip and the speed of their kinetic response, as the calculated value reached (0.674) compared to the tabular value of (0.57) at the level of significance (0.05) and the degree of freedom (n- 2). The fact that the process of kinetic transmission between the body's parts was effective shows that the benefiting from the sum of the combined speeds represented in the punch line was proportional in providing the necessary value and speed. This is because the speed of the arm movement was insufficient to influence the opponent boxer because the strike must be accompanied by both the arm and torso moving in order for it to be effective. And that the hitting arm receives kinetic energy from the torso's motion. Additionally, turning the torso's motion into potential energy before striking the target (9:182). Additionally, the table shows that there is no significant correlation between the shoulder speed variable and the kinetic response speed, with the calculated value being (0.025) compared to the tabular value being (0.57) with a level of significance (0.05) and a degree of freedom (n-2), meaning individuals did not differ significantly in their shoulder speed variables and kinetic response speeds. The performance of various biomechanical variables decreased as a result of the research sample's poor engagement in the movements of some body parts. Since the computed value was (0.040) compared to the tabular value of (0.57) with a level of significance (0.05) and a degree of freedom, we can also see from the same table that there is no significant link between the hip speed variable and the kinetic response speed (n-2). The lack of substantial change is attributed by the researcher to a discrepancy between the hip's speed and that of the kinetic reaction, as the hip's speed was slow. As the hip speed is initially directly linked to the speed of the kinetic reaction, the researcher stressed the need to enhance hip speed during the game. Furthermore, we can see from the above table that there is no significant correlation between the angular velocity of the arm and the velocity of the kinetic response. This is because the calculated value was (0.468) compared to the tabular value of (0.57), the level of significance (0.05), and the degree of freedom (n-2), which indicates that the research sample performed poorly in terms of using the arm effectively. The relationship between the angular velocity as it rises and the arm's radius as it falls is validated by Saeb Attia (90:10) and is meant to be verified by practice and its interpretation. The boxer can understand the value of angular speed as a significant factor in executing the right performance.

Conclusions

Each kinetic reaction speed and the angle variable had a strong association. The development of a substantial correlation between the arm speed variable and the kinetic response speed. There was a strong correlation between the time it took to complete the punch and the kinetic reaction speed. The overall linear speed of the hand, shoulder, and hip were significantly correlated with the kinetic response speed variable.

Recommendations

The biomechanical conditions related to kinetic performance must be applied by the players since they are crucial to the proper execution of the hitting movement to the target. Due to its significance in performance as well as in influencing the opponent, it is essential that the line of the boxer's various body parts coincide when performing the punch and in a good direct method during the training procedure. It is also highlighted that by adopting the proper postures for the legs, torso, and arms while standing ready, a boxer can achieve the best position possible for their particular expertise. The need of developing unique and suitable physical traits to apply the correct performance in line with the biomechanical circumstances. Conducting fresh research on additional biomechanical aspects and the rest of the various boxing techniques. Holding training sessions to educate coaches and boxing enthusiasts about the value of biomechanical kinetic analysis as a crucial component of the training process.

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