An Analytical Study of Final Stages Biokinematic Characteristics of some Compound Skill Performances of Young Soccer

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Introduction & Research Problem

A compound skillful movement performance is generally successive, synchronic, or illusive, as compound successive skill performance includes a combination of skill performances according to time succession, whereas compound synchronic motor performance merges skill performances synchronically in a way that does not clarify succession among them, and the compound illusive skill performance is a preliminary stage that leads to a reaction of the opponent, and near the end of the preliminary stage, a player makes a sudden shift of movement path into a main stage of a new skill performance, without a preliminary stage (١١١: ٤).

An instructor and trainer can recognize the ideal form of performance and how to teach it, through steps of motor analysis of compound skill movement performance, in addition to recognizing the limits of compound skill movement performance in order to achieve ideal performance, and accomplish mechanic duty with the highest possible efficiency, leading to a positive effect on level of performance, and reaching the best results in competitions, since biomechanical analysis is used to recognize specific skill principles, rules, and facts, as an approach to diagnosis, instructing, and improving players' performance, in comparison with the analyzed model (١٦ :٢٦) (١٢٢ :٢٥).

The dual stage that is considered the most important stage that was conducted by the

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current researchers so as to recognize the most important stage involved in achieving basic mechanic duty of compound motor performances, as it was found that 77.8% of experts agreed that the dual stage is the most important stage involved in achieving basic mechanic duty of compound motor performances, whereas 11.1% stated that the preliminary stage is the most important one, and 11.1% stated that the final stage is the most important stage involved in achieving basic mechanic duty. the biomechanical variables is found to be the effective factor in reducing the time structure of compound skill performances, hence, , in which the two skills will be combined together.

Aim of the Research:

The present research aims at recognizing the biomechanical characteristics of final stages of some compound skill performances for young soccer's through: recognizing the values of biomechanical variables (speed – displacement – path of body weight – body angles – angular speed of body points) that affect compound skill performance stages (reception by inside foot – direct shooting while moving by front foot).

Research questions:

There are significant characteristics and values of biomechanical variables (speed – displacement – path of body weight – body angles – angular speed of body points) of compound skill performance stages (reception by inside foot – direct shooting while moving by front foot) of young soccer's.

The Research Population & Sample:

The research population was selected from young soccer at the age stage (12 – 14) at Sohag Sporting Club during the training season 2017 – 2018 whose number was (25) young soccer. However, some players were excluded (8), (2) absent, (2) injured, (10) for the pilot study. the research population comprised (7) young soccer that chosen as a purposeful sample to conduct the study.

Table (1)
Means of physical traits of the research sample

Trait	Unit of Measurement	Data
Height	Cm.	١٤٨.٤٢٩
Weight	Kgm.	٤٠.٦٢٦
Trunk	Cm.	٧٠.٥٢٤
Arm	Cm.	٧٠.٨٥٤
Upper Arm	Cm.	٢٩.٤٨٢
Forearm	Cm.	٢٦.٢٤٠
Hand	Cm.	١٧.٨٩٤
Leg	Cm.	٨٩.٥٠٠
Thigh	Cm.	٤٤.٥٠٠
Calf	Cm.	٤٠.٥٠٠
Foot	Cm.	٢٠.١٢٥

Harmony of Research Sample

The researchers affirmed harmony among the research population before video and biomechanical motor analysis in variables that might affect the research results as demonstrated in the following table:

Table (2)

Arithmetic means, median, standard deviation, and skewness of the main variables of research population N = (17)

Skewness	Standard Deviation	Median	Arithmetic means	Variables
٠.٥٥٢-	٤.٦٧٤	١٤٩.٠٠٠	١٤٨.٢٩٤	Height
٠.٠١٩-	٤.٩٢٣	٤١.٠٠٠	٤٠.٠١٥	Weight
٠.٢٢٢-	٠.٣٣٢	١١.٥٠٠	١١.٦٥٤	Age
٠.٥٩٣-	٠.٢٢٥	٢.٠٠٠	١.٨١٣	Training Age

Table (2) indicates that the values of skewness coefficients ranged between (١.٢٤٧- ٠.٨٦٤). This signifies that the sample measurements in variable of age and training age came under the normal distribution curve, which is a reference to the harmony of sample individuals in theses variables.

Procedures of the Research

Specifying Compound Skill Performances

The researchers specified the compound skill performances of the highest frequency during matches, according to what

was stated by many researchers and specialists in their literature through making a comprehensive referential survey (appendix 1), then, they piloted the experts' opinion concerning the recognition of compound skill performances of the highest frequency during matches, in addition to specifying compound skill performances that are most appropriate for the age stage of the research sample (12–14) years.. Shooting while moving by foot front, and ball reception passing by inside foot, were selected according to their importance among experts who stated with a 100% percentage that they are the most appropriate for the age stage of the research sample.

Techniques & Tools of Gathering Data

Tools & Equipment Used in the Research

- 3 video cameras with frequency 250 cadre/second and a triple stand
- A digital camera with 4 gigabytes internal memory and frequency 30 cadre/second
- An electronic memory for storing videos
- Phosphoric signs to specify body joints in circular form of 3 cm. width having a black circle in the middle
- Electrical wires of 100 meters length
- A measurement cube 1 X 1 meter – a measurement tape – a computer set for unit of motor analysis
- Phosphoric ground for specifying and demonstrating movement range
- Dark uniform to suit video background
- Motor analysis program (Simi Motion) which is one of the newest high definition computer software

The Main Study

After specifying the study approach, sample, tools of data gathering, and conducting the pilot study, the compound skill performances of the current research were also defined, as well as points of time that will be dealt with within the study. The main study and experiment were conducted as follows:

Video Procedures

After specifying the compound skill performances and time points that would be dealt with in the current study, the researchers made a video of one trial for each player that was later biomechanically analyzed (appendix 7).

Preparing the Video Setting

The researchers specified the range within which the skill would be performed in order to limit the video range through guiding signs and camera positions.

Camera positions were adapted for video setting and range of motion, at a distance of 11.75 meters, and 1.15 meter height, assuring that the video cadre included the whole range of motion.

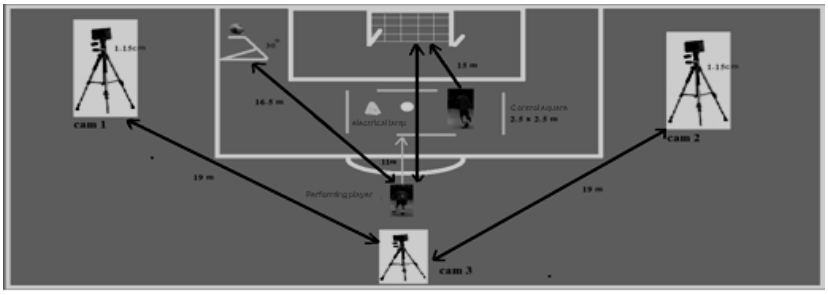

Figure (1)

Camera position during video of current research skills

Preparing Camera Position

Preparing Players for Video

Sticker signs were put on the anatomical points of players' body joints, where similar points to head weight center were specified above lateral border of the anconeus muscle, cubitus joint was represented by a point on the humerus bone, shoulder joint was represented by a point on the scapula extrusion, , thigh joint represented by a point on the big rotator of the femur, knee joint was represented by a point above the lower condyle of femur, and the ankle represented by a point on the fibula, and the metatarsal bones.

Procedures of Biomechanical Motor Analysis

The process of biomechanical motor analysis was performed at the biomechanical motor analysis laboratory at the Faculty of Physical Education, Assuit University,. Trials were arranged according to video processing procedures. The number of analyzed trials was (7), one for each player, and biomechanical variables of the study were extracted using Simi Motion program. Raw

data were introduced in order to calculate (speed – displacement – velocity). Statistical treatment was conducted for raw data resulted from biomechanical motor analysis through SPSS program.

Results & Discussion

Results and discussion of the time variable (time structure of the research compound skill performances):

Table (3)

Time structure and percentage of each stage of compound skill performance Ball reception and passing with inside of foot

Stage percentage to total time	Stage time (sec.)	Stage	N.
%٨٠	٢.٧٩٤	Running time before reception	١
%٢٠	٠.٦٧٧	Time of dual stage	٢
%١٠٠	٣.٤٧١	Total time	٣

Table (3) indicates that the total time of performing ball reception and passing with inside of foot was (3.471) sec. and the researchers divided performance into two essential stages (running time before reception, and time of dual stage "time between reception and passing"), running time before reception was (2.794) sec. with a percentage of 80% of the total time of performance, and the dual stage (between reception and passing) was (0.677) sec. with a percentage of 20% of the total time of performance.

Table (4)

Time structure and percentage of dual stage of compound skill performance (Ball reception and passing with inside of foot)

Stage percentage to total time	Stage time (sec.)	Stage	N.
%٤.٤٣	٠.٠٣٠	Reception time	١
%٨٢.٨٧	٠.٥٦١	Rotation time	٢
%٥.٩١	٠.٠٤٠	Swinging time	٣
%٦.٧٩	٠.٠٤٦	Passing time	٤
%١٠٠	٠.٦٧٧	Total time	٥

Table (4) shows that the time of dual stage of performing ball reception and passing with inside of foot was (0.677) sec., and the researchers divided it into four stages (reception time, rotation time, swinging time, and passing time): reception time was (0.030) sec. , with a percentage **(%٤.٤٣)** of the dual stage time, rotation time was (0.561) sec. , with a percentage **(%٨٢.٨٧)** of the dual stage time, swinging time was (0.040) sec., with a percentage **(5.91%)** of the dual stage time, and passing time was (0.046) sec., with a percentage **(%٦.٧٩)** of the dual stage time (time from reception to end of performance).

Table (5)

Time structure and percentage for each of compound skill stages Direct shooting while moving by foot front

Stage percentage of total time	Stage time (sec.)	Stage	N.
%٩٦	٢.٨٠٩	Running time before shooting	١
%٤	٠.١١٧	Time of dual stage	٢
%١٠٠	٢.٩٢٦	Total time	٣

Table (5) indicates that total time of performance of direct shooting while moving by foot front was (2.926) sec., and the researchers divided performance into two essential stages: (running time before shooting, and dual stage time "time from ball touching till the end of shooting"). The stage of running time before shooting was (2.809) sec. with a percentage (96%) of total performance time. The dual stage (time from ball touching till the end of shooting) was (0.117) sec., with a percentage

of (4%) of total performance time.

Table (6)
Time structure and percentage of dual stage of compound skill performance Direct shooting while moving

Stage percentage to total time	Stage time (sec.)	stage	N.
%٧٢	٠.٠٨٤	Swinging time	١
%٢٨	٠.٠٣٣	Shooting time	٢
%١٠٠	٠.١١٧	Total time	٣

Table (6) shows that dual stage time of performing direct shooting while moving was (0.117) sec. The researchers divided it into two stages (swinging time, and shooting time). The swinging time was (0.084) sec. with a percentage (72%) of dual stage time, and the shooting time was (0.033) sec. with a percentage (28%) of dual stage time (time from ball touching till the end of performance).

Presentation and discussion of results of speed variable values for anatomical points during selected time moments of research compound skill performances

Table (7)
Arithmetic mean, standard deviation, and highest/lowest values of speed variable values for anatomical points during selected time moments of compound skill performance (Ball reception and passing with inside of foot)

Table (8)
Arithmetic mean, standard deviation, and highest/lowest values of speed variable values for anatomical points during selected time moments of compound skill performance (direct shooting while moving by foot front)

Table (7) shows that the highest horizontal speed was for the right foot toe (7.364 m. /sec.), and the lowest horizontal speed was for the right ankle (-1.208 m./ sec.). The highest tangential speed was for right foot toe (7.382 m. / sec.), and the lowest tangential speed was for the right thigh (0.250 m. / sec.). The highest vertical speed was for right knee (0.262 m. sec.), whereas the lowest vertical speed was for right knee (-0.874 m./sec.) during reception moment of compound skill performance into passing with inside foot. Table (8) indicates that the highest horizontal speed value was for the right foot toe (12.413) m./ sec. and the lowest value was for right ankle (1.551) m./ sec., the highest tangential speed was for right foot toe (8.199) m. / sec. and its lowest value was for right ankle (-0.520) m. / sec., whereas the highest vertical speed was for right knee (0.885) m./ sec. and the lowest vertical speed was for right ankle (-5.782) m./ sec. during maximal swinging of compound skill performance, direct shooting while moving. The table also indicates that the highest value of horizontal speed was for right foot toe (13.839) m./ sec., and its lowest value was for right thigh (0.127) m./ sec., the highest tangential speed was for right foot toe (4.151) m. / sec., and its lowest value was for right ankle (-0.890) m./ sec., whereas the highest vertical speed was for right knee (1.561) m./ sec., and its lowest value was for right ankle (-4.851) m./ sec., during collision moment of compound skill performance, direct shooting while moving. In addition, table (8) shows that the highest horizontal speed was for right ankle (8.759) m. / sec., the lowest horizontal speed was for right thigh (-0.382), the highest tangential speed was for right foot toe (7.430), the lowest tangential speed was for right thigh

(-0.271), the highest vertical speed was for right knee (0.975), and the lowest vertical speed was for right foot ankle (-2.923) during the swinging moment of compound skill performance, reception and passing with inside foot. Finally, the table indicates that the highest horizontal speed was for right ankle (6. 432 m. / sec.), the lowest horizontal speed was for right thigh (0.115 m. / sec.), the highest tangential speed was for right foot toe (5.005), the lowest tangential speed was for right thigh (-0.255 m./ sec.), the highest vertical speed was for right foot toe (2.047 m. / sec.), and the lowest vertical speed was for right ankle (-1.424 m. / sec.) during passing moment of compound skill performance, reception and passing with inside foot.

Presentation of results of displacement variable values for anatomical points during selected time moments of research compound skill performances

Table (9)
Arithmetic mean, standard deviation, and highest/lowest values of displacement variable values for anatomical points during selected time moments of compound skill performance (Ball reception and passing with inside of foot)

Table (10)
Arithmetic mean, standard deviation, and highest/lowest values of displacement variable values for right lower limb during maximal swinging moment of compound skill performance (direct shooting while moving by foot front)

Presentation and discussion of results of biomechanical variable values for body mass center during selected time moments of research compound skill performances

Table (11)
Arithmetic mean, standard deviation, and highest/lowest values of body mass center during selected time moments of compound skill performance (Ball reception and passing with inside of foot)

Table (11) demonstrates the biomechanical variables of body mass center during selected time moments of compound skill performance, reception and passing with inside foot. During the reception moment, the highest horizontal displacement was (1.865 m.), the lowest horizontal displacement was (0.769 cm.), the highest tangential displacement was (1.504 cm.), the lowest tangential displacement was (0.879 cm.), the highest vertical displacement was (0.868 cm.), and the lowest vertical displacement was (0.700 cm.). The highest horizontal speed was (1.487 m. / sec.), the lowest horizontal speed was (0.990 m. / sec.), the highest tangential speed was (0.990 m./sec.), the lowest tangential speed was (0.314 m. / sec.), the highest vertical speed was (0.314 m. / sec.), and the lowest vertical speed was (-0.247 m. / sec.). During the swinging moment, the highest horizontal displacement was (2.252) cm., the lowest horizontal displacement was (1.309) cm., the highest tangential displacement was (2.051) cm., the lowest tangential displacement was (1.150) cm., the highest vertical displacement was (0.824) cm., and the lowest vertical displacement was (0.707) cm. The highest horizontal speed was (1.143) m./sec., the lowest horizontal speed was (0.396) m./sec., the highest tangential speed was (1.336) m./sec., the lowest tangential speed was (0.143) m./sec., the highest vertical speed was (0.078) m./sec., and the lowest vertical speed was (-0.605) m./sec. During the passing moment, the highest horizontal displacement was (2.293) cm., the lowest horizontal displacement was (1.333) cm., the highest tangential displacement was (2.104) cm., the lowest tangential dis placement was (1.157) cm., the highest vertical displacement was (0.829) cm., and the lowest vertical displacement was (0.697) cm. The highest horizontal speed was (0.941) m./sec., the lowest horizontal speed was (0.080) m./sec., the highest tangential speed was (1.250) m./sec., the lowest tangential speed was (0.279) m./sec., the highest vertical speed was (0.435) m./sec., and the lowest vertical speed was (-0.558) m./sec., for body mass center during the passing moment of compound skill performance, reception and passing with inside foot.

Table (12)
Arithmetic mean, standard deviation, and highest/lowest values of body mass center variables during maximal swinging moment of compound skill performance (direct shooting while moving by foot front)

Collision moment				Maximal swinging moment				
Lowest value	Highest value	±ع	س-	Lowest value	Highest value	±ع	س-	variables
١.١٨٣	٢.٥٩١	٠.٤١٦	١.٧٥٩	١.٠٠٧	٢.٣٧٥	٠.٣٩٠	١.٥٩٦	Horizontal displacement
٠.٣٨٤	١.٧٧٩	٠.٤٣٨	١.٢٥٥	٠.٣٢٣	١.٦٦٤	٠.٤١٣	١.١٤٣	Tangential displacement
٠.٧٦١	٠.٨٦٢	٠.٠٣٨	٠.٨١٦	٠.٧٧٤	٠.٨٥٠	٠.٠٢٦	٠.٨٠٨	Vertical displacement
١.٤٤٢	٢.١٢٣	٠.٢٠١	١.٧٦٧	١.٢٦١	٢.٣٠٤	٠.٣٩٦	١.٧٩٥	Horizontal speed
٠.١٣٦	١.١٧٣	٠.٣٧٠	٠.٧٢٥	٠.٠٢٩-	١.٠٣٧	٠.٤٠٥	٠.٦٩٦	Tangential speed
٠.٠٣٨	٠.٧٢٠	٠.٢٤٩	٠.٣٢٢	٠.٤٩٢-	٠.٣٤٠	٠.٣٣٧	٠.١٤٨-	Vertical speed

Table (12) indicates the values of biomechanical variables of body mass center during time moments of compound skill performance, direct shooting while moving with foot front. During the moment of maximal swinging, the highest horizontal displacement was (2.375) cm,, the lowest value of horizontal displacement was (1.007) cm., the highest value of tangential displacement was (1.664) cm., the lowest value of tangential displacement was (0.323) m./sec., the highest value of vertical displacement was (0.850) cm., and the lowest value of vertical displacement was (0.774) cm. The highest value of horizontal speed was (2.304) m./sec., the lowest value of horizontal speed was (1.261) m./sec., the highest value of tangential speed was (1.037)m./sec., the lowest value of tangential speed was (-0.029) m./sec., the highest value of vertical speed was (0.340) m./sec., and the lowest value of vertical speed was (-0.492) m./sec., for body mass center, during the maximal swinging moment of time. During collision moment, the highest value of horizontal displacement was (2.591) cm., the lowest value of horizontal displacement was (1.183) cm., the highest value of tangential displacement was (1.779) cm., the lowest value of tangential displacement was (0.384) cm., the highest value of vertical displacement was (0.862) cm., and the lowest value of vertical displacement was (0.761) cm.

The highest value of horizontal speed was (2.123) m./sec., the lowest value of horizontal speed was (1.442) m./sec., the highest value of tangential speed was (1.173) m./sec., the lowest value of tangential speed was (0.136) m./sec., and the highest value of vertical speed was (0.720) m./sec., and the lowest value of vertical speed was (0.038) for body mass center, at the collision moment of compound motor performance, direct shooting while moving.

Presentation and discussion of results of body angles during selected time moments of research compound skill performances

Table (13)

Arithmetic mean, standard deviation, and highest/lowest values of body angles during the time moment of reception for compound skill performance (Ball reception and passing)

Passing moment				Swinging moment				Reception moment				Time moments
Lowest value	Highest value	±ع	س−	Lowest value	Highest value	±ع	س−	Lowest value	Highest value	±ع	س−	Anatomical points
١١٧.٦٠٧	١٥١.٢٤٣	١١.٣٥٢	١٣٢.٢٤٧	١٢٣.٧٤١	١٥٦.٥٨٠	١١.٣٠٥	١٣٧.٠٥١	١٠٦.٠٣٥	١٦١.١٨١	٢١.٠٣٤	١٣٣.٦٦٢	Right thigh angle
١٠٧.٤٠٨	١٤١.٠٧٤	١٤.٣٧١	١٢٦.٨٥١	٩٨.٠١٤	١٥٩.٧١١	٢٣.٠٨١	١١٥.٤٠٠	٩٤.٤٠٣	١٧٢.٥٩٨	٣١.١٧٠	١٤٠.١٢٠	Right knee angle
٩٩.٧٩٤	١١٤.٠٢٨	٤.٤٣٧	١٠٧.٢٣٩	١٠٠.٢٢٥	١٢٠.٩٥٢	٧١.٦٣	١٠٨.٤٥٠	٩٥.٦٤٦	١٥٣.٢٨٦	٢٢.٦٠٤	١١٥.٢٩٦	Right foot angle

Table (13) presents the values of body angles during selecting time moments of compound skill performance for reception and passing with inside foot. The reception moment highest value was for right knee angle of the sixth player (١٧٢.٥٩٨) °, the lowest value was for right knee angle of the seventh player (94.403). During swinging moment, the highest value was for right knee angle of the sixth player (159.711), and the lowest value was for right knee angle of the fourth player (98.014). During the passing moment, the highest value was for right thigh angle of the first player (151.243), and the lowest value was for right foot angle of the fifth player (99.794), for the compound skill performance, reception and passing with inside foot.

Table (14)
Arithmetic mean, standard deviation, and highest/lowest values of body angles during maximal swinging moment of compound skill performance (direct shooting while moving by foot front)

Collision moment				Maximal swinging moment				Time moments
Lowest value	Highest value	±ع	س—	Lowest value	Highest value	±ع	س—	Anatomical points
١٤٠.٩٧٨	١٧١.٥٦٦	١٠.٣٣٠	١٥٠.٥٥٧	١٥٤.٩٩٩	١٧١.٢٩١	٧.٢٠٢	١٦٢.٣٥٠	Right thigh angle
٩٦.٨٦٩	١٧٣.٤٧١	٢٣.٤١٠	١٣٨.٠٧٥	٨٤.٧٦١	١١٠.١٩٨	٨.٣٢٦	٩٦.٤٠٢	Right knee angle
١٠٨.١١٦	١٤٤.٥٤٦	١٤.٦٩٨	١٢٦.٤٨٤	١٠٥.٠٩٩	١٥٥.٦٩٢	١٨.٣٥٥	١٤١.٢٤١	Right foot angle

Table (14) shows the values of body angles during maximal swinging of performing direct shooting while moving. The highest value was for right thigh angle of the fifth player (171.291), and the lowest value was for right thigh angle of the seventh player (84.761), during maximal swinging of performing direct shooting while moving. Table (14) also indicates values of body angles during collision moment of performing direct shooting while moving, where the highest value was for right knee angle of the sixth player (173. 471), and the lowest value was for right knee angle of the seventh player, during collision moment of performing direct shooting while moving.

Presentation and discussion of results of angular speed body points during selected time moments of research compound skill performances

Table (15)
Arithmetic mean, standard deviation, and highest/lowest values of angular speed body points during the time moment of reception for compound skill performance (Ball reception and passing)

Lowest value	Highest value	±ع	س—	variable	Time moment
٥٤.٤٧٤-	٢٠٠.٧٤٠	٩٧.٢٢١	٨٧.٢٩٤	Angular speed of right thigh	Reception moment
٧.٥٧١	١٤٠.٢٧٩	٥٧.٣٧٢	٥٩.١٤٦	Angular speed of right knee	

Follow Table (15)
Arithmetic mean, standard deviation, and highest/lowest values of angular speed body points during the time moment of reception for compound skill performance (Ball reception and passing)

Lowest value	Highest value	ع±	س—	variable	Time moment
٢٧٣.٤٥٨-	١٢٥.٨٦٨	١٢٦.٦٩٥	١٠.٧٢٤-	Angular speed of right foot	
٣٥٠.٦٢٣-	٢٤٧.٢١٨	١٨٤.٥٠٩	١١٩.٨٨٨-	Angular speed of right thigh	Swinging moment
٥٣٠.٧٤٧-	٧١٢.٣٢٤	٣١٩.٨٠٠	٢٧٦.٦٣٣	Angular speed of right knee	
٣٤٤.٤٣٨-	١٧٣.٢٣٥	١٦٠.١٤٤	١٧.٥٩٢-	Angular speed of right foot	
١٧٦.٨٤١-	١٣١.١٤٤	١٠٨.٥٣٣	٩٢.٥٣٣-	Angular speed of right thigh	Passing moment
٢٩١.٤٤٦-	٤٩١.٥٨٦	٢٨٨.٧٧٠	٢٩٨.٣٧٥	Angular speed of right knee	
١٢٠.٩٩٠-	١٨٦.٢٨٤	١٠٢.٣١٢	٢٤.٤١١	Angular speed of right foot	

Table (15) indicates the values of angular speed body points during selected time moments of research compound skill performances during the time moment of reception for compound skill performance (Ball reception and passing). As for moment of reception, the highest angular speed was for right thigh of sixth player (200.740) m./sec., and the lowest angular speed was for right foot of seventh player (273.458) m./sec. The table also demonstrates the angular speed values of body points during swinging moment, in which the highest value was for right knee of first player (712.324) m./sec., and the lowest value was for right

knee of sixth player (-530.474) m./sec. Concerning the moment of passing, the highest angular speed was for right knee of the first player (491.586) m./sec., and the lowest angular speed was for the right knee of the sixth player (-305.486), during the passing moment of compound skill performance (reception and passing with inside foot).

Table (16)

Arithmetic mean, standard deviation, and highest/lowest values of angular speed body points during the time moment of maximal swinging for compound skill performance (direct shooting while moving by foot front)

Lowest value	Highest value	ع±	س ـ		variables
٢٣٠.٤٥٧-	٤٤٨.٦٤١	٢٢٦.٦٧٢	١٦٩.٥٥٢	Angular speed of right thigh	Maximal swinging
٤٢٣.٢٨٥-	٥٤٤.٤٠٧	٣٢٦.٩٩٨	٣٠.٤١١-	Angular speed of right knee	
-١١٩٢.٠٠٩	٢٩.٦٤٦-	٤١٩.٢٤٨	٣٨٢.٢٢٧-	Angular speed of right foot	
٤٧٦.١٥٢-	١٠٩.٥١٦-	١٢٤.٢٦٠	٣٢٩.٩١٠-	Angular speed of right thigh	collision
٥٢١.٦٧٦	١٥٩١.٥٢٧	٣٧٤.٢٤٦	٩٦٣.٨٣٩	Angular speed of right knee	
٥٢.٩٩٨-	٦٩٤.١٢٩	٢٤٨.٠٩٩	٣٣٠.٩٦٠	Angular speed of right foot	

Table (16) indicates angular speed values of body points during time moments of compound skill performance (direct shooting while moving with foot front). The highest

angular speed was for right knee of seventh player (544.407) m./sec., and the lowest angular speed was for right knee of the fourth player (-1192.009) m./sec. As for collision moment, the highest angular speed was for right knee of the sixth player (1591.527) m./sec., and the lowest angular speed was for right thigh of sixth player (476.152) m./sec., in moment of collision of compound skill performance (direct shooting while moving).

Presentation and discussion of results of biomechanical variable values for ball as a shot during selected time moments of research compound skill performances

Table (17)

Arithmetic mean, standard deviation, and highest/lowest values of speed and displacement variables during selected time moments of compound skill performance (Ball reception and passing with inside of foot) N = 7

Total ball speed			variables
Passing moment	Swinging moment	Reception moment	Time moment
٦.٣٠٨	٢.٩٥٧	١.٧٥٣	س-
١.٣٣٨	١.٣٥٩	٠.٣٠٧	±ع
٨.٥٨٩	٤.٩٣٠	٢.٠٦٤	Highest value
٤.٦٨٨	١.٤٦١	١.٢٨٤	Lowest value
٠.٩٩٢	٠.٨٣٦	٠.٠٧٣	س-
٠.١٩٨	٠.١٧٧	٠.٠٣١	±ع
١.٢٤٩	١.١٠٧	٠.١١٧	Highest value
٠.٧٧٥	٠.٦١٤	٠.٠٣٨	Lowest value

Table (17) shows that the highest speed value of ball as a shot was (8.589) m./sec., achieved by the first player during the moment of passing, whereas the lowest speed value of ball as a shot was (1.284) m./sec., achieved by the sixth player. The table also shows that the highest displacement value of ball as a shot was (1.249) cm., achieved by the fourth player at the passing moment, and the lowest displacement value of ball as a shot was (0.038) cm., achieved by the third player at the reception moment of compound skill performance (reception and passing with inside foot).

Table (18)
Arithmetic mean, standard deviation, and highest/lowest values of speed and displacement variables during selected time moments of compound skill performance (Ball shooting while moving with foot front) N = 7

collision		Maximal swinging		Time moment
Total ball displacement	Total ball speed	Total ball displacement	Total ball speed	variables
٠.٣٦٨	٦.٠٢٨	٠.٠١٩	٣.١٩٦	س-
٠.١٣٢	١.٩٩٠	٠.٠٥٠	١.٠٤٧	±ع
٠.٦٠٥	٨.٥٧٢	٠.١٣١	٤.٢٠٦	Highest value
٠.١٩٢	٣.٠٣٤	٠.٠٠٠	١.٣٦٠	Lowest value

Table (18) indicates that the highest value of ball as a shot was (8.572) m./sec., achieved by the fourth player during the moment of collision, whereas the lowest value of ball as a shot was (1.360) m./sec., achieved by the fourth player at the moment of swinging. The highest value of ball as a shot displacement was (0.605) cm., achieved by the sixth player during collision moment, whereas the lowest value of ball as a shot displacement was (0.000) cm., achieved by players from first to sixth at the moment of maximal swinging of the compound skill performance, direct shooting while moving by foot front.

Conclusions

- The researchers recognized biomechanical variables (time– speed– displacement – angular speed– path of body mass center) for the current research compound skill performances.
- The path of body mass of the compound skill of the current research.
- The angles of anatomical points increase and decrease during time moments of the compound performances of the current research.
- There are differences in horizontal distance related to the increase in thigh angle during the moment of swinging and maximal swinging in each of the current research compound skill performances.
- A player needs high speed at the moment of collision in order to shoot the ball in an appropriate speed and displacement.

- Increasing performance speed leads to a reduction in time of the dual stage and compound motor performance.

Recommendations

- The necessity of taking guidance from scientific bases in setting and designing programs that are related to instructing compound skill performances and developing the standard of skill performance.
- The necessity of instructing and training young soccer at skills based on biomechanical variables for developing speed, and displacement, as well as improving skill functional efficiency of young soccer.
- The necessity of designing training programs aiming at improving body joints' working during ball reception, passing, and shooting, and increasing speed rate of body joints during ball reception, passing, and shooting, whereas decreasing joints' speed during maximal swinging.

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