



THE CONTRIBUTION OF BIOMECHANICAL ANALYSIS TECHNOLOGY TO IMPROVE THE ASSESSMENT OF STUDENTS DURING CERTAIN SCHOOL SPORTS ACTIVITIES (LONG JUMP)

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Abstract

The purpose of this study was to determine the contribution of biomechanical analysis technology to improve the assessment of students during certain school sports activities (long jump), this by (1) determining the statistical differences between groups in variables analyzed. (2) revealing the relationship between the kinematical variables analyzed and the digital level & evaluation result. The sample included 32 students in the 1st year of secondary school (16 males, 16 females), two groups for each gender. Group I working on the use of kinetic analysis in a correction the kinetic performance and evaluated, and group II is guided by the observation only. The study involved the kinematical analysis of performance during long jumping activity, by using the software; Coach's Eye & MyDartfish Express. The data were analyzed in SPSS 22.0 program, the descriptive statistics (mean \pm SD, Std. E), the Anova & T-tests for difference statistical between groups, and the P test for the correlations between variables. In conclusion, our assessment problem is that it depends on the digital level only in the learning phase. Besides, these results indicate that the professors who use this kinetic analysis software have adjusted the way they evaluate students, where Improving digital achievement should depend on proper evaluation in the stages of achievement for the physical education and sports teaching process.

INTRODUCTION

The values and objectives of physical education and sports are not achieved by the mere participation of students in the lesson, but require specific guidance and good utilization of time and material and technological means available in the teaching process during the lesson sections to benefit from the time of physical education and sports to meet the needs of students and to enhance the educational benefits of it (Cale et al., 2016). This requires the professor of physical education to harness the means of technology, scientific programs available to develop the educational process, as the programs of biomechanical analysis are programs available through the different applications in smartphones owned by most members of the community. The benefits indicate that scientific basics-based interventions for professors have the potential to increase physical activity in practice and evaluate (Tarun et al., 2017), and it would be very important for the digital level achieve.

The previous studies point out that the physical education is the group of activities chosen to achieve and satisfy the mental and psychological needs of people to achieve the integrated growth of man (Beddoes & Castelli, 2017; Kahan & McKenzie, 2017), and emphasized that the physical education and sports are a part of comprehensive education, which aims to create the citizen apt mentally, physically, emotionally and socially. Several forms

and types of physical and sports activities (Fairclough et al., 2016).

In view of the importance of this field of education, which has been given by all modern and developed countries in recent times (Panoutsakopoulos V, 2015), And made it an essential part of the educational courses for all academic levels, primary school education, secondary school education and higher education (university) as well (Muc et al., 2015).

In Algeria, the physical education curriculum for the educational stages includes a range of key activities, including long jumping activity. The long-jump is one of the most important events in track & field competitions, as it has a long history and is involved in multiple event competitions (i.e decathlon, heptathlon, pentathlon) (Joseph L. Rogers, 2000). it's consists of four interconnected phases: approach, take-off, flight, and landing.

According to some existing studies (Čoh et al., 2008; Hay et al., 1986; Mendoza, 1989), the approach and take-off are the most important factors that affect the result. The fundamental problem of long jump, from the biomechanical point of view, is the transformation of horizontal velocity to a resultant of the vertical and horizontal velocities in the take-off phase (Čoh et al., 2017).

In order to achieve high performance in long jumps, the athlete should convert the horizontal speed of the approach into vertical speed with minimal loss of the former (Bridgett &

Linthorne, 2006). Hence, the take-off technique which affects the trajectory is an important factor to achieve high performance (Bartlett, 2007; Abdelkader et al., 2020).

As the biomechanical analysis of sports performance provides an objective method of determining the performance of any particular sporting technique (Guebli Abdelkader et al., 2018), because it is a science concerned with studies kinetic technology and movement performance in order to make the skill work well, and this requires various elements of physical fitness and kinetic performance.

From that point of view, this new idea proposed for using some application of movement analysis in smartphones during the lessons of physical activities for correction the kinetic performance of long jump and evaluated. Therefore, the purpose of this study was to determine the contribution of biomechanical analysis technology to improve the assessment of students during certain school sports activities (long jump).

Where the study efforts were directed towards (1) determining the statistical differences between groups in variables analyzed. (2) revealing the relationship between the kinematical variables analyzed and the digital level & evaluation result.

METHODS

Ethical approval

The Human Research Ethics Committee of Hassiba Benbouali

University approved all procedures, and all participants provided written informed consent before commencing the study to the investigator, with the condition of keeping personal data secret.

Sample size

Thirty-two students' males and females (age: 15-16 years) volunteered to contribute in the present study, sixteen for each gender, and each gender have two group GI & GII (eight students in the group). The group GI working on the use of kinetic analysis in a correction the kinetic performance and evaluated, and group GII is guided by the observation only. The digital level for our sample achieved in the long jump for males ($\geq 4.25\text{m}$) and females (≤ 4.0

Exclusion criteria were

Practicing sports out the school in special club Athletics, other types of physical training more than 1 time per week, and being on a hypocaloric diet to reduce weight.

Research design

For analysis, we have calculated the distance of the jumping in two-dimensional. The analysis of the present study was with the software; "Coach's Eye" & "MyDartfish Express" during the kinetic performance of long jump (Figure. 1), where we used the camera of phone for capturing video (CONDOR plume P8 phone, 13MP). The phone camera was placed X9 m from the

midline of the long jump, with their optical axe at right angle to this line, and

Y1.2 m forward (or on the pit side, between the board long jump and beginning of the pit) of the front edge of the board (Figure. 2), and was used to record performance during the push phase of the long jump. To measure the real distance, a series of markers was placed in carefully measured locations along the inside. These markers served as reference measurement. Long jumping tries were applied for our sample in five tries, we choose the best three tries for analysis.

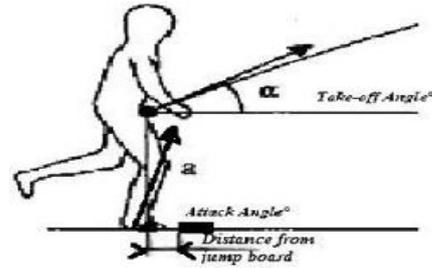
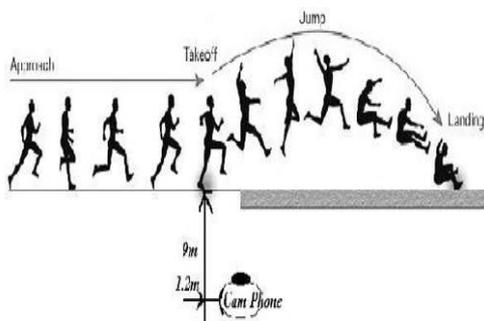


Fig 2. Phone camera placement during the performance of long jump, and kinematical variables choose for analysing.



Fig 1. The software; Coach's Eye & MyDartfish Express.



Kinematic Variables analysis

Based on some previous studies, we choose the kinematic variables for analyzing the performance kinetic of students in long jumping activity (variables; Attack Angle°, Take-off Angle°, Distance from jump board and Digital Level). We used "Coach's Eye" & "MyDartfish Express" software for the kinematical analysis, it's a video player for sports analysis. It provides a set of tools to capture, slow down, study, compare, measure technical performances, and annotate.

Statistical analyses

The obtained data were analyzed by using a software IBM SPSS Statistics (SPSS for Windows, version 22.0, SPSS Inc. Chicago, Illinois, USA), we used Students "T" and "Anova" tests to differentiate between groups in the variables analyzed for our sample. Significance was accepted at $P < 0.05$. All data are presented as mean \pm standard deviation, standard deviation Error, Minimum \downarrow and Maximum \uparrow value (for subject characteristics).

RESULT

The groups were comparable regarding Attack Angle (degree °), Take-off Angle (degree °), Distance from jump board (cm), Digital Level (m). and Evaluation Result (point /20). in addition, every one of the included (a), through the results of the “T” student test at the 0.05 level (2-tailed) between group GI and GII are significant in the variables; the Attack angle° for males ($4.606 > t$) and females ($3.840 > t$), the Take-off Angle° for females ($3.409 > p$), and in the digital Level for males ($2.936 > t$) and for females ($2.406 > t$). Also show Table 2 (b) the results of the Anova test at the 0.05 level (2-tailed) between all groups are significant in the variables; the Attack angle° ($11.825 > \text{anova}$), the Take-off Angle° for females ($4.674 > \text{anova}$), and in the digital Level ($24.123 > \text{anova}$). Table .3 shows the connectivity relationships between variables analysed in order to study based on the digital level and evaluation result for our groups of the sample. The simple correlation is significantly positive at the 0.05 level (1-tailed) in males’ group GI (working on the use of kinetic analysis) between the variable of Take-off angle° and the Digital Level (0.763^*), in addition, the negative significant correlation at the 0.05 level (1-tailed) between the variable of Distance from jump board and the Evaluation Result (-0.765^*).

Based on the results obtained, we conclude that the results of using the biomechanical software in kinetic

participants completed the study. All participants in this study followed and received group supervision in all physical education session from their teacher of APS in school, and compliance with the control protocol was 100% complete in all session.

performance are effective in the digital level achievements for the students’ males and females from group GI typically. but, the results of evolution between students for the professors who did not use biomechanical software in analyzing and evaluating motor performance did not support the final evaluation results for their students, and this is a kind of injustice in the evaluation process.

Also, we referred to the importance of the Take-off angle in achieving the digital achievement, as well as the effect of using kinetic analysis in the evaluation process (Bridgett & Linthorne, 2006; Tan & Zumerchik, 2000; Wakai & Linthorne, 2005). From that, we conclude that the results of using the biomechanical software are benefit to evaluating for the student’s males from group GI typically.

DISCUSSION

Based on the results obtained, we referred to the errors in the motor performance (Attack Angle, Take-off Angle in tab 2; fig 2 and 3) of the sample between Groups I and II (GI is working on the use of kinetic analysis; GII is guided by observation only), The notion that the optimum take-off angle is 45

degree (Abdelkader et al., 2018; Zerf Mohammed et al., 2015) is based on the assumption that the take-off velocity is constant for all choices of take-off angle (Hay et al., 1986). However, in the long jump, as in most other sport's projectile events, this assumption is not valid (Wu et al., 2003), in accordance with "Zhiguo Pan" the bigger the take-off angle α within certain limits, is not allowed to be too big or too small. If α is too big, the loss of the horizontal speed when taking off will be large and the jumping distance will be small, if α is too small, it is difficult to gain necessary jumping height and time (Jovanović, 2012; Tan & Zumerchik, 2000), thus affecting the result and unable to achieve ideal distance (Wakai & Linthorne, 2005). Take-off angle is well known that take-off angles in the long jump are substantially less than the 45-degree angle that is usually proposed as the optimum for a projectile in free flight (Čoh et al., 2017). Video measurements of world-class long jumpers consistently give take-off angles of around 21° (Çetin et al., 2014). The limit for the utilization rate of the run-up speed of long jump is 100%; however, athletes cannot attain their own absolute speed in running up in order to complete the action of take-off (Guebli et al., 2018). The reason is that the ultimate goal of running up is to obtain the maximum controllable speed before taking off which can reveal the utilization rate of speed (Bridgett & Linthorne, 2006). It is thus clear that to increase the utilization rate of the run-up speed is a problem that cannot be ignored

in training and teaching (El-Ashker et al., 2019; Gontarev et al., 2014; Ramírez-Vélez et al., 2017). Speed has become the core factor of long jump technologies.

Therefore, it is necessary to put exerting the training of the maximum speed of oneself in the first place and provide conditions for increasing the run-up speed (Tan & Zumerchik, 2000). show the effectiveness of time and evaluate for the success of the lesson of physical education and sports in the correct distribution of this time, that doing by the professor, and because time is an important criterion in the output of the lesson model of physical education and sports, it needs to study the distribution of time the actual exploited in the lesson of physical education and sports (Sutherland et al., 2016). This reflects the extent, to which the student benefited from the programs and exercises prescribed during the training séance (physical education), And that makes the assessment process based on development during the performance of the movement in the periods of the exercise share of physical education, the teacher should seek justice in evaluating the students based on their level of development by distributing the total score in the evaluation to the set of results of the required motor performance variables, and the digital level achieved. Ultimately, the use of biomechanical analysis technology software contributes to improving the assessment of students during school sport activity of long jumping, also

effective in highlighting performance variables affecting the level of digital achievement.

CONCLUSION

The use of biomechanical analysis technology was effective in improving the evaluate the students in the long jump technique. Students who received the video feedback showed improvements in attack angle^o, take-off angle^o, and digital level. We recommend to our professors that technology programs in the teaching and assessment in the different activities of sports (specialty in individual sports), especially the software of kinetic performance analysis become part of their regular teaching regimens when learning and evaluating students technical skills in different physical activities because the analysis of kinetics performance of students in different phases of long jump allows us not only to measure the effort distribution but also define the techniques and errors of practice.

The comparisons guide us to determine the technique practiced and the weaknesses of our student's in practice. Further research is needed to integrate modern scientific software into the methods of teaching and evaluating the students during practice sports activities.

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