

Acute effect of ballast vest on physical conditioning for soccer goalkeepers

Efecto agudo del chaleco lastrado sobre la condición física del portero de fútbol

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Abstract

There are few studies related to the physical condition of young soccer goalkeepers. The aim of the study is to analyze the acute effect on the goalkeeper's physical condition through a session by wearing a weight-bearing vest at 5% of body weight. The variables analyzed are explosive strength (SJ and CMJ) through the application "My Jump" and the agility test Lloureq (Llopis, Ulloa & Requena, 2010) adapted. A session with a weight-bearing vest is carried out at 5% of his body weight, on 6 young goalkeepers of high sporting skill, with a mean age of 16.17 (\pm 1.17 years). The main results show that there are no significant differences between the pretest and posttest SJ and CMJ force levels, however, there are significant differences ($p < .05$) in the other variables analyzed in relation to specific agility and technical elements Specific to the goalkeeper. The use of the ballast vest with acute effect can be considered as a good training material specific to the goalkeeper of soccer.

Key Words

Goalkeeper; Ballast Vest; Physical Conditioning; Soccer.

Resumen

Son pocos los estudios relacionados con la condición física de los porteros jóvenes de fútbol. El objetivo del estudio es analizar el efecto agudo sobre la condición física del portero a través de una sesión mediante el empleo de un chaleco lastrado al 5% del peso corporal. Las variables analizadas son fuerza explosiva (SJ y CMJ) a través de la aplicación “My Jump” y el test de agilidad Lloureq (Llopis, Ulloa & Requena, 2010) adaptado. Se realiza una sesión con chaleco lastrado al 5% de su peso corporal, sobre 6 porteros jóvenes de alta pericia deportiva, con una media de edad de 16.17 (± 1.17 años). Los principales resultados muestran que no existen diferencias significativas entre los niveles de fuerza SJ y CMJ pretest y posttest, sin embargo sí que existen diferencias significativas ($p < .05$) en el resto de variables analizadas en relación a la agilidad específica y los elementos técnicos específicos del portero de fútbol. El uso del chaleco lastrado con efecto agudo se puede considerar como un buen material de entrenamiento específico del portero de fútbol.

Palabras clave

Portero de fútbol; Chaleco Lastrado; Condición Física; Fútbol.

Introduction

Football has evolved of being a game in origins up to turning into a sport, as we know it today (Paredes, 2002). Since protofútbol, it was created as a simple game with some first references more than three thousand years in China like it outlines Diem (1966) on having spoken that during the dynasty Han (206 B.C-25 A.D.) the Chinese were already practising the football, happening for a great quantity of cultures that gather in traditions different types of games of ball that can relate to the football, since: the native Australians, the Eskimoes of Arctic, different tribes (Navajos; chukchi; Zulú), Egypt, China, Japan, Hindúes, Maya, Aztecs and Romans, between others.

Sport, like football for example, as we understand it today, it is something different from what it went and meant in beginnings. Olivera (1993) explains it to us on having said that: For all this, we cannot consider those precedents to be sports, since there treats herself about games and ritual competitions which social function was different well in each of these companies, and certainly, well different the one that it corresponds to the contemporary sport of our epoch (p. 13). Therefore, the original game has evolved, to the organization of the sports realized in England for Thomas Arnold in the 19th century and for the impulse of the Olympic Games of the modern age (Paredes, 2002), until it turned nowadays in the acquaintance as " sport king " due to his popularity and repercussion (Vitoria, 2005).

There is no doubt that is considered to be one of the major businesses of the world by the multitude of factors that it moves around it (Sanchez, Perez & Yagüe, 2013). Between these factors, it is the number of medical instructors who promote even more than 265 millions (Kunz, 2007) and his presence more than significant in the mass media (De Rose, Ramos & Tribst, 2001) with daily and constant form, since for example that the newspaper most read in Spain is about sports and with his most centred on the football, since it is the sports newspaper MARCA.

The practice of the high-level football needs of numerous physical, technical, tactical and psychological qualities (Dauty, Bryand & Potiron-Josse, 2002). Nevertheless, the explosive strength seems to be a parameter of special importance in the football players, being one of the determinant factors in the sports performance (Le Gall, Beillot & Rochcongar, 2002), in all the players and in the goalkeeper especially. As Sambade (2011) explains, the average duration of the efforts of the goalkeeper of football during a match is of between one and two seconds and the number of specific actions of high intensity changes between 15 and 26, therefore the goalkeeper makes specific actions centred on the explosive strength and the specific agility of the position.

Different studies value the physical and functional capacities for the categories of sports formation affecting in that the follow-up of these capacities along the path of the player can determine the future sports performance (Calahorro, Zagalaz, Lara & Torres-Luque, 2012; Carrasco, Calahorro, Lara & Torres-Luque, 2015; Gil, Gil, Ruiz, Irazusta & Irazusta, 2007;

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Gravina, Gil, Ruiz, Zubero, Gil & Irazusta, 2008). The line of investigation previously proposed reinforces the hypothesis of which an ideal physical capacity on the part of the player influences his technical performance, on his tactical decisions and in addition, it can manage to reduce the risk of suffering injuries (Stølen, Chamari, Castagna & Wisløff, 2005).

The conditional element performs great importance in the performance of the football player, for this reason, there exist publications that concern the anthropometric characteristics (Reilly, Bangsbo & Franks, 2000; Soarez, Fragoso, Massuça & Barrigas, 2012) and conditional (Gonçalves, García & Hespanhol, 2007; Sánchez, Pérez, Yagüe, Royo & Martín, 2015) to promote that the player could increase his performance adapting to the own needs of the specific position. Finally, in the study realized by Sanchez et al., (2015) it makes clear that the muscular strength is a determining capacity of the motor skills in general and of the sports performance especially. This affirmation countersigns the study realized by Carrasco et al., (2015), thinking that the explosive strength is key for the not alone short-term success also long-term. In addition, the work of strength with the specific work of football gives better results that only the work of football, therefore it is a suitable complement (Sánchez, et al., 2015).

Traditionally, the work of strength has had an orientation to the work with high loads, whereas the work of power has realized with more light loads, which would allow to increase the force to high speeds (explosive force) (Martínez-Valencia, González-Rave, Navarro, & Alcaraz, 2014). In this area, the work with ballasted vest is considered to be that one that to be realized against an added resistance to the natural resistance in the execution of a specific gesture of a sport (Martínez-Valencia, et al., 2014).

Different authors coincide with, that is from the puberty when it begins the most sensitive period in the development of the majority of the physical capacities, appreciating in this stage a significant increase of the muscular mass and consistently of the strength, a better development of the anaerobic capacity and a more prominent improvement of the agility (Malina, Cumming, Morano, Barron & Miller, 2005; Philippaerts, et al., 2006).

Other one of the factors that determine the performance is the agility, which has been defined of classic form as the skill that allows changing rapidly the direction of the movement (Bloomfield, Ackland & Elliot, 1994). In case of the football, it is requested in a great quantity of occasions along the matches, and it is needed to give response to the movements with speed and direction changes that they come from diverse stimulus, all this of speed, effective and precise form (Gonzalez, 2008), specifically it is what the goalkeeper realizes along the whole match.

The goalkeeper is the last capable player of avoiding that the ball goes into his own goal and, at the same time, the first attacker in the zone of creation of the game. For it, the victory or defeat, it often depends on the performance of the goalkeeper (Wein, 2004). The high degree of responsibility that the goalkeeper's demarcation carries is often in the middle of important defensive and offensive actions of the game (Llopis, 2010; Vicente, 2012).

This position acquires a great value in the game due to his role, much more important in the implication and situations of the game (Llopis, 2010). This, joined to the regulation changes, provokes that its training is different and specific (Llopis, 2010), being the explosive strength and the agility the conditional elements with major importance in the performance (Le Gall, Beillot & Rochcongar, 2002) of the goalkeeper of football.

According to Robles and García (2010) in spite of the fact that the football is a team sport, when we refer to the goalkeeper, we consider it as a player with particular conditionings: apparel, procedure, position in the area of game... This means, that it is one of the positions that it has more evolved recently, giving it importance to the actions that a goalkeeper shows out of the goal like as the good domain of the ball with the foot and in the actions that are considered of continuation in the game (Pérez, Domínguez, Rodríguez, López & Sánchez, 2016). Therefore, the aim of the training is that it is prepared by the best levels of physical form that there allows it to operate with major effectiveness and efficiency in the different technical - tactical actions which have to resolve in the competition of rapid and explosive form (Llopis, et. al., 2010).

The aim of the study is to analyze the acute effect on physical conditioning of the goalkeeper across a session by means of the use of a ballasted vest to 5% of the corporal weight.

Material and Method

Methodology

The investigation that is realized is a type quantitative experimental one field study with a pretest, intervention and a final posttest, to verify the effect of the intervention on the physical condition. Cook and Reichardt (1986) and Pita and Pértegas (2002) give us a series of characteristics on the type of methodology of the investigation, which is a methodology of quantitative investigation, since there is gathered observable, measurable information, quantifiables and offer a few numerical results. With regard to the aims of this type of methodology, the investigation chases to explain experiments.

Sample

The sample is composed by 6 goalkeepers, with an average age of 16.17 (± 1.17 years), height of 181.17 (± 5.64) centimetres and 69.83 (± 10.55) kg of weight. All of them belong to the most representative club of football in the province of Salamanca and of major relevancy in Castilla y León, Unión Deportiva Santa Marta.

Procedure

The information was gathered in the facilities of the sports club, previous request and authorization to the parents, trainers, goalkeepers and responsible technical personnel of the sports club in accordance with the ethical principles of Helsinki's declaration.

The specific session of training had duration of 90 minutes to value the acute effect that the use of the ballasted vest on the physical condition.

Before the beginning of the program, the height and the weight was registered finding of the latter 5 % used for the ballasted individual load that they were going to take each one.

Before the intervention with ballasted vests (Table 1), the specific tests of physical-technical condition of the goalkeeper of football were realized. To obtain great reliability and to avoid mistakes in the measurements, the correct execution was initially taught them and it was allowed to them to practise it, since later only an attempt will be allowed providing that the execution and form is the suitable one.

The followed process was a capture of information of strength, SJ and CMJ, in the specific gym, following by the specific warming up of the goalkeeper with duration of 15 minutes. Later, there is realized the first measure of the specific agility of the goalkeeper by means of the test Lloureq. Once finished the capture of information, it is realized a specific training session of 90 minutes with ballasted vest to 5% of the weight of every goalkeeper (Table 1) and, finally, the information takes already without ballasted vest.

Table 1. Weight and Percentage in every vest.

	<i>Weight</i>	<i>5% (kg)</i>
Player 1	78	3.9
Player 2	82	4.1
Player 3	85	4.25
Player 4	63	3.15
Player 5	60	3
Player 6	68	3.4

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Material

The experimental part has developed in the facilities of the club in all the areas: material of field, training field and gym. In the gym, there realized the capture of information of specific strength Squat Jump (SJ) and Countermovement Jump (CMJ) with the application “My Jump” scientific validated by Balsalobre-Fernández, Glaister y Lockey (2015). The test of agility used is Lloureq (Llopis et al., 2010) modified ad hoc, with technical components measured with a manual chronometer. The statistical treatment was in use the program SPSS Statistics 20.0.

Statistical analysis

The statistical treatment was in use the program SPSS Statistics 20.0., with a level of significance $p < .05$. The descriptive statistics are presented in average and standard deviation (SD). There was in use the punctuation obtained after the jumps of test for the test CMJ and SJ. The time in the circuit for the field test providing that the observer was not observing any irregularity as for the reduction or increase of the final time. An ANOVA was realized for comparison of averages and to determine if there exist significant differences between the realized test and the moments of the test.

Results

The information gathered in the Pretest for the CMJ shows that the average was 35.10 cm (SD 4.338), the maximum jump was 39.40 cm, 12.25% higher than the average; and the minimum jump was 27.20 cm, 22.51% lower than the average (Table 2).

In the SJ, the average was 31.52 cm. (SD 4.632), the maximum jump was 36 cm, being 14.21% higher than the average, and the minimum jump was 23.20 cm, being 26.40% lower than the average.

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Observing more held up the table, it appreciates that in the CMJ the values are superior to the SJ owed possibly to that in the test CMJ the jump is realized by one against previous movement and in the SJ, is not (Table 2).

Tabla 2. Test of explosive strenght: Pretest.

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average</i>	<i>Stand Dev</i>
CMJ	6	27.20	39.40	35.10	4.338
SJ	6	23.20	36.00	31.52	4.632

In the analysis of the test Lloureq, it was registered an average of 5.14 seconds (SD 0.251), the fastest time (minimum) was 4.84 seconds, 5.83% lower than the average, and the slowest (maximum) was 5.59 seconds, 8,75% higher than the average. In the test Lloureq with frontal blocking and continuous play, it was registered an average of 7.25 seconds (SD 0.302), the fastest time (minimum) was 6.97 seconds, 5.66% higher than the average. In the test Lloureq with flat blocking, it was registered an average of 9.32 seconds (SD 0.5559), the fastest time (minimum) was 8.71 seconds, 6.55% lower than the average, and the slowest (maximum) was 10.19 seconds, 9.33 higher than the average. In the test Lloureq with lateral blocking, it was registered an average of 9.66 seconds (SD 0.35), the fastest time (minimum) was 9.19 seconds, 4.87% lower than the average, and the slowest (maximum) was 10.22 seconds, 5.80% higher than the average. In the test Lloureq with half-height blocking, it was registered an average of 10.32 seconds (SD 0.302), the fastest time (minimum) was 10.00 seconds, 3.10% lower than the average, and the slowest (maximum) was 10.81 seconds, 4.75% higher than the average. In the test Lloureq and its variants, is observed that, as it increases the difficulty of the specific technical action, the time of the test increases (Table 3).

Table 3. Specific Tests: Pretest.

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average</i>	<i>Stand Dev</i>
Lloureq	6	4.84	5.59	5.14	.251
Lloureq with frontal blocking	6	6.97	7.66	7.25	.302
Lloureq with flat blocking	6	8.71	10.19	9.32	.559
Lloureq with lateral blocking	6	9.19	10.22	9.66	.365
Lloureq with half-height blocking	6	10.00	10.81	10.32	.302

As for the posttest CJM, the average was 34.32 cm (SD 3.472), the maximum jump was 37.10 centimetres, 8.10% higher than the average and the minimum jump was 28.20 centimetres, 17.83% lower than the average. In the test SJ, the average was 32.90 cm (SD 2.551), the maximum jump was 34.90 cm, 6.08% higher than the average and the minimum jump was 28.20 cm, 14.29% lower than the average. We affirm for the gathered information in the Table, that in the test CMJ, the values are superior to the test SJ (Table 4).

Table 4. Test of explosive strenght: Posttest.

	<i>N</i>	<i>Minimum</i>	<i>Maximun</i>	<i>Average</i>	<i>Stand Dev</i>
CMJ	6	28.20	37.10	34.32	3.472
SJ	6	28.20	34.90	32.90	2.551

In the test Lloureq, the average was 5.43 seconds (SD 0.151), the faster time (mínimum) was 5.25 seconds, 3.31% lower than the average, and the slower time (maximum) was 5.69 seconds, 4.79% higher than the average. In the test Lloureq with frontal blocking, the average was 8.02 seconds (SD 0.544), the faster time was (minimum) 7.43 seconds, 7.26% lower than the average and the slowest time (maximum) was 8.94 seconds, 11.47% higher than the

average (Table 5). In the test Lloureq with flat blocking, the average was 10.23 seconds (SD 0.237), the faster time (minimum) was 9.88 seconds, 3.42% lower than the average, and the slower time (maximum) was 10.59 seconds, 3.52% higher than the average (Table 5). In the test Lloureq with lateral blocking, the average was 10.62 seconds (SD 0.221), the faster time (minimum) was 10.32 seconds, 2.82% lower than the average, and the slower time (maximum) was 10.94%, 3.01% higher than the average (Table 5). In the test Lloureq with half-height blocking, the average was 11.82 seconds (SD 0.348), the faster time (minimum) was 11.40 seconds, 3.55% lower than the average, and the slower time (maximum) was 12.37 seconds, 4.65% higher than the average. As same as in the pretest, in the posttest, as it increases the difficulty in the specific technical action, the time of the test increases (Table 5).

Table 5. Specific Tests: Postest.

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Average</i>	<i>Stand Dev</i>
Lloureq	6	5.25	5.69	5.43	.151
Lloureq with frontal blocking	6	7.43	8.94	8.02	.544
Lloureq with flat blocking	6	9.88	10.59	10.23	.237
Lloureq with lateral blocking	6	10.32	10.94	10.62	.221
Lloureq with half-height blocking	6	11.40	12.37	11.82	.348

In short, in the Figure 1, we can observe of clear form that in the strength, in CMJ test, it presents decrease in the results, whereas the same thing does not happen in the SJ test.

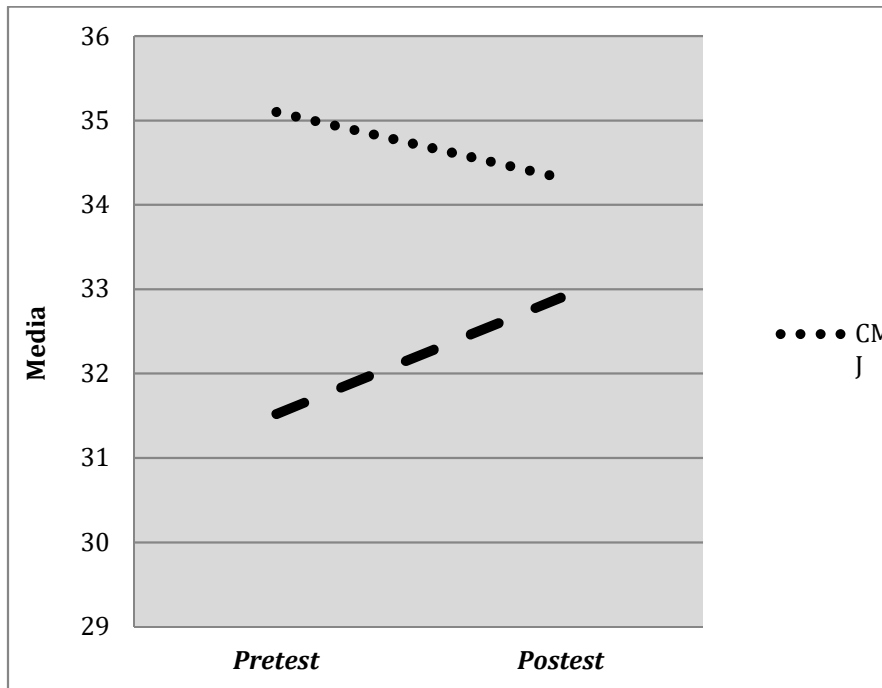
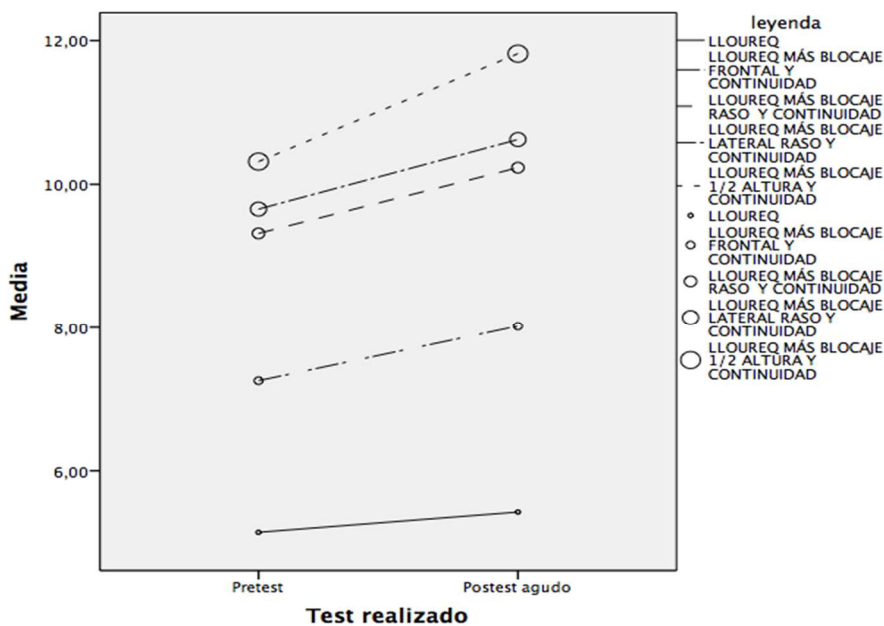


Figure nº 1. Average physical test: pretest and posttest.

And in case of the agility and the technical elements, the figure 2, show that the results are worse in case of the posttest with regard to the pretest.



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Figure nº 2. Average test Lloureq: pretest y postest.

In the table 6 it is possible to see that significant differences do not exist in the explosive strength between the SJ and CMJ. Although, goalkeepers get down his performance in the acute postest with regard to the pretest only in the CMJ, in the SJ, the information does not descend. As for the test of agility Lloureq and his variants, in all tests produce statistically significant differences in the pretest and postest (Table 6).

Table 6. Significant differences between Tests.

	F	Sig.
CMJ	.118	.738
SJ	.411	.536
Lloureq	5.542	.040*
Lloureq with frontal blocking	9.023	.013*
Lloureq with flat blocking	13.634	.004*
Lloureq with lateral blocking	30.977	.000*
Lloureq with half-height blocking	63.712	.000*

* $p < .05$

Discussion

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The first thing to outlining is the scanty studies with which to be able to compare the results of this investigation. For it, it is necessary to continue increasing the knowledge on the physical specific condition of the goalkeeper of football in the stages of formation if it is tried to continue advancing in this field.

The average time which one was late in realizing the tour of the test Lloureq does not correspond with the one that appears in the article of Llopis, et al., (2010). This can be because the sample used in his article consists of professional goalkeepers with values of age, weight and height very different from the sample used in this study.

On the other hand, the variants used in this test are not reflected in any other article due to the fact that they are own modifications of a validated test: the test Llourez of Llopis et al., (2010).

As for the specific explosive strength of the goalkeepers in the CMJ test, our results do not coincide with the average values obtained in the study of García-Pinillos, Ruiz-Ariza and Latorre-Román (2015), with a similar sample as for age. Neither with the average results of the whole sample of his study, being in both cases our average results 4 centimeters for below, always speaking about the pretest. Though they show better results than in the study realized by Gravina et al., (2008) and Carrasco et al., (2015), with a sample of amateur football players, and of the study realized by Carrasco, Calahorro, Lara-Sánchez and Torres-Luque (2014), in this study there are people of infantile age. Finally, the obtained results are in agreement with the study realized by Romero, Fera, Sañudo, De Hoyo and Del Ojo (2014), though they are not it with the investigation realized by Benítez, Da Silva-Grigoletto, Muñoz, Morente and Guillén (2015), with young elite football players in both cases, not specifying the results for positions.

As for the results of the test SJ, they do not coincide with the investigations of Benitez et al., (2015) and Santiago, Granados, Quíntela and Yanci (2015) with minor results in our case.

The accomplishment of a program of training in which the sessions were passing with the employment of a ballast of 5 % of the corporal weight has produced decrease in the physical condition though they are not significant in the test CMJ and SJ, pretest and postest.. On the

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contrary, studies of strenght by means of the employment of the isoinercial system realized for the improvement of the vertical jump have not found significant differences (Romero, et al., 2014).

The employment of the ballasted vest in a session of aggressive character to value the functional loss of the subjects, also has taken in this study without being significant the differences between the pretest and posttest in the case of the explosive strength (SJ and CMJ). This information coincide with studies realized by means of the employment of a previous task of training with heavy loads, it has not found significant improvements (González, Machado, Navarro & Vilas-Boas, 2006; Romero, et al., 2014).

Nevertheless, does exist significant differences in the specific tests of agility realized, that it could be compare with any study that has realized a similar investigation or similar test.

Finally, it would be advisable that the results were confirmed in future investigations, taking a major sample size and with more studies to increase the knowledge in this area of action.

Conclusions

The extracted results have to take warily because they cannot be considered like relevant, needing any more studies that demonstrate the usefulness of the use that has the ballasted vest on the physical condition with acute effect of young goalkeepers of football and its incidence in the explosive strength and the agility, both general and specific of the goalkeeper with different technical and tactical worn out elements. Though, it might incorporate of form continued in the trainings of habitual form the ballasted vest to help in the specific improvement of the physical condition of the goalkeeper.

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