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Effects of Core Stability Training on shooting success and Jump in young basketball player –(A field study for the U13 basketball team)

آثر تدريبات تقوية الجدع على نجاح التسديد والارتقاء - (دراسة ميدانية للاعبي كرة السلة بقسنطينة صنف 13 سنة)

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Abstract: This research aims to identify the degree of involvement of core stability on the jump and the improvement of shooting success in young basketball players (u13). **Methods:** 30 players from the basketball team (U.S.C) Union Sportive Constantine. Who were divided into two experimental and control groups: age: 13.06 ± 0.85 years, height: 162.13 ± 6.51cm, weight: 57.26 ± 7.97kg), Two weeks were devoted to the tests (pre-tests), and (post-tests) .The investigations concerned the evaluation of the (vertical jump and horizontal jump) for the physical tests; and the shooting tests (1-2) to assess the success of the shots, and the ten-week period was devoted to the proposed program. **The results:** the proposed program had a significant impact on the horizontal jump of young players, since, and at the level of the success of the shots ($P < 0.05$) for the experimental group. The proposed program seems to greatly influence the performance of the players, which is particularly well transferred to the level of the effectiveness of the shots

Keywords: Core Stability -Shooting success -jump- basketball.

الملخص: يهدف هذا البحث للتعرف على درجة اشتراك التقوية العضلية للجدع في تحسين نجاح التسديد والارتقاء عند لاعبي كرة السلة (صنف 13 سنة). **إجراءات البحث:** أجريت هذه الدراسة على 30لاعبا من فريق كرة السلة USC (الاتحاد الرياضي القسنطيني) تمّ تقسيمهم إلى مجموعتين {ضابطة وتجريبية} (العمر 13.06 ± 0.85 سنة، الطول 162.13 ± 6.51 سم، الوزن 57.26 ± 7.97) مدة أسبوعين خصصت للاختبارات القبلية والبعدية حيث تم إجراء اختبارات القفز العمودي والقفز الأفقي واختبارات التسديد لتقييم فعالية التسديد، ومدة عشرة أسابيع خصصت لتطبيق البرنامج المقترح. **النتائج:** البرنامج التدريبي قد أحدث تطورا في الارتقاء الافقي حيث كان التطور معنويا ($P<0.05$). كما أظهر تحليل النتائج تطورًا معنويًا في نجاح التسديد ($p < 0,05$) وهذا ما أكد أن البرنامج أثر في مردودية اللاعبين.

- **الكلمات المفتاحية: -تقوية الجدع –نجاح التسديد-الارتقاء –كرة السلة**

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1- Introduction and problematic of the study:

Basketball is a very popular sport played all around the world. Professional basketball today has become a highly physical, high-contact sport. The play is characterized by intensive body contact, frequent intermittent running and jumping, demanding one-on-one situations, quick direction changes in combination with challenging technique, and coordination aspects like catching, throwing, passing, and dribbling .Most of the injuries in basketball involve the lower extremities **(Garbenytė-Apolinskienė, 2018).)** Basketball player cuts More than 6000 meters during official matches, and this distance varies between high intensity movements and explosive movements in the form of jumps ... more than 150 for each type of these movements **(Hichem, 2020)** The success of the team depends on continuous training and the mastering of basic skills by the players. (**Houdhifa Meddour, 2021)**

Vertical jump (VJ) is one of the most prevalent acts performed by basketball players. Jumping acts are part of various defensive (e.g., blocking, rebounding, and stealing) and offensive (e.g., passing, rebounding, and shooting) maneuvers performed by basketball players in practices and games. To improve the VJ ability of players, basketball coaches, strength, and conditioning coaches should devote a considerable amount of time to strength and conditioning programs focusing on jumping performance. It has already been established in the literature on methodology of training that basketball players should work on their jumping ability in both the preparation and competition phases of the annual training program **(Ziv, 2010).**

Shooting is the most important determinant in determining the score return and result of a match, gaining the upper hand and winning the game. The most used condition and technical features in basketball are strength and shooting Free throws are very important in competition, as they provide

numbers that are favorable for the team's score, that can be won without the opponent, and these numbers are considered to be won as a team. It has an important role in gaining superiority in a competition and winning the competition **(Şahiner, 2021).**

In the basketball, where many changes in body position are required, the transmission of force occurs through the core region in jumping shots or tourniquet shots. Also, it is indicated that muscle mass is important in sport branches requiring strength and power . Balance and postural control are also provided through the muscles in the core region **(Şahiner, 2021).**

The core is the center of the functional kinetic chain providing the proximal stability for the distal mobility and function of the limbs. The core district strength is an important prerequisite for the practice of many sports, such as football, basketball, athletics jumping disciplines and others, and to carry out some everyday activities such as walking, climbing stairs, keep **(Sannicandro, 2020).**

The lumbopelvic-hip complex has been referred to as the core, and it connects the upper and lower extremities. Specific core stability training (CST) has been evaluated in several studies related to low back pain and injury prevention. Core endurance with low loads, multiple repetition, isometric exercises, balance training, and isolated training of local muscle stabilizations of the lumbopelvic-hip complex has been used as training approach .However, using the same training approach among athletes to improve sport performance has resulted in contradictive results **(Saeterbakken, (2011).**

Several studies have looked at the links between core stability exercises and athletic performance. The conclusions are mixed; some studies conclude that these exercises are effective, in particular on throwing in handball women, on running time over 5000 m and more generally, on general sports

performance in university athletes. Others conclude on a non-significant improvement or on an ineffectiveness.

Stray-Pedersen, (2006) carried out a controlled study involving twenty-one soccer players, with the aim of evaluating the impact of muscle stabilization training in the lumbo-pelvic region, using an unstable surface (sling) on the speed of shoot the ball, without backswing. After eight weeks of training, the results show a clinical but statistically non-significant increase in shooting speed in the Intervention group.

Also **Butcher, (2007)** assessed the effects of core stabilization training on movement speed, as well as lower limb muscle strength. Fifty-five athletes were randomly assigned to one of four training groups: trunk stability (TS), leg strength (LS), trunk stability and leg strength (TL), and control (CO). Subjects were tested 3 times: at pre training, after 3 weeks of training, and after 9 weeks of training. A repeated-measures analysis of covariance (ANCOVA) was used to examine differences among groups for vertical takeoff velocity measured indirectly using a force plate. Pre training takeoff velocity and body mass were used as covariates. After 3 and 9 weeks, the training groups were not different from each other. After 9 weeks of training, all three training groups had a greater takeoff velocity than the control group ($P<.05$). After 3 weeks of training only the TS group had a greater takeoff velocity than the control group ($P<.05$). Only the TL group increased significantly in vertical takeoff velocity between the third- and ninth-week testing periods ($P<.05$). Nine weeks of trunk stability training was similarly effective in enhancing vertical takeoff velocity as leg strength training or the combination of trunk stability and leg strength training.

Nesser, (2008) observed the relationship between trunk stability and strength and power variables in soccer players. The results suggest that core stability is moderately related to sports performance. However, an increase in

core strength does not contribute significantly to an increase in peripheral limb strength and power.

GROSGEORGE, (2009) conducted an experiment on young players aged 10-11 who were trained using exercises centered on "sheathing the axis of the body ." Two groups of the same age group (10 -11 years) with very similar training conditions (3 hours per week), delivered to an experimental plan lasting 12 weeks during which an experimental group (A) fired twice as many shots as the control group (B). Group (A) doing sheathing instead of shooting.

Seven subjects in each group participated in the entire training program Groups A (experimental) and B (control) obtained very similar results in the physical pre-tests and in the shooting test .In the post test, the researchers noted a very significant improvement in performance. In relative gains, the experimental group (A) improved its performance by 26.9% in test 1, and by 76% in test 2, while the control group only slightly increased it in test 2.The introduction of these core stability exercises had a positive impact on the shooting and jumping performance of young boys aged 10-11.

The study of **Sannicandro I. &.,(2017)** describes the effects of an integrative training of core stability on jump performance in young basketball players. In total 44 young basketball players (19 female gender, 25 male gender, age7.07 ± 0.3yrs, height 114, 4 ± 4.3 cm weight 26.8 ± 2.7 kg) participated and were assigned to either an intervention(EG) or a control group (CG). The training program has had a duration of 4 weeks (8 sessions twice a week, for one hour); EG, besides the sports-specific exercises and introduced in the warm up 4 core exercises stability. The strength was evaluated through mono podalic and vertical jump. The results revealed that the 4-week core stability training program improved the left($p<0.05$) and right ($p<0.001$), hop test, the 6m timed hop left and right test ($p <0.0005$).The CG has obtained

statistically significant benefits only in the bipodalic vertical jump ($p<0.01$). The study confirms the need to introduce integrative core stability exercise, as well as the literature suggests. The study highlighted the functional relationships between core stability and jump performance in pre pubertal basketball players.

The study of **Sannicandro I. C., (2020)** aims to verify the effects of an integrative core stability training on jump and sprint performance in young basketball players. Young basketball players were involved in the study (n = 42, 16 female, 26 male) whose age, stature and weight were respectively (average ± ds) 8.22 ± 0.4 years, 118.2 ± 3.7 cm and 28.8 ± 4.9 kg and was randomly divided in Training Group (TG, n = 24, 10 F, 14 M) and Control Group (CG, n = 18, 6 F, 12 M). The training program was monitored for 4 weeks (8 sessions, twice a week and lasting 1 hour each during the usual sports activity; in addition to the usual technical and sport-specific exercises, the TG introduced only 4 core stability exercises in the warm-up). The results revealed a change in test scores across ,the two time periods for TG in the left limb Side hop, ($p < 0.026$) in the right limb side hop ($p < 0.001$), in the left limb 6 meter timed hop ($p < 0.0005$) , in the right limb 6 meter timed hop ($p < 0.0005$), in the vertical jump,($p < 0.002$), in the 10 meters sprint ($p < 0.0005$) and in the 10 × 5 meters test ($p < 0.001$) . The CG highlighted differences statistically significant only in the 10 meters sprint ($p < 0.05$). The study confirms the need to hypothesize in youth sport supplementary sessions intended for strength training, as the literature has already suggested for several years.

More young athletes are becoming professionals at a younger age **(Garbenytė-Apolinskienė, 2018)**.Young basketball players are the future of basketball.... therefore, we must pay attention to the training of players only rarely and only recently the specific core stability program effects have been investigated in youth basketball **(Sannicandro, 2017).**

So far, the literature has mainly focused on describing the effectiveness of core stability exercises in athletic subjects or in physically inactive adults, with particular reference to low back pain and performance.

In addition, it would be very interesting to understand the following questions:

Does core stability Training have an effect on improving jumping and shooting success for young basketball players (12-14) years old?

Sub - questions:

-Does a weak core play a role in efficiently transmitting leg power and maintaining dynamic balance during jump?

-Does a weak core play a role in efficiently transmitting leg power and maintaining dynamic balance during shooting?

2- Hypotheses:

Core stability Training improves jumps and shots success in young basketball players.

2-1Sub- hypotheses:

-There are statistically significant differences between the pre and post measurement in the jump and shooting tests of the control l group.

-There are statistically significant differences between the pre and post measurement in the jump and shooting tests of the experimental group.

- There are statistically significant differences between the control and experimental group in the post measurements in the jump and shooting tests in favor of the experimental group.

3-The main objectives of our research: Determine the impact of Core stability Training on the effectiveness of shooting and jumping in young basketball players. . In addition, highlight the influence of targeted muscle strengthening

(sheathing) on improving the efficiency of shooting the jump in young basketball players.

4-The importance of the study: In the sports world, such a study is of undeniable interest in sports practice. The information obtained can serve as a reference for the management, methodological orientation and control of training in young basketball players.

5-Research methodology

-5-1 Research method: The researcher used the experimental method with two equal groups in order to suit it to solve the research problem because 'the most important characteristic of accurate scientific activity is the use of experiment method'.

5-2- Participants: This study was conducted on a basketball team (U.S.C) Union Sportive Constantine. The average age of the young basketball players subjected to this research was between 12 and 14 years old, with experience of practicing this discipline of the order of two years.

On the preparation side, these young basketball players did three training sessions per week of an hour and a half, in addition to the competition.

The sample was divided into 2 groups, the experimental group, "15" players, and the control group, "15" players.

5-3-Materials: To assess explosive strength have been used sargent jump test and Horizontal Jump Tests **(Aurélien & BOLLET Olivier, 2012)** .To assess efficiency shots have been used ; Shot 1" test : 15 shots, dribble start from the 3-point line, 2 dribbles and stop on the front edge of the limiting key **(GROSGEORGE, 2009.).**Shot 2: 10 shots, the rebounder counts the number of free throws scored on ten attempts, **(PIEPENBRING, 2009).**

5-4The reliability and validity of the tests: The reliability coefficient of the tests used was calculated by applying and re-applying them (Test-Retest), with a

time difference of one week from the date of making the first application on a sample of (5) players from the experimental group and the control group to find the correlation coefficient between the first and second applications, as well as finding self-honesty. This is on the same sample and under the same conditions, and they were subsequently excluded from the pilot study.

5-5-Training Procedures: The training program was monitored for 4 weeks, with 8 sessions (biweekly, 1 hour each); EG followed the drills basketball and techniques introduced in the initial warm up core stability exercises (Table 1).

Weeke	**S1**	**S2**	**S 3**	**S4**	**S 5**
experimental	**Pre-test**	**training**	**training**	**Training**	**training**
control	**Pre-test**	**Basketball drills**	**Basketball drills**	**Basketball drills**	**Basketball drills**
Weeke	**S6**	**S7**	**S8**	**S9**	**S10**
experimental	**training**	**training**	**training**	**Training**	**Post test**
control	**Basketball drills**	**Basketball drills**	**Basketball drills**	**Basketball drills**	**Evaluation Post test**

5-6-Procedure: The training program was monitored for 8 weeks (January 2016-march 2016, with 16 sessions twice a week during the usual sports

activity; in addition to the usual technical and sport-specific exercises, the TG introduced four core stability exercises in the initial warm-up (Table2).

Table 2: training group core stability.

Core stability program	core stability training
Frontal Bridges(A:short bridges; B: long bridges)	15''-15'' 20''-20'' 4rip
Back Bridges(A:short bridges; B: long bridges)	15''-15'' 20''-20'' 4rip
Side Plank(A:short bridges; B: long bridges)	15''-15'' 20''-20'' 4rip
Bird Dogs A: three-point position with an elevated leg; B:two-point bird-dog position with elevated contralateral leg and arm	15''-15'' 20''-20'' 4rip

5-7-Descriptive statistics

Skewness and (M ± SD) were calculated for all assessed variables; Student's paired and t-test unpaired was used to verify the existence of statistically significant differences between the average values obtained. The significance was set at p.

6-Presentation, discussion and analysis of results:

6-1-presentation of the results of homogeneity in the average age, height and weight of the two groups are presented in the table below:

Table3: analysis of the results of homogeneity in the average age, height and weight of the two groups

Axe / Variables	the group	N	Arithmetic mean	standard deviation	Mediator	S k
Age (Years)	experimental	15	13.06	±0.85	13	0.79
	control	15	13	±0.86	13	
Weight (Kg)	experimental	15	57.26	±7.97	56	0.84
	control	15	56.13	±9.89	55	
Length (cm)	Experimental	15	162.13	±6.51	160	0.42
	control	15	160	±6.86	159	

The table3 above shows that the torsion coefficient(skewness)values for age, height, weight.

6-2presentation and analysis of the equality between the pre-tests of the two groups (experimental and control) for the physical tests and technical tests of the shots:

The table4: represents the equality between the pre-tests of the two groups (experimental and control) for the physical tests and technical tests of the shots.

Axe / Variables	the group	N	Arithmetic mean	standard deviation	value of "t".	Signification
Vertical jump	experimental	15	29,86	±10.86	0.16	NS
	control	15	29	±16.74		NS
Horizontal jump	experimental	15	155 ,66	±24.38	0.57	NS
	control	15	157	±23.49		NS
Shooting Test 1 (point)	experimental	15	4.86	±1.18	-0.31	NS
	control	15	4.73	±1.16		NS
Shooting Test 2 (point)	experimental	15	3	±1.06	-0.18	NS
	control	15	2.93	±0.88		NS

The scheduled value of t is equal to 2.04 at the significance level 0.05 and the degree of freedom 28.

The table represents the results of the physical tests (vertical jump horizontal jump) of the pre-tests of the control and experimental groups T, calculated not significant ($p < 0.05$). Therefore, there is equality between the two groups in the physical pre-tests. The results of the shooting pre-tests (1 and 2) of the control and experimental groups demonstrated that the calculated T values are not

significant, p < 0.05; they are lower than the table T (2.04), so there is a tie between the two groups.

6-3Results of the pre and post-tests of the control group:

Table5: represents paired (T) test results for the pre and post physical tests and technical tests l tests of the control group.

Axe / Variables	Pre test		Post test		value of "t".	Signification
	mean	standard deviation	mean	standard deviation		
Vertical Jump	29 cm	±16.74	30.86	±16.44	-0,30	NS
Horizontal Jump	157 cm	±23.49	160.06	±23.46	0,29	NS
Shooting Test 1	4.73	±1.16	4.60	±0.82	0,61	NS
Shooting Test 2	2.93	±0.88	3	±0.76	2,25	S

The scheduled value of t is equal to 2.14 at the significance level 0.05 and the degree of freedom 14.

The analysis of the results of the physical tests (vertical jump, horizontal jump) shows no statistically significant change between the two measurements pre-test and post-test of the control group which followed a normal training since the values of T calculated are lower at the T table .

6-4Results of the pre and post-tests of the experimantal group:

Table6: represents paired (T) test results for the pre and post physical and technical tests of the experimantal group

Axe / Variables	Pre test		Post test		value of "t".	Signification
	mean	standard deviation	mean	standard deviation		
Vertical jump	29,86	±10,68	33,26	±13,39	0,76	NS
Horizontal Jump	155,66	±24,38	171,11	±25,06	2,80	S
Shooting Test 1	4,86	±1,18	6,13	±1.50	±-6,97	S
Shooting Test 2	3	±1,06	4.45	±1,18	±-11,00	S

The scheduled value of t is equal to 2.14 at the significance level 0.05 and the degree of freedom 14.

The analysis of the results of the physical test (vertical jump) show no significant change between the two measures pre-test and post-test of the experimental

group which followed the program, since the values of t calculated (; 0.76) are lower than those of the table (2.14). .(For the horizontal jump test, the analysis of the results shows a significant improvement.

6-5Results of the physical and technical post-tests of the control and experimental groups:

Table7: represents the Test (T) at two independent groups at the physical and technical post-tests of the control and experimental groups

Axe / Variables	Post test control		Post test Experimantal		value of "t".	Signification
	mean	standard deviation	mean	standard deviation		
Vertical jump	30.86	±16.44	33,26 c	±13,39	-0,43	NS
Horizontal Jump	160.06	±23.46	171,11	±25,06	-1,62	NS
Shooting Test 1	4	±0.82	6,13	±1,50	3,45	S
Shooting Test 2	3	±0.76	4,45	±1.18	3,59	S

The scheduled value of t is equal to 2.04 at the significance level 0.05 and the degree of freedom28.

The analysis of the results of the post-test physical (horizontal jump, vertical jump) of the experimental and control groups show no significant improvement, the values of T calculated (0.52; 0.43; -1.62) are lower than those of t table (2.04). The analysis of the results of the shooting post-tests (1 and 2) of the experimental and control groups shows a significant improvement in favor of the post-test of the experimental group since the values of T calculated (3.45; 3.59) are higher than those of t board (2.04).

6-7 success gains in shooting tests (1 and 2) of the control and experimental groups:

Table8: Represents success gains in shooting tests (1 and 2)

Shooting Test1	**Pre-test**	**Post-test**	**Gains**	**Differential**
Control group	**31,55%**	**30,66%**	**-0,89%**	**9,37 %**
Experimantal group	**32,40%**	**40,88%**	**8,48%**	
Shooting Test	**pré-test**	**post-test**	**Gain**	**Differential**
Control group	**19,55%**	**21,33%**	**1,78%**	**7,99%**
Experimantal group	**20%**	**29,77%**	**9,77%**	

For the shootings tests (1 and 2), if we scale the success gains back to the initial success, we see a very significant improvement in performance for the experimental group.

In relative gains, the experimental group improved its performance by 32% to 40% in test 1; and from 20% to 29.77% in test 2, while the control group increased it only very slightly (31.55% to 30.66% in test 1; and from 19.55% to 21.33 % in test 2).

7-Discussion of results:

The progress of basketball and the high level of physical and skill performance requires the coach to work continuously in order to develop the players in all aspects, physical, skill and tactical, based on the correct methodological and scientific foundations to reach the highest levels. **(Mouna, 2022)**.The purpose of this study was to determine the effects of training in core stability to improvement of the success of shooting and jump in young basketball players aged (12-14) years. The integrated core stability program was introduced in Warm-up period of each lesson and has provided a difficulty and an intensity increase, from tasks performed on the ground.

First, it should be noted that the subjects of the two groups felt a general improvement in the jump tests. The gains of the control group (vertical jump: 1.86 cm), and (horizontal jump for 3,06cm), the experimental group (vertical jump 3.4 cm), and (horizontal jump 15.45 cm) .The introduction of core stability exercises had a very significant impact on the horizontal jump of the latter.

The core stability solicit the various muscles of the trunk, and the horizontal jump test, measures the explosive force, the main muscles mobilized are: the glutes, thighs, calves and deep trunk muscles, which explains the improvements in the average horizontal jump of the experimental group**. (ABDELLAH, 2022)** says that according to "Panariello" during the competition, the player who jumps higher and moves faster has a clear advantage over the opponent.

The results of this study are consistent and in line with similar studies that have described the effects of the core stability in horizontal jump performance in

young **(GROSGEORGE, 2009.) (Granacher, 2014) (Sannicandro I. &., 2017) (Sannicandro I. C., 2020)**

Data analysis showed that a significant improvement was observed in shooting efficiency in the experimental group. The proposed program seems to have a huge influence on player performance. The earnings differential between the two groups for shot5 (1) is 9.46% and 7.99% for shot (2). In addition, according to **(Abd elmadjid Djoubri, 2021)** shooting activities. It requires a high level in many aspects, the most important of which are physical fitness, skill and psychological performance. Training is the main principle in improving your shooting skill **(houssem, 2020)** .We can think that the consolidation caused by an improvement in the cladding was particularly well transferred to the level of the effectiveness of the shots. Our results agree with the results of the work **(Stray-Pedersen, 2006); (GROSGEORGE, 2009.) (CHUGRITHAI, 2020) and (Saeterbakken, 2011).**which have shown that core stability training has a positive impact on player performance.

Conclusion

Core stability training s can significantly improve abdominal muscles and leg muscles; therefore, an important improvement can be obtained in jump tests and shooting tests. One of the most important factors in jumping and shooting is good core stabilization, which is influenced by the strength of the muscles between the chest and pelvis. This is the main reason to plan depending on the movements that are made during the throwing and jumping of the Exercises whose priority would be the activation of the abdomen and its maintenance during the movement from squat to extension, as occurs during throwing and jumping.

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