A N A L E L E

UNIVERSITĂŢII DIN ORADEA

FASCICULA

EDUCAŢIE FIZICĂ ŞI SPORT

EDITURA UNIVERSITĂŢII DIN ORADEA

2021

Editorial Office Address:
University of Oradea, Department of Physical Education, Sport and Physical Therapy
1 Universităţii Street, 410087 Oradea, Romania
http://www.fefsoradea.ro/Fascicula_Educatie_Fizica_si_Sport/index.html,
e-mail: journal@fefsoradea.ro

I. S. S. N. 1224 – 510

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Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev.noXXXI **/2021** pp.3-10
Article no31101-865.

Optimizing the aerobic performance of junior football players through small-sided football games training

Sîrbu Marius[1]
Babeş-Bolyai University Cluj-Napoca, Faculty of Physical Education and Sport, Doctoral School
e-mail: sîrbumarius28@gmail.com
Hanţiu Iacob
Babeş-Bolyai University Cluj-Napoca, Faculty of Physical Education and Sport, Doctoral School
email: iacobhantiu@gmail.com

Abstract: Training with small-sided games proved to be effective in the training of football players. The purpose of this study was to analyze whether participation in a training programme with small-sided football games resulted in the development of the aerobic capacity. The subjects of this study were 40 16-18-year-old athletes divided into two equal groups: experiment group (GE) and control group (GC). Both groups participated in training programmes from 6.07.2020 to 27.11.2020 – GE in a small-sided football training programme; GC in a classic exercise training programme. The following equipment was used: Hosand GTa – to measure HR – and the WittyGateMicrogate2 system for timing of the samples taken. Subjects took the YIRTL1 sample. The data collected was processed with the SPSS programme, variant 23. In the YIRTL field trial there were no significant differences in the initial testing (IT) between the two groups, but in the final testing (FT) the differences were significant. Thus, at FT the difference between the score means of the two groups was significant both for the covered distance parametre ($U = 4{,}00$, $N_1 = 20$, $N_2 = 20$, two-tailed $p = {,}000$, $d = 3{,}35$) and for the parametre indicating the hold time in the aerobic zones <81%FCmax ($U = 82{,}50$, $N_1 = 20$, $N_2 = 20$, two-tailed $p = {,}001$, $d = 1{,}21$). The study revealed that the aerobic capacity developed by implementing a small-sided football games training programme for 21 weeks.

Keywords: aerobic capacity, heart rate, small-sided-games, football

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Introduction

Recent studies, conducted on football teams, show that small-sided games are an effective strategy for developing specific physical qualities and physical skills in football (Chaouachi et al., 2014; Young & Rogers, 2014).

The optimization of sports performance in football involves the development of the technical, tactical as well as the psychological characteristics and the physical ones (Laursen & Buchheit, 2019, p. 547; Stolen, Chamari, Castagna, & Wisloff, 2005; Turner & Stewart, 2014). While in the past small-sided games were used mainly to develop technical-tactical skills, today such exercises are standardized in the training aimed at developing aerobic resistance (Balsom, Lindholm, Nilsson, & Ekblom, 1999; Drust, Reilly, & Cable, 2000; Reilly & Gilbourne, 2003).

[1] sîrbumarius28@gmail.com

The small-sided games method used in football training produces positive effects both in developing capacity and aerobic power and in developing technical-tactical skills (Gabbett, 2006; Girard, Mendez-Villanueva, & Bishop, 2011; Impellizzeri et al., 2006). According to the authors Castagna, Impellizzeri, Chamari, Carlomagno, & Rampinini (2006), Chamari (2005), Hill-Haas, Dawson, Impellizzeri, & Coutts (2011) and McMillan (2005) achieving sporting performance requires training physical qualities such as aerobic resistance, using appropriate means.

The meta-analysis results of Hammami, Gabbett, Slimani, & Bouhlel (2017) show the higher efficiency of small-sided football training compared to training including classic exercises when it comes to developing the athletes' aerobic capacity. Other studies show that the functional recovery potential of the sportspersons' body, during repeated high intensity efforts, is correlated with their aerobic performance (Castagna, Impellizzeri, Rampinini, D'Ottavio, & Manzi, 2008; Tomlin & Wenger, 2001).

THE PURPOSE OF THIS STUDY

The aim of this study was to investigate the effect of the participation of 16-18-year-old junior football players in a training programme with small-sided football games on their aerobic capacity.

HYPOTHESIS

Subject participation in a training programme with small-sided football games will produce improvements in aerobic capacity compared to subjects who are doing classically trained workouts.

MATERIALS AND METHODS

Research protocol

The period and place of the research

The research was carried out from 06.07.2020 to 27.11.2020 at the multifunctional base of the sports complex at the Stadium in Deva.

Subjects and lots

The sample included in the study consisted of 40 sports pupils aged 16-18, divided into two groups of 20 subjects – experiment group (EG) and control group (CG) – all component subjects of the same sports club. They participated in a programme of 5 workouts per week. For the EG athletes, 3 of the 5 weekly training lessons included small-sided football games, and for the CG athletes the training programme contained classic training means. All subjects and their parents have given their written consent to participation in the study, and the medical protocol for outdoor sports activities has been followed. Participation in research was voluntary.

Equipment used and tests carried out

The subjects performed the initial test, Yo Yo Intermitent Level 1 (Bangsbo et al., 2008; Bangsbo, 2008, pp. 103-106), both for the assessment of aerobic capacity and for the measurement of FCmax in order to delimit the specific effort zones of each sport. The aerobic capacity has been assessed both in terms of the distance sportsmen run in the YYIRTL1 (Bangsbo et al., 2008; Castagna et al., 2009) and their possibilities to maintain themselves, as much as possible, in the aerobic effort zones <81%FCmax.

To drive training intensity, heart rate was monitored using the Hosand GTa system. In the initial and final tests, the YYIRTL1 sample, the WittyGateMicrogate2 electronic timing system was used.

The intervention programme

The microcycles of training included 4 weekly workouts and a bilateral game at the weekend. Due to the situation caused by SARS COV, official competitions being stopped for the

competitional season 2020-2021, friendly games were planned at the end of weekly microcycles to model the training programme according to the specific content of each training stage. The training was between 60 and 110 minutes, structured according to the training period specific objectives as follows:

Structure of the weekly microcycle used by EG, specific training for the preparation period:

Monday - 2 small-sided football games for aerobic capacity development (5vs5/6vs6 - 50%/60% FCmax) and 2 games for aerobic power development (3vs3/3vs3+1 - 70%/80% FCmax); Wednesday - 2 small-sided football games for aerobic capacity development (4vs4/5vs5 - 65%FCmax) and 2 small sided football games for developing lactacide anaerobic capacity (2vs2/3vs3 >80%FCmax); Friday - 1 small-sided football game to develop aerobic capacity (6vs6+2Gk - 60%FCmax) and 2 small sided games for developing alactacide anaerobic capacity (1vs1 - 90%FCmax).

Structure of the weekly microcycle used by EG, specific training for the competitive period:

Monday - 3 small-sided football games for aerobic capacity development (5vs5/6vs6 - 50%/60% FCmax) and 1 game for aerobic power development (3vs3/3vs3+1 - 70%/80% FCmax); Wednesday - 1 small-sided football game for aerobic capacity development (4vs4/5vs5 - 65%FCmax) and 2 small-sided football games for developing lactacide anaerobic capacity (2vs2/3vs3 >80%FCmax); Friday - 1 small-sided football game to develop aerobic capacity (6vs6+2Gk - 60%FCmax) and 3 small-sided games for developing alactacide anaerobic capacity (1vsGk - 90%FCmax).

CG subjects attended a training programme with classic exercises during this period. In both groups, the weekly cycle also included technical-tactical training on Tuesday, with an intensity of 50-60% of FCmax. Both groups had theoretical lessons included in the weekly programme on Thursdays.

Small-sided football games were selected, streamlined and standardized to cover all areas of effort, aerobic, anaerobic and mixed. In the standardization of small-sided football games, the same structuring rules were established: the topic approached according to the moments of the game, the size of the field, the number of players, the number of touches, the gates, the size and position of the gates, the half/break ratio, the number of repetitions, the presence or absence of goalkeepers, numerical inferiority and numerical superiority. By monitoring the intensity of the exercises measuring HR, the content was correlated with the area of effort proposed to be achieved: 2vs2, 3vs3, 4vs4 (with/without goalkeepers, support players), time between 1 and 3 minutes with a rate of 2:1 half/break for anaerobic lactacide effort; 4vs4, 5vs5, 6vs6 (with/without goalkeepers or support players) between 3 and 6 minutes with a 1:1 rate for the aerobic effort (Figure 1); 1vs1 (with/without goalkeepers) between 8-10 seconds with a rate of 1:2 for alactacid anaerobic effort.

Statistical processing

The analysis and interpretation of the results were carried out using the SPSS programme, version 23.0, with the materiality threshold $p < 0.05$ applied. The Shapiro Wilk test was used in the analysis of data distribution normality and parametric or non-parametric tests were used to compare the results obtained by subjects in the two groups depending on the distribution of the data. The size of the effect was also calculated (Cohen, 1988).

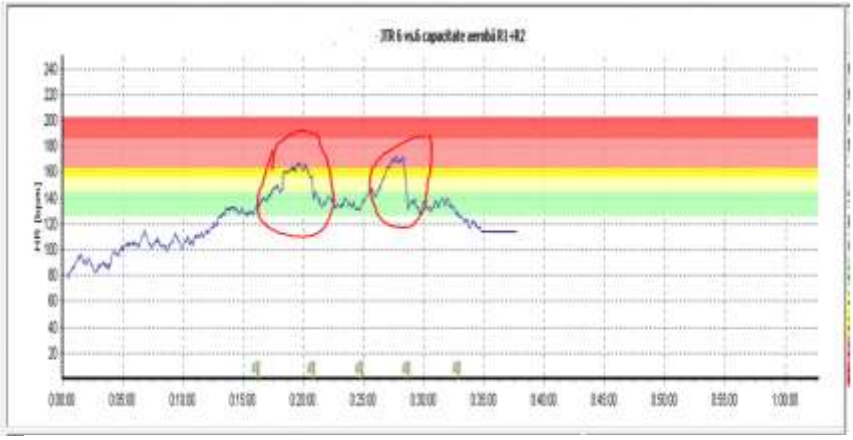

Figure 1. Heart rate monitoring small-sided football game for aerobic capacity development,6vs6

RESULTS

From the analysis of data distribution and interpretation of the Shapiro-Wilk test for YYIRTL1 sample, it was found that in the initial test (IT) the data were not normally distributed at the distance parametre at both EG (p = ,033) and CG (p =,019). At the parametre indicating the hold time in aerobic areas <81%FCmax, the data have been distributed normally for both EG (p = ,218) and CG (p = ,104). Regarding the final test (FT), the distribution was normal for the experimental group (EG) at the distance parametre (p =,179) and the parametre showing the holding time in aerobic areas <81%FCmax (p = ,408); it was not normal for control group on any of the two measured parametre, distance (p =,034), maintaining aerobic range <81%FCmax (p = ,011). Therefore, parametric tests (independent t-test and paired sample t-test) were used for comparison of the media when the data were normally distributed and not parametric (Mann-Witney U or Wilcoxon) when the data were not normally distributed. The size of the effect has also been calculated (Cohen, 1988).

The Mann Whitney U test shows that in the initial test the difference between the two groups' means at the distance parametre is not statistically significant (U = 145,000, N_1 = 20, N_2 = 20, two-tailed p = ,142, d =,26), the groups being homogeneous (Table 1).

To compare the means recorded by the two groups to the parametre indicating the holding time in aerobic areas <81%FCmax, the t-test for independent samples has been used, which shows that the difference between the means of the two groups is not statistically significant, with the groups being also at this parametre of the homogeneous YYIRTL1 sample (t = -450, df = 38, two-tailed p = ,655, d =,13) (Table 1).

Table 1. Comparison of means and effect size, YYIRTL1 sample, distance and OnZonaAe 81%FCmax prior to the intervention programme (N = 40)

Variable	Group	Mean	AS	ES	Test statistics			
					t/U*	df.	Sig.	Cohen d
Distance	EG (20)	992	108,26	24,21	145,00*	38	,131	,26
	CG (20)	1018	83,57	18,68				
OnZonaAe <81%FCmax	EG (20)	5,16	,72	,16	,450	38	,655	,13
	CG (20)	5,06	,79	,17				

Note: EG – experimental group; CG – control group; OnZonaAe – holding time in aerobic effort zones.

After the completion of the intervention programme, the measurements for the sample under investigation were repeated and the results are also analyzed statistically (Table 2). The

difference between the scores means of the two groups was significant both for the YYIRTL1 sample distance parametre (U = 4,000, N_1 = 20, N_2 = 20, two-tailed p = ,000, d = 3,35) and for the parametre indicating the hold time in aerobic areas <81%FCmax (U = 82,500, N_1 = 20, N_2 = 20, two-tailed p =,001, d = 1,21).

Table 2. Comparison of means and effect size, YYIRTL1 sample, distance and OnZona Ae <81%FCmax - at the end of the intervention programme (N = 40)

	Dist. TF YYIRTL1	OnZonaAe <81%FCmax
Mann-Whitney U	4,000	82,500
Z	-5,337	-3,179
Asymp. Sig. (2-tailed)	,000	,001
Cohen d	3,35	1,21

Note: FCmax – maximum heart rate; OnzonaAe – holding time in aerobic effort zones.

For the analysis of the effect of intervention programmes on the subjects in the two groups, the means recorded by the subjects at the two points of the study were compared, using tests according to the data distribution. Thus, the Wilcoxon test (Table 3) shows that in the test group the differences between the results obtained are significant for the distance variable (Z = -3,926, two-tailed p = ,000086, d = 4,19). The same test shows that, for the control group, the differences between the mean results obtained by the subjects at the two study points are statistically significant for the distance variable (Z = -3,250, two-tailed p = ,001, d = 1,49).

Table 3. Comparison of the means and effect size of the YYIRTL1 sample, distance variable and OnZone Ae<81%FCmax, in the experiment and control groups, before and after the intervention programme (N = 40)

			Paired Samples Statistics		Paired Samples Test[a, b]			
Pair	Time	Variable	Mean	Std Deviation	t[a]\Z[b]	df	p	d
Pair 1 EG	TI	distance	992	108,269	-3,926[b]	19	,000	4,19
	TF	distance	1418	93,110				
Pair 2 CG	TI	distance	1018	83,578	-3,250[b]	19	,001	1,49
	TF	distance	1136	73,870				
Pair 3 EG	TI	OnZonaAe<81%FCmax	5,1685	,72575	-6,222[a]	19	,000	2,03
	TF	OnZonaAe<81%FCmax	6,8055	,87143				
Pair 4 CG	TI	OnZonaAe<81%FCmax	5,0605	,79083	-2,221[b]	19	,026	,75
	TF	OnZonaAe<81%FCmax	5,7110	,92811				

Note: a. t-test; b. Wilcoxon Signed Ranks Test; IT – initial test; FT – final test; EG- experimental group; CG - control group; OnZonaAe – holding time in aerobic effort zones.

According to the paired samples t-test (Table 3), at the experimental group the differences are significant for the variable indicating the holding time in aerobic areas <81%FCmax (t = -6,222, df = 19, p = ,000006, d = 2,03). The Wilcoxon test was used when comparing the control group means (Table 3) and the differences were also significant in this group (Z = -2,221, two tailed p = ,026, d = ,75).

DISCUSSIONS

As regards our study, the analysis of the data from the YYIRTL1 trial shows that significant progress has been made in the experiment group compared to the control group. Significant progress was also observed between the initial testing and the final one at the level of the experiment group, showing that the training programme with small-sided football games has

been effective.

The results obtained by the two groups do not show significant statistical differences in any of the parametres measured by the YYIRTL1 sample at IT moment, which shows that subjects in both groups had a close level of physical preparation as evidenced by the YYIRTL1 field trial.

Unlike IT, the results achieved at the FT for the same sample show significant differences in EG's favour, which shows that small-sided games football training over 21 weeks improves aerobic capacity.

From the analysis of the results obtained by the two groups, we can see significant differences between IT and FT in both groups and these data indicate that traditional exercise training also produces effects on the development of the aerobic potential of athletes. However, compared to the performance of CG athletes, the results of EG athletes are higher. Thus, for the variable that represents the distance run in the aerobic effort zone at YYIRTL, the athletes in EG achieve a higher performance of 426 metres in the FT in comparison with IT, unlike CG where the difference is only 118 metres. Just like in our research, a study by the Hill-Hass, Rowsell, Dawson, & Coutts (2009) shows, through the results obtained, significant improvements of the YYIRTL1 test parametres. The data of this study indicate, after 7 weeks of small-sided games training in the preparatory period, a significant improvement in the YYIRTL1 sample distance. On the other hand, there were no significant statistical differences between the YYIRTL1 distance results, between the group that followed the small-sided games training programme and the group that followed the classical exercise training programme (Hil-Hass et al., 2009).

With regard to the possibility for athletes to maintain the duration in the area of aerobic effort, the difference between the time obtained in the initial test and in the final one was 2 minutes and 4 seconds for EG, unlike CG athletes who have improved their ability to maintain themselves in their aerobic zone by just 1 minute and 5 seconds.

Similar results were also obtained in a study carried out at the level of groups of juniors, girls and boys, in handball (Buchheit et al., 2009). The 10-week study demonstrated that small-sided games used in handball training at intensities of 86,8%FCmax produce significant improvements in both aerobic performance and aerobic maximum power.

Three studies, carried out during the preparatory period in football, have demonstrated significant improvements in the aerobic performance as a result of the implementation of small-sided games in the training programmes (Impellizzeri et al., 2006; Hill-Hass et al., 2009; Radmziminski, Rompa, Barnat, Dargiewicz, & Jastrzebski, 2009). These studies used, in the methodology of the conduct, a comparison of the results of training with small-sided football games and those obtained from traditional practice exercises.

The results obtained in the studies submitted are corroborated with the review carried out by Halouani, Chtourou, Gabbett, Chaouachi, & Chamari, (2014), on small-sided games in sport training. This analysis shows that small-sided games used in football training at higher intensity stimulate cardiovascular functionality, subsequently influencing the body’s adaptation to effort and improving aerobic capabilities.

As far as the evaluation sample selected for this experiment is concerned, Krustrup et al. (2003) have investigated the physiological responses of elite footballers from the YYIRTL1 field sample. Their results highlight the strong correlation between aerobic capacity and sporting performance, especially in relation to distance run during a football game, as shown in the study by Castagna, Impellizzeri, Cecchini, Rampinini, & Alvarez (2009).

According to data from Bangsbo, Iaia, & Krustrup (2008), the distances taken by athletes in the YYIRTL1 test were directly proportional to their aerobic possibilities, as the test is an effective means of determining the specific resistance of footballers, depending on age or football position held (Markovic & Mikulic, 2011).

Another study, conducted in handball during the competitional season, shows that after 10 weeks of small-sided games training, significant improvements in aerobic capacity were achieved, represented by the total distance run in the YYIRTL1 test (Iacono, Eliakim, & Meckel, 2015).

CONCLUSIONS

The analysis of the results of this experiment leads us to the following conclusions: A 21-week training programme, including small-sided football games, significantly improves the aerobic capacity of 16-18-year-old footballers.

By standardizing and by constantly managing the means selected in the intervention programme, as the sport body adapts to the stress stimuli initially planned, the concerned effort zone can be influenced.

The results obtained by the two groups show significant statistical differences between IT and FT times, which shows that both methods improve aerobic capacity after 21 weeks of training.

After the completion of the intervention programme, the difference between the score means of the two groups was statistically significant, and the effect was great, demonstrating that small-sided football games training can be more effective in developing the aerobic performance of athletes compared to the training containing classic exercises.

Acknowledgements

The present research paper is part of a larger research that investigates the concept of small-sided games and the possibilities to improve aerobic capacity through football training with small-sided games. All authors have equally contributed to the elaboration of the research design, data collection and writing of the research paper.

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Submitted:	Revised:	Accepted and published online
July 11 2021	October 15, 2021	October 22, 2021

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. noXXXI /**2021** pp.11-18.
Article no.31102-866.

IMPORTANT ASPECTS OF ATTACK ACTIONS IN BEACH VOLLEYBALL

Gabriel Alexandru PETROVICI *
University "1 December 1918" Alba Iulia, Faculty of Law and Social Sciences, Department of Physical Education and Sport, Adress: Str. Gabriel Bethlen, No. 5, Alba Iulia, C.P. 510009, Romania
Corresponding author: ducu_petrovici@yahoo.com

Zoltan KOVACS
Sports High School "Bihorul" Oradea, Adress: Calea Matei Basarab, Oradea, C.P. 410095, Romania,
email: zollea@yahoo.com

Abstract: The game of beach volleyball has developed over the past years to become more spectacular with game actions that can leave the audience speechless, explosive players, attack and defense actions that can capture the attention of spectators for a long time. Spiking is a fundamental skill in both indoor and beach volleyball, being appreciated by the public as one of the most spectacular moves in beach volleyball, but also is appreciated by coaches as the most efficient modality of obtaining points. The present paper tries to identify the essential aspects of attacking actions: entering the attacking position, anticipating the setting and adapting to it, detachment step for attack, the arms swing, the heel-toe-finger movement, the "bow and arrow" attack movement.

Key words: beach volleyball, attack actions, phases of the attack in beach volleyball.

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INTRODUCTION

Spiking is a fundamental action in volleyball, both beach and indoor, which generates the most intense and pleasant feelings experienced by a volleyball player. We can consider the attack as the culmination of the entire volleyball game system that encompasses all the defining motor qualities for a volleyball player. According to Zhang (2000), not all actions have the same effect on the game. Service, attack, and blocking allow the team to score directly while receiving, setting and diving follow other technical actions.

However, we must be aware of an essential aspect: although the spiker desperately wants to finish the rally by sending the ball with power into the opponent's court, this is closely related to how the setter manages to put in the situation to attack the ball. There are, of course, situations in which the attacker, out of a desire to complete a spike, spectacularly makes mistakes and offers the opponents point (he is blocked by the opposing player, sends the ball into the net or off the court), often because reception from his teammate was not a perfect one for a killing attack. However, the following must be very well aware: no matter how difficult the teammate's set for the attack was, it is never his fault that the spiker completely missed the attack.

* Gabriel Alexandru Petrovici

In beach volleyball, the spiking ability is often used as a fundamental offensive tactic. This technique must be used skillfully to obtain the maximum possible points (Mesquita, Moreno & Teixeira, 2003; Mesquita & Teixeira, 2004, Lacerda & Mesquita, 2003). In this context, players use their ability to spike in their attack tactics based on the space discovered in the opponent's court (Kiraly, 2000). In beach volleyball is also an important psychological factor; sports psychology is a branch that applies psychological concepts to sports or exercise. These values are often used to improve efficiency. The sport psychologist is interested in helping every sport participant reach his or her potential as an athlete (Sopa, 2021, Popa et al., 2020).

It is the duty and obligation of the spiker to adapt to a not precisely perfect setting of his teammate. If the setting was too far outside, the attacker moved too fast towards the net. If the setting was too low or too high, it means that the attacking player did not follow the rule of the three attack steps (approach step, directional step, and double beating to get off the sand) because if he had followed it, he would have managed to adapt to the setting offered by his colleague. Another fundamental rule is that an attacker must not use the spiking option with power in all situations but can also use the cut shot or line.

A powerfully executed shot must take place only when the player is sure that he has observed the free space in the opponent's court and is convinced that the opponent's block will not reach it; otherwise, he must execute a cut shot and be convinced that the ball, if is not reached by opponents, will land in the opponent's court, not outside it.

The attack in the game of beach volleyball can be presented as a succession of chained technical elements that ultimately lead to hitting the ball at the highest possible point and in the most challenging way to be recovered by opponents. Scientists discovered that group cohesion has a considerable influence on the performance and other fundamental factors in team sports life (Pomohaci & Sopa, 2018).

The primary data of modern volleyball is obtained using statistical procedures that can identify the strengths and weaknesses of the opponent team. Coaches use this data to develop other teams and achieve the desired results (Szabo & Magdas, 2014, Szabo, 2015a, Szabo 2015b, Szabo & Sopa, 2015, Szabo et al., 2019; Szabo & Sopa, 2018).

From an interdisciplinary point of view, we want to emphasize the importance of proprioception (Szabo et al., 2020, Szabo et al., 2020b, Szabo & Sopa 2020), strength motor skill (Tulbure et al., 2020), biomechanics, and psychomotor skills (Szabo et al., 2020c, Szabo et al., 2020d), as well as modern smart means in the game of beach volleyball (Szabo et al., 2019b).

Entering the attacking position

The first thing a striker needs to do to increase his chances of success after executing the shot is to follow a well-developed training routine through many repetitions that will help him reach the same favorable position every time for the attack success are as high as possible.

The results of several investigations confirmed the importance of the context of the attack. The authors found that effectiveness is a primary factor in beach volleyball and is dependent on factors such as blocking or receiving an attack or service (side-out or counter-attack). Mesquita and Teixeira (2004) and Zetou and Tsigilis (2007) found that the effectiveness of attacks was different during the side-out and counter-attack phases. During the side-out phase, it is dependent on the effectiveness of the reception, while in the counter-attack phase, it is dependent on other small game space factors (Giatsis, 2003; Giatsis and Papadopoulou, 2003; Giatsis et al., 2004; Giatsis & Tzetzis, 2003; Grgantov et al., 2005) or blocks actions (Giatsis, Tili & Zetou, 2011; Tili & Giatsis, 2011)

So, first of all, the attacker must arrive after the reception, while the ball follows its trajectory towards his teammate who is set for the attack, in the same starting point of the attacking momentum.

It must be somewhere 3 meters from the net and near the sideline if the player is on his strong side (a right-hander on the left or a left-hander on the right) and if he is on his weak side. Relative to positioning in the field (a left-hander on the left or a right-hander on the right) about one meter inland.

Anticipating the setting and adapting to it

The two partners must know each other well and are confident in the qualities of the setter.

If the attacker is in the privileged position of having a player by his side who constantly sets the ball in a position favorable to the attack, then after the reception, the attacker can execute the routine that all players have vis-à-vis the attacking momentum. However, what happens if even the best setters have the misfortune to step on a dune or in a pit formed on the ground and become unbalanced at the moment of the setting? The set sent to the attacker will be different in one way or another from those sent in ideal conditions with which the attacker is accustomed, and then the latter must adapt his attack momentum after that. If a player has an inconsistent teammate who sends the sets differently from each other, the attacker has the obligation that when the ball is in the air, even before it touches the hands of the setter, to execute that pre-jump actions before the approach step and to be prepared to go in any direction to attack. Thus, if the ball is too high, the attacker can move towards it quickly and coordinate with its downward trajectory. If it is too low, it can start in a fast momentum and reach it before it falls under the upper band of the net and is in an impossible position to attack. Also, if the pass is to the left or the right than the attacker expects, he can use the directional step to adjust his attack position to take advantage of any chance and score on the scoreboard.

The attacker needs to adapt to the setting received from his teammate so that the ball is always hit from the front to give it maximum strength and allow him to see where his opponents are placed. In the court on the defensive phase.

In beach volleyball, a significant number of landings after the attack are observed, related to high forces in the joints of the lower limbs (Bisseling et al., 2007; Edwards et al., 2012; Lindner et al., 2012). Such high forces can cause acute and excessive injuries, such as ruptures of the anterior cruciate ligament or patellar tendinopathies, respectively (Bahr & Reeser, 2003). Bahr and Reeser, 2003, reported 54 acute injuries (30% knee, 17% ankle, and 17% finger) to 178 professional beach volleyball players interviewed during a 7-week interval of the regular season. More than a third of players (67 out of 178) reported excessive injuries (back pain 19%, knee pain 12%, and shoulder pain 10%) for which they received medical care. Much of the reported injuries and conditions of overuse can be related to high loads on injured joints during jumps and specifically during landing actions (Eerkes, 2012). Also, the correlation between body mass index and the apparition of spine, knee, and feet deficiency in the youth population was studied by many authors (Szabo & Sopa, 2018).

Detachment step for attack

The attacking momentum is executed in 3 successive steps (the approach, directional, and detachment, the force step). The force step is perhaps the most important of the three steps of the momentum for the attack.

The attacking momentum can be executed in some cases and more than three steps when the attacker must move quickly from the bottom line to the area where he will attack, but each time the speed movement will end precisely in the position from which it must begin its three steps of attack momentum. Therefore, the detachment step must be performed in the following way: after the directional step (step 2 of the momentum) has reached a favorable position towards the ball, the attacker must transform all the energy accumulated through the two steps, close and directional employing the third, the detachment step with double beating, from the energy used for the horizontal movement into energy for the vertical detachment.

This aspect must follow the following routine: when transitioning between steps two and three (valid for right-handers), the attacker takes a big step with support on the left foot. The arms are pulled back, the palms are facing the sky, the legs are bent at the joints of the knees and ankles, the torso is bent forward, and the body position becomes low. Then comes contact with the sand for the first time, with the right foot followed at a close distance but slightly shifted forward by the left foot. Make that sudden stop instead of pushing hard on your feet and throwing your hands hard vertically.

The aspect related to the detachment from the sand is vital and much different from the one in the hall. Particular emphasis is placed on the transfer of weight from the heel - sole - toes - detachment. Without this obligatory routine to be used by all attackers, the attacking momentum is not correct, and the result can be a wrong detachment that cannot make the attacker spike the ball from the highest possible point, as he wants. For left-handed attackers, the routine is the same, only that the starting moment of the momentum is reversed; they step for the first time with their left foot, not with their right.

The swinging of the arms

It is imperative to swing the arms from back to front and finally up, as we mentioned above. The arms must be left very far back with the help of the muscles, even pushed as far as mobility allows with the palms to the sky and then, with maximum effort to be pulled forward and upward so that the mechanical work generated by this chain of movements allows the ball to be hit at a point as high as possible. In the images below, you can see in detail how this sequence of movements is performed.

Figure 1. The phases of the attack (Mauro, 2012)

Figure 2. The moment of initiation of the detachment step (Mauro, 2012)

Figure 3. The moment of swinging the arms in the spcific phase of detachment phase with heel - sole - toes – movement of the feet (Mauro, 2012)

Figure 4. The final momentum of the double-step with feet closed (Mauro, 2012)

The Heel-toe-finger movement

It is essential to understand the role of this motor act that transfers the horizontal displacement energy into the vertical detachment energy. This mode is the only one valid for the game of volleyball, both sand and indoor. Executing this movement correctly, with the feet close to each other at the moment of detachment and with the left foot slightly offset from the right, we manage to detach exclusively vertically. Any deviation from this rule makes our detachment from the sand vertically and horizontally, which will make the landing be accompanied by touching the net or entering the opponent's side and automatically losing the point.

Although some kinematic differences have been reported between beach volleyball and attack volatility for indoor volleyball (Tilp et al., 2008), athletes in these sports use similar techniques during service movements, diving, setting, attacking, blocking, and defense. However, there are tactical differences, e.g., the number of players (beach volleyball team: two, indoor volleyball: six) that affect landing movements and strategies. This classification could lead to a different amount of "land and go" and "land and stop" movements, as classified by McNitt-Gray, 2000, who reported different lower limb loads. Other differences in movement conditions are due to differences in court size and playing surface. The biomechanical differences of playing surfaces and their influence on the risk of loading and injury, and coordination (Moritz & Farley, 2006) have already been studied. The sand surface decreases the maximum vertical reaction forces on the ground during the jump takeoff phase by 8% (Giatsis et al., 2004) compared to the rigid surface. As far as we know, no data are available on the forces during sand landings compared to inland terrain. However, Mills et al., 2010 calculated that low stiffness and increased damping, such as

the sand surface compared to the inner surface, reduce the reaction forces of the soil and subsequently the bending moments of the knee and thigh during movements and landings.

The „bow and arrow" movement of the arms

After the proper detachment, the attacker reaches the position where he is raised in the air with his hands pointing towards the ball following a downward trajectory and will be hit in the next few moments. For the shot to be correct and efficient, we need the maximum force and the appropriate technique in hitting the ball. The arm swinging movements of 96 professional beach volleyball players were examined at the 2017 World Beach Volleyball Championships; experts classified the movements into two categories, bow and arrow technique and alternative techniques (Seminati et al., 2015). Also crucial in discovering the efficiency of attack is the statistical analysis of the game (Szabo & Sopa, 2020; Szabo et al., 2019; Sopa & Szabo, 2019).

The next phase of the bow and arrow movement for the attack is when the left hand remains to follow the ball and when the attacking movement is triggered, the left hand is pulled down strongly while the right hand goes straight from the elbow and rises to the ball which will be hit hard and short, the wrist remaining flexible, the movement of hitting resembling a whipping of the ball. Good jumping ability and static and dynamic balance can ease the attack and give many other opportunities (Sopa, 2021; Sopa & Pomohaci, 2021).

This mechanism is achieved through the abdominal muscles that contract strongly when the left arm has a downward trajectory and the right upward, ending with a firm ball hit. Another essential aspect is the way the shoulders open to the net and the ball's position. This aspect, in a specific language, means that the shoulder line will rotate to the right (if the attacker is right-handed) and will become almost perpendicular to the net, the torso next to the movement of hitting the ball with the arms, performs a rotational movement around the spine, which will generate additional force for the attacking blow.

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Submitted: July 20 2021

Revised: November 09 2021

Accepted and published online December 07, 2021

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. noXXXI /**2021** pp.19-27?
Article no. 31103-867

THE BENEFITS AND IMPORTANCE OF PHYSICAL ACTIVITY IN COMBATING OBESITY AMONG CHILDREN—A LITERATURE REVIEW

Dan-Alexandru SZABO*
George Emil Palade University of Medicine, Science and Technology of Târgu Mureş, Adress: Str. Gheorghe Marinescu, No. 38, Târgu Mureş, C.P. 540139, Romania, e-mail: dan-alexandru.szabo@umfst.ro

Andreea ILIEŞ
George Emil Palade University of Medicine, Pharmacy, Science, and Technology, Romania, Address: Str. Gheorghe Marinescu, No. 38, C.P. 540139, Târgu Mureş, Romania, e-mail: iliesa1911@gmail.com

Andreea Bianca STOICA
George Emil Palade University of Medicine, Pharmacy, Science, and Technology, Romania, Address: Str. Gheorghe Marinescu, No. 38, C.P. 540139, Târgu Mureş, Romania, e-mail: andreeab.stoica@gmail.com

Abstract: The development of boyhood overweight is usually related to maintaining the pathophysiological state in adulthood. Childhood overweight is characterized as the abnormal buildup of body weight in adipose tissue during childhood, which harms health. Increased physical behavior appeared linked to various health benefits, ranging from improved lipid and glucose homeostasis to endothelial function. Such health outcomes are usually independent of BMI changes. The prevention of boyhood adiposity is a global health priority. Because obesity is a complex condition, effective obesity prevention strategies must consider various factors (personal, environmental, and socio-economic). This article aims to review the benefits, importance, and advertising of physical behavior to children and emphasize the prevention and treatment of childhood obesity.

Key words: physical activity, obesity, children, benefits.

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INTRODUCTION

Most children's daily physical activities have been removed from their daily lives by modern society and culture, making high-energy, low-nutrient foods and beverages more affordable and accessible, making them healthier than similar products. Attractive. Obesity can be reduced mainly through changes in behavior and lifestyle. If the environment encourages unhealthy eating habits and sedentary lifestyles, relying only on personal *self-control* strategies and interventions will be ineffective. Children cannot produce knowledgeable outcomes speaking of health, and unhealthy, so paying attention to environmental changes is more important. This shall supply youngsters through healthier food choices while expanding their physical movement levels and decreasing the threat of overweight (Must et al., 1992; Pandita et al., 2016).

* dan-alexandru.szabo@umfst.ro

Obesity development in the early stages of life is commonly related to maintaining the pathophysiological state after adulthood. Childhood overweight is characterized as the abnormal buildup of body grease in adipose tissue during childhood, harming health (Guinhouya, 2012). In modern decades, the global incidence of overweight youth has increased rapidly and is currently regarded a global epidemic (Guinhouya, 2012). In recent decades, children have become less active due to technological progress and socio-economic factors (Landry & Driscoll, 2012). Childhood obesity is the most important known risk factor for cardiovascular disease in adulthood. When these factors appear in childhood, they will increase in later life. Therefore, it is necessary to fight against them from the beginning, especially during this period—observed lifestyle habits (Brambilla et al., 2011; Paes et al., 2015).

Obesity is a significant risk factor for various bodily and psychological health problems, including metabolic disorders, type 2 diabetes, colon cancer, cardiovascular disease, mortality, and depression (Faith et al., 2002; ***. WHOMC, 2015). It appears quantified that the therapeutic expense of overweight in 2009 was 147 billion U.S. $, accounting for more than 46% of the increase in hospitalization costs (Finkelstein et al., 2009). Preventing childhood obesity is important because it is significantly associated with adult obesity (hazard ratio = 2.27-5.91). (Bris et al., 2012). Child obesity affects motor function, leading to delayed motor development and boosted threat of disability (Kantomaa et al., 2013; De et al., 2008). In addition, obese children may face social stigma and discrimination (Kuczmarski et al., 2010; Pizzi, 2010; ***. U.S. DHHS, 2010), and have fewer opportunities to participate in social activities and play at residence and schooling (Pizzi et al., 2010; Pizzi, 2010; ***. U.S. DHHS, 2010; Lane & Bundy, 2011; Pizzi & Vroman, 2013; Hong et al., 2016).

Research on children's functional limitations, factors related to children's occupations, and participation patterns are essential to understand childhood obesity better and provide interventions for obese children (Lollar & Simeonsson, 2005). In addition, motivational strategies, such as activities chosen by students, appeared recognized as an essential part of increasing physical exercise to treat obesity (Salmon et al., 2007). Occupational therapy researchers propose to develop personalized interventions to allow children to participate in exciting and enjoyable activities consistent with motivational strategies (Bazyk & Winne, 2013). Therefore, it is crucial to determine whether or not there appears a difference between healthy strength and overweight children enjoying physical activities (Hong et al., 2016).

According to another research, lack of physical exercise is inversely proportional to the threat of overweight. (Spear et al., 2007; ***. HALCA, 2002) Intuitively, the increasing physical practice appears to have the opposite effect. The occurrence of overweight should be reduced. Although many studies have been conducted on this critical issue, physical activity intervention has not significantly impacted BMI. (Harris et al., 2009; Oude Luttikhuis et al., 2009) These negative findings highlight some of the difficulties in obesity research. First, lifestyle changes are rarely isolated. For example, increasing physical activity might be corresponded to increase caloric intake. Second, people do not know much about compensatory behavior—school-based interventions increase physical activity and may compensate for reduced activity later in the day. Finally, it is often difficult to assess compliance with physical activity interventions (Pradinuk et al., 2011).

PHYSICAL ACTIVITY BENEFITS, IMPORTANCE, AND PROMOTION

Increased physical behavior is correlated for different health benefits, from improving lipid and glucose homeostasis to improving endothelial function. Such health outcomes usually occur independently of changes in BMI. The higher the level of physical behavior in childhood, the lower the threat of cardiovascular disease and type 2 diabetes, and the longer the life expectancy of adults. The implication of physical behavior on cardiovascular risk is related to body fat

(especially abdominal fat) and insulin action. Exercise training improves capillarity and insulin sensitivity in this way (Cesa et al., 2014). Moderate physical practice might improve to purchase considerable well-being advantages (Figure 1). High-intensity activities are required to obtain more beneficial health effects, and aerobic exercise is conducive to more significant health benefits (Janssen & Leblanc, 2010). Maintaining high degrees of physical behavior is also associated through a spectrum of other physical health benefits, such as improving body composition, blood pressure, metabolic status, muscle growth, and bone mineral density, greater self-esteem, improved coordination, balance (Sopa & Pomohaci, 2021; Szabo et al., 2021), and motor skills (Szabo et al., 2020a; Szabo et al., 2020b; Szabo et al., 2020c; Tulbure et al., 2020; Janssen & Leblanc, 2010; Fritz et al., 2016; Wyszyska et al. People, 2020) (Figure 1).

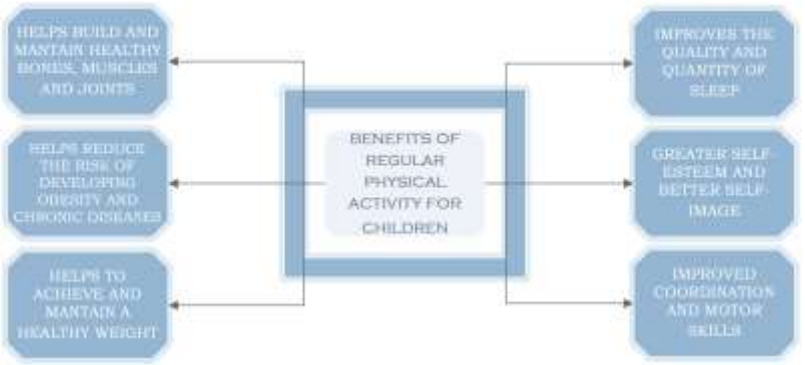

Figure 1. The benefits of regular physical activity for children

Traditional methods of combating the lack of physical activity have focused on raising personal awareness and encouraging behavior change. However, it gets progressively obvious that a person's social, physical, and cultural environment are potent predictors of their activity level (Colley et al., 2012; Pradinuk et al., 2011). In a recent questionnaire of principal health care physicians (family doctors and community pediatricians, 46% to 48% response rate), more than 70% of the respondents identified an obese environment (defined as a lifestyle that encourages consumption energy and prevents energy expenditure), and children living in childhood obesity management is a significant obstacle (Pradinuk et al., 2011; He et al., 2010).

The physical practice is considered a basic health-related behavior related to obesity (Jiménez-Pavón et al., 2010). More elevated degrees of physical practice and longer life span (Arem et al., 2015), the more serious danger of cardiovascular disorder (Swift et al., 2018), deeper concentrations of many cancers, stroke and diabetes, and quality Higher life, better mental health, higher cognitive function, and various other positive health outcomes (Brown et al., 2012; Middleton et al., 2013; Vagetti et al., 2014; Lubans et al., 2016; Bidzan-Bluma and Lipowska, 2018; Baranowski, 2019). Therefore, if citizens of all countries participate in the optimal level of physical activity throughout their adulthood, they will live older, healthier, happier, more conscious, less demanding health care systems, and possibly more productivity, the state of affairs that many citizens, employers, and governments expect (Baranowski, 2019; White et al., 2016).

Physical exercise has been proven to improve children's cardiorespiratory health, physical composition, and social and mental health. Physical exercise has been used as an essential tool for preventing and treating obesity (Kelley & Kelley, 2013). It can cultivate physical fitness that actively changes body composition and metabolic activity and reduces obesity-related complications (Alberga et al., 2013; Paes et al., 2015).

It is suggested that youngsters and adolescents among the periods of 6–17 take sixty minutes of physical practice every day (Piercy et al., 2018). Starting from the age of two, the

2015–2020 Dietary Guidelines for Americans propose eating various products and veggies, entire seeds, protein, low-fat creamery merchandise, and limiting sodium, solid fats, and added sugars (DeSalvo et al., 2016). Disappointingly, merely 21.6% of youngsters among the ages of 6 and 19 take 60 minutes of recommended physical activity five days a week (***. Alliance NPAP, 2016). Diet quality affects weight gain, and it is quantified that the overweight outbreak played an essential role in the decline in life expectancy for the first time in 30 years in 2015 (Ludwig, 2016; Smith et al., 2020).

The frequent physical practice is essential for regulating body composition during growth. However, it would be suggested that the physical changes of children in the process of growing up will affect exercise intensity and performance. Therefore, exercise should be planned according to the child's unique characteristics, age, and gender (Bülbül, 2020; Taşkn et al., 2018) (Figure 2).

Figure 2. The weekly activity of children
(Source: Bülbül, 2020)

PREVENTING AND TREATMENT OF CHILDHOOD OBESITY

Preventing the emergence of youth obesity is a worldwide health priority. Because obesity is a complicated condition, effective obesity prevention strategies must address various factors (personal, environmental, and socio-economic). The leading couple periods of life are essential to initiate preventive measures that may affect lifestyle and overweight or obesity. Prevention strategies for young children should include parents, primary caregivers, schools, social networks, media, and the larger community (Han et al., 2010). These organizations should encourage a healthful way of life and appropriate physical activity and diet levels by establishing an excellent illustration or providing/supporting a supportive environment. The prevention plan should mainly focus on the child's family. Parents should establish an excellent exemplar in favor of their youngsters and develop a healthy lifestyle. Due to the difficulty of this parental approach, parents require social support to understand the significance of shifting lifestyle habits and their role in the psychophysiological development of their children (Watson et al., 2011; Wyszyska et al., 2020).

Obesity control needs to be prevented because many (but not all) obese children will grow up to become obese adults. The likelihood of follow-up or childhood obesity continuing into adulthood is related to age. Adult overweight supervision is challenging and often unsuccessful, especially with no known organic cause (e.g., leptin deficiency or other hormonal abnormalities). Regarding the opposite script, preventing childhood obesity may be more valuable and likely to reduce long-term complications. When dealing with childhood obesity, there are three degrees of prevention (Guo et al., 1994; Parsons et al., 1999; Pandita et al., 2016) (Figure 3).

Figure 3. The levels of prevention

The treatment of youth overweight is very complicated. Poor patient motivation and parents' inability to devote time to their children possess appeared recognized as the most critical factors leading to inefficiency during the therapy of children and adolescents (Befort et al., 2006). Children who are trapped between courses/courses in an exam marathon due to occupational anxiety cannot spare time for physical exercise and are even referred to medical institutions due to these problems. Therefore, the most common problem is non-compliance with childhood obesity treatment. When comparing the two studies, it was found that children are more likely to be non-adherent to treatment (Bülbül, 2020).

Traditional interventions for overweight or obesity include healthy nutrition education and lifestyle changes through increased physical exercise. In this case, interventions based on increasing physical activity are generally considered the most effective, not only because they help control weight but also because they provide health benefits such as bone and muscle strengthening, improved sleep, and strengthened psychological well-being and decrease the threat of cardiovascular disease (Janssen & Leblanc, 2010; Harris et al., 2009). In a longitudinal research of more than 6000 7-year-old children participating in regular physical activities, it was found that physical activity was related to the percentage of body fat of 11-year-old children (Griffiths et al., 2016). Similarly, research on children aged 4 to 18 shows that regular physical exercise has significant health benefits, such as increased bone density, good blood pressure, and improved metabolism or cardiorespiratory health (Janssen & Leblanc, 2010; Yuksel et al., 2020).

Experts recommend specific nutrition and physical practice behaviors (Barlow & Expert Committee, 2007). In addition to clinic-based interventions, researchers have also tried to manage obesity through family, community, school, and after-school programs. According to Cochrane's review of childhood obesity prevention programs, most well-designed interventions have produced positive results, especially in children between 6 and 12 years of age. (Summerbell et al., 2005). Children may benefit from clearly targeted interventions, while adolescents may benefit from population-based practical and cost-effective methods (Kelishadi & Azizi-Soleiman, 2014). The purpose of this article is to review (literature) the benefits, importance, and promotion of physical activity to children and to try to highlight the prevention and treatment of childhood obesity.

CONCLUSIONS

Physical behavior has appeared proven to promote active adaptation to childhood obesity and support its prevention and treatment. The size of the benefits may vary from practice to practice. The main effects of the exercise are mainly related to the restoration of blood lipids, the restoration of autonomic nerves, and the improvement of body composition.

Child obesity is now one of the particularly severe widespread health care challenges in developed and developing countries. Child overweight is a threat element for many chronic diseases, including type II diabetes, cardiovascular disease, hypertension, osteoporosis, and cancer. It also has psychosocial consequences, such as delays in academic and social functioning, low self-esteem, and depression.

Clinical health psychologists are well-suited to investigate this complex issue, but transdisciplinary teams will be required to shift the dial.

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Submitted: September 12 2021

Revised: December 03, 2021

Accepted and published online October 13, 2021

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. noXXXI **/2021** pp.28-36
Article no. 31104-869

BIOMECHANICAL ANALYSIS OF THE THROWING OVER THE CHEST TECHNIQUE IN WRESTLING

Marius OLARU
West University of Timișoara, Doctoral School Sports Science and Physical Education, e-mail: marius.olaru@e-uvt.ro

Dorina IANC*
University of Oradea, Faculty of Geography, Tourism and Sport, Department of Physical Education, Sport and Physical Therapy, e-mail: dorina.ianc@yahoo.com

Ioan TRIFA
University of Oradea, Faculty of Geography, Tourism and Sport, Department of Physical Education, Sport and Physical Therapy, e-mail: nelu.trifa@gmail.com

Abstract: Understanding and preventing injuries in training is important for professional athletes. Cancellations of matches due to training injuries are a professional burden for both the injured athlete and their opponent. A well-structured training program, under proper supervision, can help prevent injury and improve athlete performance. The purpose of the study was the biomechanical analysis of the technique of throwing over the chest with the comparison of the execution of the technique by a novice fighter and an expert, while highlighting the risks of injuries in performing this technique in case of inadequate physical training. The study included an advanced fighter and a beginner fighter, for which images from the execution of the technique were compared and the differences were highlighted. The joint angles from different moments and the muscular activity during the execution were analyzed. The biomechanical analysis of the studied technique led to the highlighting of the muscles involved in the realization of this technique, the way of requesting them, the reange of motion required in the respective execution. Understanding and preventing injuries in training is important for professional athletes. Cancellations of matches due to training injuries are a professional burden for both the injured athlete and their opponent. A well-structured training program, under proper supervision, can help prevent injury and improve athlete performance.

Key words: throw, combat sport, injuries, prevention

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INTRODUCTION

Contact sports are a deeply rooted reality in today's society. Although the term ‘contact sports’ is generically assigned to those sports in which allowed or accidental contact between athletes occurs, it is most often associated with combat sports. These include classical sports such as boxing, wrestling, as well as sports branches of traditional martial arts such as judo, karate, taekwondo, jujitsu, wushu, etc.

It is relevant that in order to contribute to the quality increase of the training process, it is fundamental to develop new scientific knowledge regarding the sports technique, which should contribute constructively in the training process. With this context, scientific research in the field

* Corresponding Author

has expanded by studying the biomechanics of fighting techniques in order to understand the physical principles underlying their efficiency and to find the factors that influence performance.

The competition rules require athletes to compete with each other depending on their weight category. Some competitions require competitors to compete based on age, experience and gender. This not only allows more people to participate, but also reduces the risk of injury. However, injuries occur, especially to the knees, shoulders, skin diseases and blows to the head. Knee and shoulder injuries occur more severely than all other injuries and are the main injuries that require surgery, treatment and recovery (Jensen, 2017).

Studies show that the frequency of injuries is higher during training than during competitions (Rainey, 2009; AFHSC, 2014; Ziare et al., 2015; Lystad et al., 2015). Thus, Ziare (2015), in its study of 620 karate athletes, found that 90% of injuries were caused during training. Lystad (2015) conducted a study of 152 Australian taekwondo athletes and found that 81.5% of their injuries occurred during training (Lystad et al., 2015).

Hewett shows in his study about wrestling injuries that the injury rates increased with age, experience, and level of participation. The head, spine, trunk are the body region that incurred the greatest frequency of injuries, followed by the upper and lower extremities (Hewett et al., 2005). Some shoulder injuries occurring in wrestlers have been documented in a variety of case reports. Those include documented injuries to the suprascapular nerve, subscapularis tendon, sternoclavicular joint and avulsion fractures of the scapula and lesser tuberosity (Ross & Love, 1989; Berry et al., 1995; Brindle & Coen, 1998; Reddy et al., 2000).

Understanding and preventing injuries in training is important for professional athletes. Cancellations of matches due to training injuries are a professional burden for both the injured athlete and their opponent. All stakeholders (coaches, athletes, fitness trainers) should be encouraged to make more efforts to identify risk factors for injuries and to prevent injuries in training (Șarlă, 2015). A well-structured training program, under proper supervision, can help prevent injury and improve athlete performance.

Due to the complexity of most movements of the human body, imaging motion capture is the only method that provides the ability to capture all the data needed for a dynamic analysis of a specific activity over a long period (Winter, 2009). Although biomechanics for performance in sports studies the human body as a whole, many researchers focus on individual systems, such as the osteoarticular system, the muscular system, the nervous system, etc., applied segmentally (arm, leg). As a result, complex research is scarce or even absent. The strong point of computer modelling and simulation is that it provides real support for sports science, by providing research results that help to understand the performance of elite athletes (Bartlett & Payton, 2008). Specialized studies related to biomechanics in contact sports are very limited in terms of computer modelling and simulation. The modelling was applied for the analysis of impact situations, most models being dynamic, with finite or multibody elements.

The objectives of this paper were: biomechanical analysis of the technique Throwing over the chest and highlighting the risks of injuries in combat, especially in the execution of this technique, in order to contribute to improving the methodology used in preparation for contact sports.

MATERIALS AND METHODS

Participants

The study included an advanced fighter who has been practicing this sport for 15 years and a beginner fighter. The advanced subject (T.V.) practices Greco-Roman wrestling at a competitive level, being part of the national team Astra Arad and being national vice-champion in the 74 kg category. The trainings are with a frequency of 5 times a week, 2 hours each. The amateur subject practices this contact sport for pleasure, for 3 years, 3 times a week, without competitive purpose.

The characteristics of the subjects are presented in table 1. Both advanced and beginner subject training contain a physical training program and learning and improving sports procedures.

Table 1. General characteristics of the subjects

Subjects	Age (years)	Hight (cm)	Weight (kgf)	Years of practicing sports (years)
T.V.	29	175	73	15
S.C.	30	172	73	3

Description of the analysed wrestling technique – over the chest throwing

Jumps or throws over the chest are procedures related to the procedures of throwing over the hip. The characteristic of the procedure is the actions of the legs that create the turn, back towards the opponent. The group of throws over the chest includes some of the most important combat procedures. Chest throws or jumps are among the basic procedures of classical wrestling. The technique of execution of these procedures is complicated and difficult, due to the falls that are very heavy, both for the executor and for the opponent, which makes it even more difficult to master the technique of their execution. Therefore, in the sequence of learning the procedures, the jumps are on the last place, so they are taught only after all the other basic procedures have been mastered and only after the coach is convinced that the athletes he works with are thoroughly prepared and fit for the effort required at this learning stage.

The execution of the jumps starts from the position of guard, as follows: the performer, one leg to the front and the other to the back, brings the back leg closer to the front one, placing it parallel, on the same line, and at a distance of approximately 25-30 cm. After bringing the legs together, they remain bent at the knees. Simultaneously with the closeness of the legs, the trunk or the arms of the opponent are quickly fixed (the grips are different and multiple). From this situation, with the opponent well fixed, the actual execution of the procedure begins, to which the whole body contributes. The decisive action is that of the legs. They perform a sudden stretching action, the arms energetically pulling the opponent upwards, simultaneously with the fall of the performer on their back. Through these combined actions, the opponent is thrown energetically upwards and obliquely forward. In the current technical language, these procedures (throws over the chest) are called jumps. The differentiations are made according to the grips that are applied on the opponent (Cizmaș, 1988).

Biomechanical analysis of the technique

Analytically, the technique can be divided as follows:

Initial position: Poziția de gardă: Guard position: Stride standing in a sagittal plane, with the knees slightly bent, the trunk slightly tilt and the upper limbs in a slight triple flexion (prepared for gripping the opponent).

Time 1. Lowering the centre of gravity by knees flexion, bringing the back foot closer to the front by placing it on the same line with it, tilting the trunk and fixing the opponent's arms with grips on the arms, from the front (figure 1 & 2);

Time 2. Moving the centre of gravity below that of the partner, by trunk extension, bending backwards, hitting the partner's pelvis for momentum, height (figure 3 & 4);

Time 3. Throwing over the chest by twisting the torso, bringing the opponent below and maintaining the dominant position (control);

Final position: Fixing the partner holding the trunk, head or arm with the chest glued to it, legs slightly apart for stability, head up, chest out (figure 5 & 6).

By breaking down the throwing technique over the chest into analytical movements, the muscles involved in this technique can be highlighted.

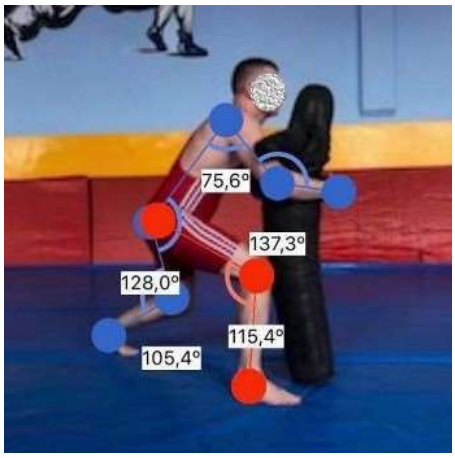

Figure 1. The subject S.C. - beginner, time 1 of technique execution execution

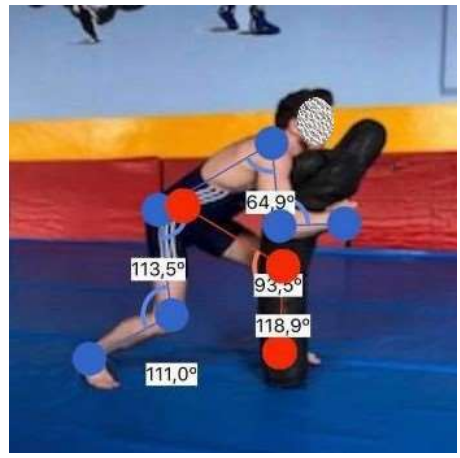

Figure 2. The subject T.V. - advanced, time 1 of technique execution

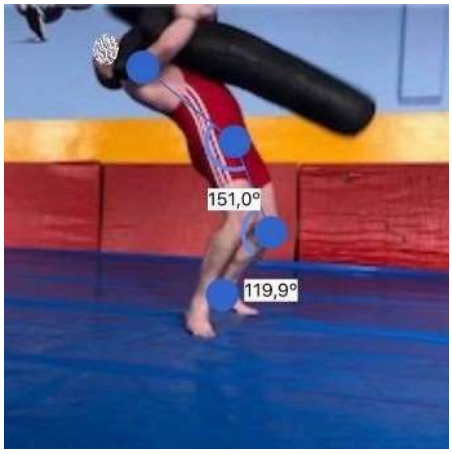

Figure 3. The subject S.C. - beginner, time 2 of technique execution

Figure 4. The subject T.V. - advanced, time 2 of technique execution

Figure 5. The subject S.C. - beginner, the final position of the technique

Figure 6. The subject T.V. - advanced, the final position of the technique

RESULTS AND DISCUSSIONS

From the tracing of the joint angles on images 1 - 6 it can be seen what is the amplitude of movement achieved by each subject during the execution of the technique. (tables 2 & 3).

Table 2. Comparison of the body segments segments positions during technique between beginner and advanced subject, at time 1 of technique execution

Joint	**Beginner**	**Advanced**
Shoulder	Flexed at 75.6°	Flexed at 64.9°
Trunk	Flexed at 30°	Flexed at 55°
Hip	Flexed at 45°	Flexed at 45°
Knee (anterior lower limb)	Flexed, angle between the thigh and the leg 137.7°	Flexed, angle between the thigh and the leg 93.5°
Knee (posterior lower limb)	Flexed, angle between the thigh and the leg 128.0°	Flexed, angle between the thigh and the leg 113.5°

Table 3. Comparison of the body segments segments positions during technique between beginner and advanced subject, at time 2 of technique execution

Joint	**Beginner**	**Advanced**
Shoulder	Flexed at 76°	Flexed at 80°
Trunk	Extended at 45°	Extended at 100°
Hip	Extended	Extended
Knee	Flexed at 45°	Flexed at 90°

From the comparison of the analyzed images and the angles measured at various moments of the technique, it can be seen that at execution time 1 which consists of entry and belting, the

beginner subject performs a lower flexion of the trunk on the pelvis and knee of the anterior lower limb, and the angle flexion of the arm on the trunk is higher than that of the advanced subject. This means that he raises his arms too high and does not move his center of gravity far enough forward and down (figure 7).

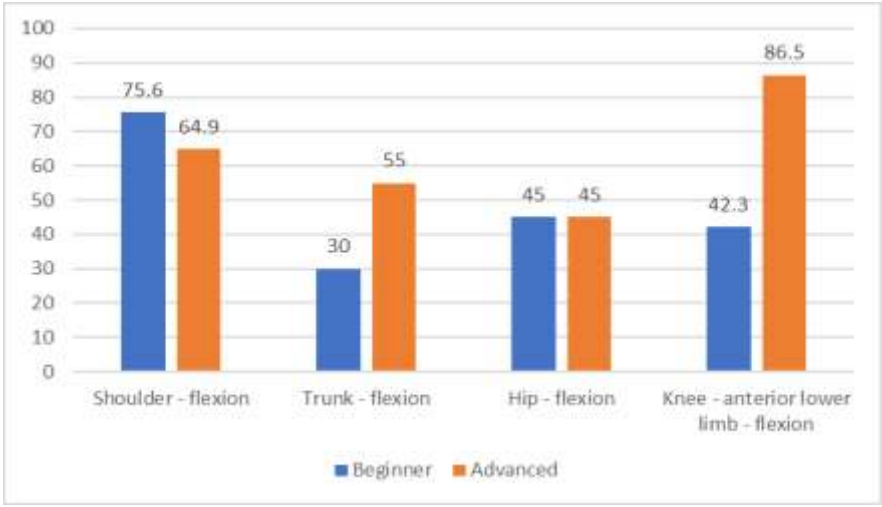

Figure 7. Comparison between the joint angles of the beginner and advanced subject, at time 1 of technique execution.

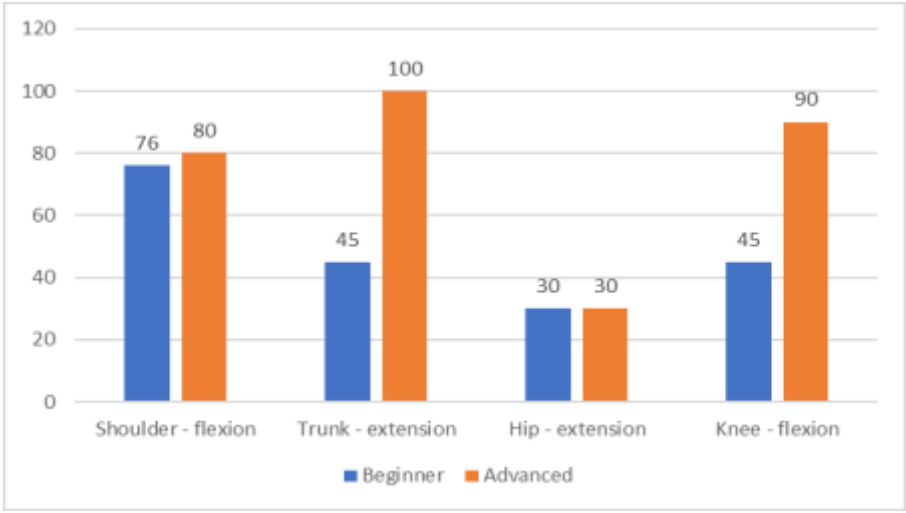

Figure 8. Comparison between the joint angles of the beginner and advanced subject, at time 2 of technique execution.

At time 2 of technique execution, which is the first part of the jump, the beginner subject performs a smaller extension of the trunk on the pelvis and flexes the thighs less on the calfs than the advanced subject. Thus, he uses much more energy and the technique may not succeed. Also, additional compensatory movements may be required, and these can lead to injuries (figure 8).

Table 4 shows the main muscles involved in each movement time of the throwing technique over the chest and their type of action during the technique. For a correct action of the technique, without performing compensatory movements involving other muscular and ligamentary actions, an adequate toning of these muscle groups is necessary.

Table 4. Muscle activity during the technique

Activity	Description	Muscles	Muscles activity
Initial position:	Stride standing in a sagittal plane, with the knees slightly bent, the trunk slightly tilt and the upper limbs in a slight triple flexion (prepared for gripping the opponent).	Quadriceps, lumbar extensors	Isometric contraction
		Anterior deltoid, biceps brachii, brachioradialis	Isometric contraction
Time 1	Lowering the centre of gravity by knee flexion, bringing the back foot closer to the front leg by placing it on the same line with it, tilting the trunk and fixing the opponent's arms with grips on the arms, from the front;	Quadriceps	Eccentric contraction
		Iliopsoas	Concentric contraction
		Right abdominal	Concentric contraction
		Anterior deltoid	Concentric contraction
		Shoulder internal rotators (Pectoralis major, latissimus dorsi, subscapularis)	Concentric contraction followed by isometry
Time 2	Moving the centre of gravity below that of the partner, by trunk extension, bending backwards, hitting the partner's pelvis for momentum, height;	Lumbar extensors	Concentric contraction
		Gluteus major	Concentric contraction
		Middle gluteus, hip adductors	Isometric contraction
		Triceps surae	Concentric contraction
Time 3	Throwing over the chest by twisting the trunk, bringing the opponent below and maintaining the dominant position (control).	Triceps surae	Isometric contraction
		Obliques abdominals, multifidus muscle	Concentric contraction
		Right abdominal	Isometric contraction
		Anterior deltoid, Pectoralis major, latissimus dorsi, subscapularis	Isometric contraction
		Hand flexors	Isometric contraction

The analytical analysis of movements and analysis of joint's angles show that a novice fighter, in order to perform and complete the technique, unless they have enough mobility and strength to perform the gripping and jump, tend to stress their joints in abnormal, compensatory positions, which will lead to a high risk of sprains and ruptures of the knee ligaments.

If the muscles of the knee, hip and torso are not toned enough, there will be an overload on the knee, which can lead to prepatellar bursitis.

One can observe from the movement analysis table that the trunk rotators play an important role in the jump during the technique. If they are not strong enough, a beginner will tend to force his shoulders, risking subluxation of the humeral head and damage to the tendons and ligaments in the shoulder girdle.

As can be seen in the analysis of the movements that make up the technique, another muscle with an important implication is the triceps suralis. Insufficient strength and a non-physiological stress on the ankle will lead to its sprain with soft tissue and ligament injuries to the ankle.

CONCLUSIONS

The purpose of the study was the biomechanical analysis of the technique of throwing over the chest with the comparison of the execution of the technique by a novice fighter and an expert, while highlighting the risks of injuries in performing this technique in case of inadequate physical training.

The biomechanical analysis of the studied technique led to the highlighting of the muscles involved in the realization of this technique, the way of requesting them, the reange of motion required in the respective execution.

The results of the analysis on photographs highlight large differences in joint amplitudes between a novice and an expert during the execution of the technique, which can be explained by insufficient strength of the muscle groups involved, insufficient joint mobility and / or incorrect acquisition of the technique. These weaknesses can most commonly have traumatic impacts on the knee through ruptures of the anterior cruciate ligament and sprains of the medial collateral ligament and prepatellar bursitis. Other effects of inadequate physical training are dislocation of the shoulder and sprains of the ankle. If the muscles of the knee, hip and trunk are not toned enough, there will be an overload on the knee, which leads to prepatellar bursitis.

To prevent these types of injuries, it is necessary for fighters to have in their physical training program, a series of exercises to increase the strength of the muscles that act on the knee and ankle targeted to increase the durability of ligaments and other connective tissues. Exercises to improve flexibility in these joints are also very important. In order to prevent shoulder dislocation during the fight, shoulder flexibility and strength exercises are required. Finally, yet importantly, exercises for training the trunk rotators should not be missing from the physical training program.

Aknowlegments

We gratefully acknowledge the athletes from Sportiv Club Astra Arad whose participation and contributions made this work possible.

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Submitted:	Revised:	Accepted and published online
September 25 2021	December 10, 2021	December 13, 2021

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. noXXXI **/2021** pp.37-46
Article no. 31105-**868**

THE IMPORTANCE OF LEARNING AND CONSOLIDATING MOTOR QUALITIES THROUGH DYNAMIC GAMES IN PHYSICAL EDUCATION AND SPORT CLASSES

Ioan Sabin SOPA *
University "Lucian Blaga," Faculty of Science, Department of Environment Sciences, Physics, Physical Education and Sport, Adress: Str. Ion Raţiu, No. 5-7, Sibiu, C.P. 550012, Romania
Corresponding author: sabin.sopa@ulbsibiu.ro

Marcel POMOHACI
University "Lucian Blaga," Faculty of Science, Department of Environment Sciences, Physics, Physical Education and Sport, Adress: Str. Ion Raţiu, No. 5-7, Sibiu, C.P. 550012, Romania, e-mail: puiu.pomohaci@ulbsibiu.ro

Abstract: The pandemic infection generated many malfunctions in everyday life of the human being in all domains starting from the sanitary domain, economic, transportation, and not the last, the educational system. Physical Education was one of the most affected from the curriculum discipline, being a predominantly practical activity in which teachers were not accustomed to using interactive electronic means. The present research highlighted the importance of using alternative physical education for online teaching. The research used the questionnaire method on a 31 sample of physical education teachers to find out the importance of using dynamic games in the process of learning and consolidating the motor qualities. The responses showed that the majority of teachers consider that the dynamic games represent a good alternative and method for online teaching-learning process and consolidating the motor qualities in the physical education lessons. Also, this dynamic game brings joy and happiness starting from young age to the oldest, offering a good way of learning and having fun.

Key words: physical education, dynamic games, motor qualities, motor development.

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INTRODUCTION

The development of motor skills is one of the objectives of physical education, which at first glance would be another component of the "motor literacy" of students, but, in the course of our work with them, we have noticed a significant interdependence between the two, defined as "mutual potentiation" (Neagu, 2010).

Motor activity involves every form of movement from spontaneous twitches to goal-directed movements, from head to toe in every part of the body, from solo play to group interactions in every physical and social sense. Motor activity growth bridges the entire lifespan from the first fetal motion to the last dying breath (Adolph & Franchak, 2017).

Also, evidence of the value of physical fitness for youth's health is shown in several studies associating it with, among others, better cardiovascular function (Baumgartner et al., 2020),

* Corresponding Author

movement skills (Rainer & Jarvis, 2020), or weight status and reducing obesity (Garcia-Hermoso et al., 2020; Parra et al., 2020). Regarding the psychological domain of health, psychological wellbeing is defined as the combination of positive effects and optimal social and personal effciency (Deci et al., 2008); self-esteem represents confidence in and respect of oneself; anxiety is characterized by a feeling of unease about situations with uncertain outcome; while stress is a psychophysical response when facing demanding or adverse environmental conditions. Also, other scientific papers highlight the importance of physical development as contributory factors of influence in sport performance (Szabo et al., 2020a). All of these variables seem to be associated with youth's health levels, although in different ways. For instance, authors suggest that psychological wellbeing, social inclusion, and social support are positively correlated (Arslan, 2018). Similar positive interactions are found with peer relationships (Gomez-Lopez et al., 2019); self-esteem seems to play a role in preserving mental health (Triana et al., 2019), as well as in modulating individuals' behaviors (Fan et al., 2019); childhood anxiety has been linked with increased risk of depression (Griffith et al., 2020) and higher emotional imbalance (Shimshoni et al., 2020); finally, findings from previous research highlight a direct association between childhood depression and stress (Bai et al., 2020), leading to higher risk of the onset of eating disorders and obesity (Micheks, 2019). Physical education and sport activities also contribute to an optimal development of children with a good postural and harmonious development (Szabo et al., 2020b), and well-developed motor qualities (Szabo et al., 2020c; Szabo & Sopa, 2020a; Szabo & Sopa, 2020b).

The high use of dynamic games leads to students' active participation, improving their motor parameters and motor skill. At the same time, they positively influence and develop personality traits such as spirit of competition, attractiveness, attitude, fair play, will, diligence, and determination (Tulbure et al., 2021).

During the past year, 2020, the worldwide suffered a big crisis generated by the SARS-CoV-2 infection, and a general pandemic was declared all over the planet. The pandemic infection generated many malfunctions in everyday life of the human being in all domains starting from the sanitary domain, economic, transportation, and not the last, the educational system. The classical learning process was affected by the restriction of meeting face-to-face and introducing the quarantine and the obligatorily to stay home. The whole education system had to be restructured, and teachers had to find new online solutions for continuing the learning process. Physical Education was one of the most affected from the curriculum discipline, being a predominantly practical activity in which teachers were not accustomed to using interactive electronic means.

Some scientific papers highlighted the importance of daily practicing physical Education and sports activities (Cheng et al., 2018; Engeseth et al., 2018; Tiberi & Piepoli, 2019; Tulbure et al., 2020), and also a decrease in physical activity can also affect a person's mental health, which may be experienced as unpleasant emotions such as sadness, anger, and frustration (Brooks et al., 2020). Physical activity can be positively correlated with a pandemic state. Simple physical activity can reduce the harmful effects of strict quarantine (Apriyanto et al., 2021).

Other scientific papers highlight the importance of coping with stress during the Pandemic and how physical education or sports activities could help reduce stress and anxiety (Samelko et al., 2020; Popa et al., 2020). Positive coping is associated with better mental health outcomes, while negative coping is associated with psychological problems (Mark & Smith, 2012a; Mark & Smith, 2012b). The COVID-19 outbreak poses a significant threat to public health worldwide. This mental distress has been mainly described as sleep disturbance, symptoms of anxiety and depression, post-traumatic stress disorder, decision incapacity, and even somatic symptoms (Master et al., 2020). World Health Organization sustained the idea that School settings provide youth with critical opportunities for physical activity (PA), a key driver of positive physical, social-emotional and mental health among youth (WHO, 2020).

PURPOSE

The purpose of the study was to identify the importance of using dynamic games in the process of learning and consolidating specific motor qualities in the Physical Education lessons. The purpose of the experiment was to enquire a group of specialists in PE domain of their opinion on using dynamic games in the process of teaching and learning.

OBJECTIVES

Using the questionnaire method our objectives of the research was to identify the general opinion regarding the efficiency of dynamic games in the teaching-learning process of motor qualities in the PE activities.

HYPOTHESES

The research started from the idea that using a questionnaire of opinions applied to a group of teachers – specialists in the PE domain, we can identify their general conception regarding the efficiency of using the dynamic games in the teaching-learning process from PE lessons.

MATERIALS AND METHODS

The method used in our experiment was the questionnaire of opinions. The questionnaire had ten items (questions) with a gradation scale of five levels starting from 1 to 5 (with one meaning total disagreement with the affirmation and five meaning total agreement with the affirmation). The questionnaire had as objectives to discover teachers' opinions from the Physical Education domain regarding the difficulties that pandemic Covid-19 produced in the learning process.

STUDY DESIGN AND SUBJECTS

The questionnaire objectives were to discover the general opinion of specialists regarding the usage of dynamic games in the teaching-learning process in PE lessons. The design of the questionnaire followed the importance of dynamic games as an ideal framework for developing motor skills, the importance of learning / developing motor skills being a primary goal in PE lessons that must be based on teaching principles such as: accessibility, continuity, modeling and fundamental learning. Also, the questionnaire asked if the dynamic games are an important method for fullfiling the objectives of PE lessons and also if the number of motor skills that students learn is more important than the performance that these skills reach. Other items of the questionnaire, enquire about the most effective training methods in PE as explanation, demonstration and practical methods and the efficiency of dynamic games through their playful specificity building good atmosphere and emulation among students. Last three items question the usage of dynamic games as a very effective method of learning motor skills, being the basis of youth sports performance, and being a good method of incrising attractiveness in PE lessons

Place of the research

The research took place at the "Lucian Blaga" University of Sibiu, at the Faculty of Sciences. We distributed the questionnaire to physical education and sports teachers to discover the importance of learning and developing motor skills through dynamic games in the physical education and sports lesson at middle school level, as well as their development methods.

Subjects of the research

The subjects of the research were 31 PE teachers, 17 male (55% from total) and 14 female (45% from total), with age between 20 (11 persons and 25% from total) and over 45 years old (2 persons and 6,5% from total), with different levels of experience starting from 1-3 years (17 persons and 55% from total) to over 15 years of experience (5 persons and 16% from total), and

different degrees (without “definitivat” 20 persons and 65% from total or first degree (3 persons representing 10% from the total).

RESULTS

The results of the questionnaire were represented in the following graphics for better understanding of the opinions of teachers. At the first item that questioned the teachers if the dynamic games provide the ideal framework for learning / developing motor skills, the 31 teachers answered as follows: 17 teachers (representing 54,8% from the total) totally agreed with the presumption; 14 teachers (representing 45,2% from the total), partialy agreed with the presumption.

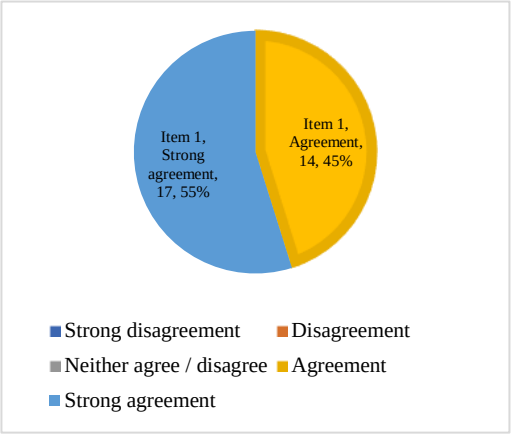

Figure 1. Answers to Item 1: Dynamic games provide the ideal framework for learning / developing motor skills

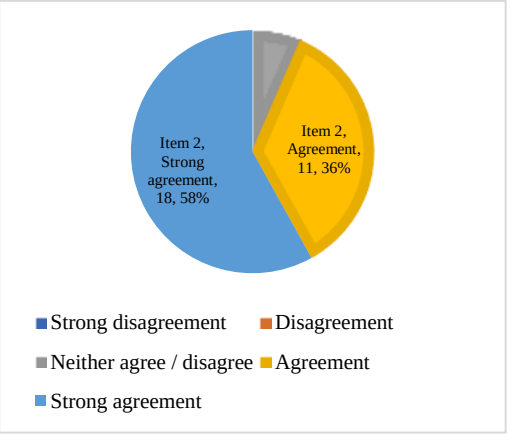

Figure 2. Answers to Item 2: Learning / developing motor skills is a primary goal of the physical education and sports lesson at gimnasium school level

The answers to the second item of the questionnaire regarding “learning / developing motor skills is a primary goal of the physical education and sports lesson at gimnasium school level”, were the following: 18 teachers (representing 58,1% from the total) strongly agreed with the presumption; 11 teachers (representing 35,5% from the total) had a good agreement with the presumption and just 2 teachers (representing 6,5% from the total) nethter agree or disagree the idea.

At the third item of the questionnaire that reffered to “the process of learning and developing motor skills must be based on the principles of teaching such as: accessibility, continuity, modeling and fundamental learning”, the following results have been obtained: 12 teachers (representing 38,7% from the total) strongly agree with the affirmation; 10 teachers (representing 32,3% from the total) agree with the presumption; 8 teachers (representing 25,8% from the total) neither agree / disagree; one teacher (representing 3,2% from the total) disagree with the affirmation.

Regarding the 4rd item of the questionnaire that emphasise the idea that “Dynamic games are an important method of fullfiling the objectives of the physical education and sports lesson at the gymnasium level”, the answer was the following: 12 teachers (representing 38,7% from the total) had a strong agreement, 10 teachers (representing 32,3% from the total) agree with the presumption, 8 teachers (representing 25,8% from the total) neither agree or disagree, and just one teacher (representing 3,2% from the total) disagree with the affirmation.

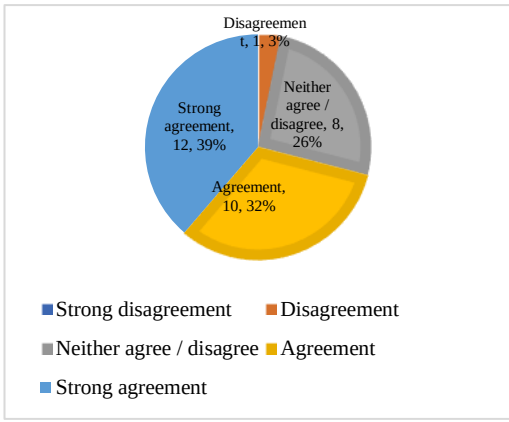

Figure 3. Answers to Item 3: The process of learning and developing motor skills must be based on the principles of teaching such as: accessibility, continuity, modeling and fundamental learning

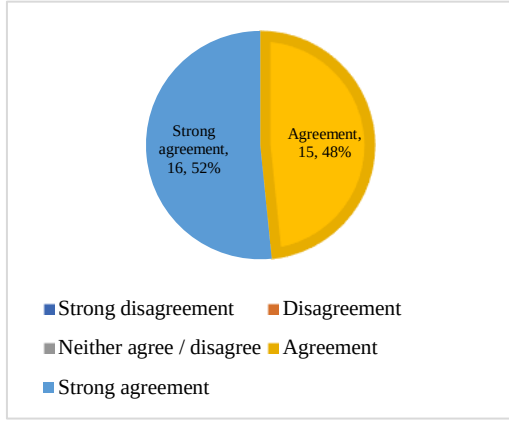

Figure 4. Answers to Item 4: dynamic games are an important method of fullfiling the objectives of the physical education and sports lesson at the gymnasium level

At the 5th item of the questionnaire that "the number of motor skills that students acquire is more important than the level of performance that these skills reach", the following results were obtained: 12 teachers (representing 38,7% from the total) had a strong agreement with the presumption, 11 teachers (representing 35,5% from the total) agreed with the statement, 6 teachers (representing 19,4 % from the total) neither agreed or disagreed, and 2 teachers (representing 6,5% from the total) disagree with the statement.

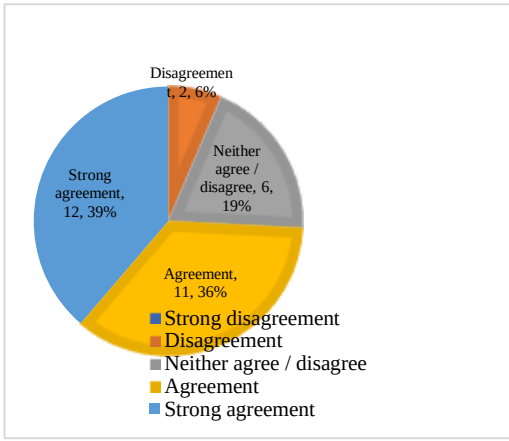

Figure 5. Answers to Item 5: "The number of motor skills that students acquire is more important than the level of performance that these skills reach"

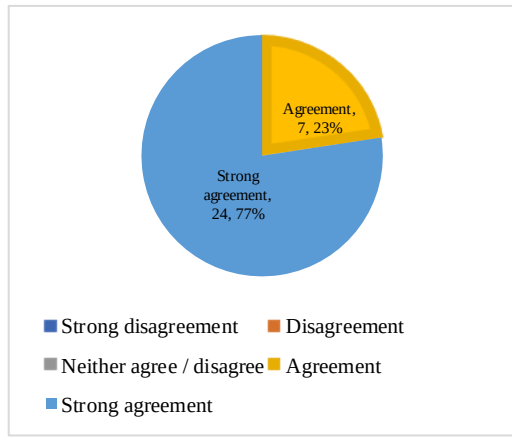

Figure 6. Answers to Item 6: "In the process of learning motor skills the most effective training methods are: explanation, demonstration and practical methods"

Regarding the 6th item of the questionnaire "in the process of learning motor skills the most effective training methods are: explanation, demonstration and practical methods", the results were the following: 24 teachers (representing 77,4% from the total) had a strong agreement with the statement, 7 teachers (representing 22,6% from the total) agree with the presumption.

At the 7th item regarding "Dynamic games, through their playful specificity, form an emulation for students through which they acquire certain motor skills", the following results were obtained: 20 teachers (representing 64,5% from the total) had a strong agreement with the statement, 7 teachers (representing 22,6% from the total) agreed with the presumption and 4 teachers (representing 12,9% from the total) neither agreed or disagreed.

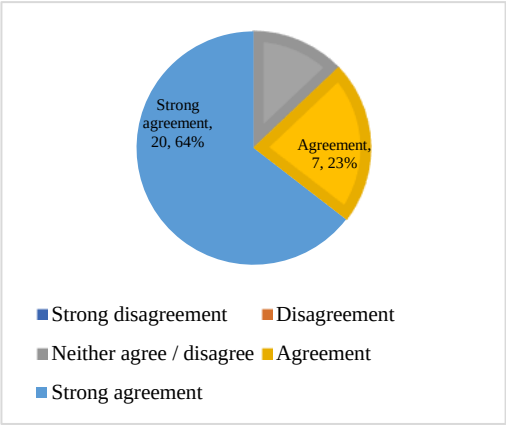

Figure 7. Answers to Item 7: "Dynamic games, through their playful specificity, form an emulation for students through which they acquire certain motor skills

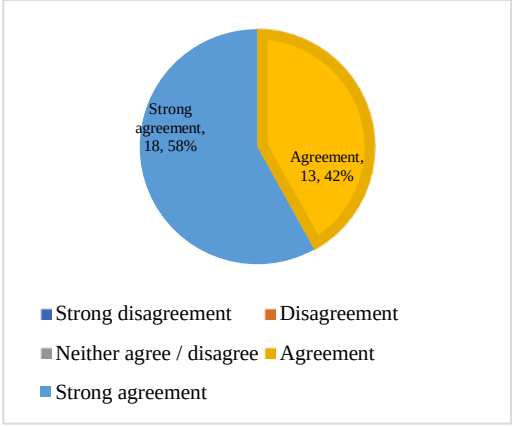

Figure 8. Answers to Item 8: "The use of dynamic games in the development of motor skills is a very effective method"

At the 8th item of the questionnaire that refferes to "The use of dynamic games in the development of motor skills is a very effective method", the following results have been obtained: 18 teachers (representing 58,1% from the total) had a strong agreement and 13 teachers (representing 41,9% from the total) agreed with the affirmation.

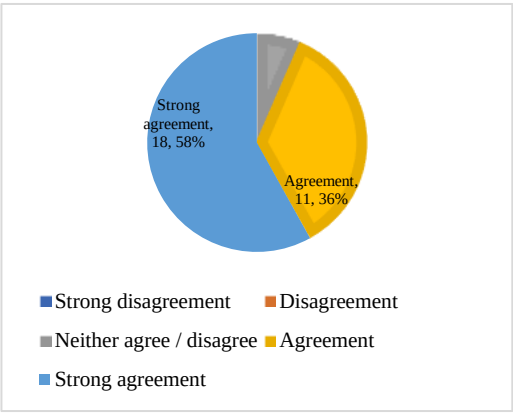

Figure 9. Answers to Item 9: "The use of dynamic games in the development of motor skills is a very effective method"

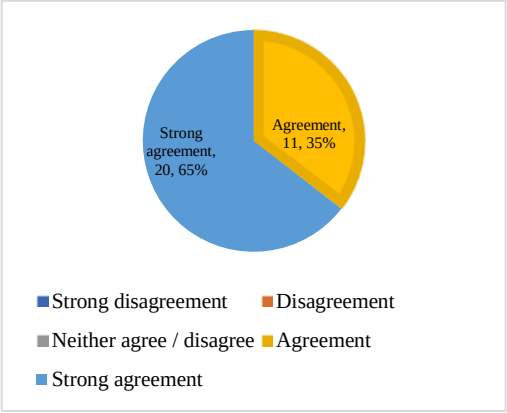

Figure 10. Answers to Item 10: "With the help of dynamic games we manage to increase the attractiveness of PE at the gymnasium level and to achieve the objectives of the lesson much easier"

Regarding the 9th item of the questionnaire that affirms that "Dynamic games specific to sport events and sports develop very important skills being the basis of youth performance sports",

the following results were obtained: 18 teachers (representing 58,1% from the total) had a strong agreement, 11 teachers (representing 35,5% from the total) agreed with the affirmation, and 2 teachers (representing 6,5% from the total) neither agreed or disagreed with the presumption.

At the last item of the questionnaire that refferes to "With the help of dynamic games we manage to increase the attractiveness of physical education lessons at the gymnasium level and to achieve the objectives of the lesson much easier", the following results have been obtained: 20 teachers (representing 64,5% from the total) strongly agreed with the presumption and 11 teachers (representing 35,5% from the total) agreed with the affirmation.

DISCUTIONS

The pandemic crisis generated by the COVID-19 infection, created many malfunctions in everyday life of the human being in all activities starting from the medical, economic, transportation, and not the last, the educational system. The classical learning process was affected by the restriction of meeting face-to-face and introducing the quarantine and the obligatorily to stay home. Measures should be taken to prevent or reduce contamination in students at risk in face-to-face education (Mandl, 2020).

The whole education system had to be restructured, and teachers had to find new online solutions for continuing the learning process. Physical Education was one of the most affected from the curriculum discipline, being a predominantly practical activity in which teachers were not accustomed to using interactive electronic means.

School settings provide youth with critical opportunities for physical activity (PA), a key driver of positive physical, social-emotional and mental health among youth (WHO, 2020). However, recent reports document PA-related effects of the COVID-19 pandemic on US school-aged youth, including decreases in PA participation and increases in sedentary behavior during home learning periods compared with prior to the COVID-19 pandemic (Dunton et al., 2020).

Physical education shifted to virtual learning platforms (Webster et al., 2021), physical education teachers and administrators were swiftly required to deliver robust virtual programs without adequate training and provision of appropriate teaching and learning resources. If designed appropriately, online physical education may have the potential to reduce health disparities related to inequitable opportunities for PA engagement (Draper et al., 2021).

Although online resources are already available for educators, they are not sufficient to meet current physical education teacher needs. For example, recent literature determined that "student access to online learning" and "availability of teacher resources" were substantial challenges related to online physical education instruction during the COVID-19 pandemic (Pavlovic et al., 2021). Similarly, Mercier et al. reported that 20% of physical education teachers felt less effective teaching their students online during the pandemic. The authors inferred that teacher responses may not reflect actual learning given that half of the sample did not use assignments or video instruction (Mercier et al., 2021).

The development of fundamental movement skills is a key element of the primary school physical education curriculum. Fundamental movement skills mastery in young children is associated with lifelong physical activity (Holfelder and Schott 2014), better health related fitness (Lubans et al. 2010), and improved physical, emotional, and cognitive development (Piek et al. 2008).

Online teaching is an increasingly used resource in education, even in the case of physical education (Killian et al., 2019), where different studies have reported benefits for students in relation to motivation, achievement involvement or its extracurricular nature (Kooiman and Sheehan, 2015; Kooiman et al., 2016; Osterlie, 2018). However, the teachers' perceptions are that this format cannot be a substitute for face-to-face meetings with students. Teachers still perceive online teaching as a complementary format for very specific situations (Daum & Woods, 2015),

and justify their opinion describing the difficulty of establishing socio-affective relationships with students (Daum & Buschner, 2012).

CONCLUSIONS

Being a practical activity, physical education and sport, was a teaching domain most affected by nowadays pandemic times, the teaching methods was changed and adapted to online learning.

Dynamic games represent a good alternative and method for online teaching-learning process and consolidating the motor qualities in the physical education lessons. Also, this dynamic game brings joy and happiness starting from young age to the oldest, offering a good way of learning and having fun.

The conclusions of our investigation drawn from the application of the questionnaire with the theme "the importance of learning and consolidating motor qualities through dynamic games in physical education lessons" where the following:

The majority of teachers that answered to the questionnaire agreed that the dynamic games provide the ideal framework for the primary goal of physical education and sport lesson: learning and developing motor skills. Also, other conclusions of the questionnaire are that principles of teaching such as accessibility, continuity, modeling and fundamental learning are fundamental in physical education lessons.

Other conclusions of the research highlingth the idea that dynamic games are an important method of fullfiling the objectives of this kind of activity and that the number of motor skills that students acquire is more important than the level of performance that these skills reach.

In the process of learning the motor skills, the most effective training methods are: explanation, demonstration and practical methods and that the dynamic games, through their playful specificity, form an emulation for students through which they acquire certain motor skills are other presumptions agreed by the majority of teachers.

Also, the use of dynamic games in the development of motor skills is a very effective method and that this king of exercises develops very important skills being the basis of youth performance sports.

The last conclusion of the research highlights the idea that with the help of dynamic games teachers manage to increase the attractiveness of physical education lessons at the gymnasium level and to achieve the objectives of the lesson much easier.

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Submitted:	Revised:	Accepted and published online
September 06, 2021	December 09, 2021	December 15, 2021

Analele Universităţii din Oradea
Facicula Educaţie Fizică şi Sport
ISSN **2286-2870**, E-ISSN **1224-5100**

Rev. noXXXI /**2021** pp.47-52
Article no. 31106-870

ASPECTS REGARDING THE INTRODUCTION OF STATIC CONSTRUCTIONS, PYRAMIDS, IN THE PHYSICAL EDUCATION LESSON, AT PRIMARY SCHOOL

Dana Ioana CRISTEA
University of Oradea, e-mail: danacristea07@yahoo.com

Anca Maria SABĂU*
University of Oradea, e-mail: sabauancamaria@yahoo.com

Aurelian Andrei CRISTEA
Greek-Catholic High School ”Iuliu Maniu” Oradea, e-mail: andreicristea07@yahoo.com

Emilia GROSU
Babeș-Bolyai University, Cluj-Napoca, e-mail: e_f_grosu@yahoo.it

Mihai Ionel ILLE
University of Oradea, e-mail: illemihai@yahoo.com

Abstract: Applying ACROGYM in the school and club permits a differentiated class in face of the challenges proposed, aligning theory and practice and teaching the students about certain concepts, procedures and attitudes the modality offers. It is also important for the proposals to be varied in opportunities and present different means for the practice, which can be developed by students with different physical builds, preserving the heterogeneity of the classes and favoring inclusion. The purpose of the paper is to provide models of static constructions - pyramids, which can be made with primary school students. Given the low degree of difficulty in building, these can also be practiced by students with special educational requirements, thus increasing the possibilities for physical exercise. Pyramids can be used successfully in sporting demonstrations in school or county competitions, dance, contemporary dance, show-dance, cheer-leading and so on, both as a starting position and as a final position.

Key words: acrosport, static constructions, primary school, physical education**.**

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INTRODUCTION

The studies found until 1970 are books or parts of books that refer to the acrobatics performed in twos and in small groups, and not Acrobatic Gymnastics as a sports modality, since its implementation occurred together with the foundation of the International Federation of Sports Acrobatics in 1973. After the first world championship in the modality, in 1974, there was an increase in the number of publications (academic articles, articles in specialized journals and

* Anca Maria SABĂU

books) until the end of the 1980s. These publications were more to encourage and disseminate, to present and explain the modality and its pedagogical principles. Therefore, the studies were encompassing and the modality was the main focus.(Boelsems, 1982; Merida F., Merida M., Nista-Piccolo 2008)

ACROGYM has three main fundamentals that characterize it: the formation of figures or human pyramids, the execution of acrobatics, elements of strength, flexibility and balance to go from one figure to the other, and the execution of dance elements, leaps and gymnastic pirouettes as a component of choreography. The difference between practicing ACROGYM and other gymnastic modalities is in the fact that the proposals are more geared towards working in groups of gymnasts than performances on equipment, although there are some elements in common, such as tumbling, strength, flexibility, balance and the presence of choreography (Criley, 1984; Boelsems, 1982; Nissen, 1991).

ACROGYM needs few materials and has a low cost when compared to the other gymnastic modalities (Almeida, 1994; Criley, 1984; Nissen, 1991).

ACROGYM's characteristics introduced herein make it a legitimate, rich and highly positive practice in the school and club context. That is because it can offer countless possibilities for motor exploration and stimulate spatial and rhythmic notions, the diverse physical capacities and mainly creativity in relation to figure composition and the elaboration of simple choreographies (Macovei, Popescu, Dina, Corlaci, 2011; Merida F., Merida M., Nista-Piccolo 2008). With regard to social-affective aspects, we underscore cooperation, trusting of oneself and others, autonomy and pleasure that permeate the entire process. Inserting the appropriate problem situations in this context allows the student to be stimulated to demonstrate his/her capacity for corporeal resolution. Thus, the first moments of pleasure and joy in sports practice can arise, although precariously, generating feelings of success that extend throughout life, a fact that proves important for the formation of the citizen and relevant to current society.

Applying ACROGYM in the school and club permits a differentiated class in face of the challenges proposed, aligning theory and practice and teaching the students about certain concepts, procedures and attitudes the modality offers. It is also important for the proposals to be varied in opportunities and present different means for the practice, which can be developed by students with different physical builds, preserving the heterogeneity of the classes and favoring inclusion (Tudor, Ciolcă, 2010). This modality is lacking in the dissemination of its practices and studies about the diverse aspects that support its practice (Merida, 2004).

Human pyramids are formed by gymnasts that receive a name according to the specific functions they execute. The base is the gymnast that supports and projects his companions. The intermediate is the gymnast who helps support and project, or who performs intermediate positions. The top is the gymnast who is supported and projected by the others, and frequently is at the top of the pyramids. Each pyramid can have one or more gymnast for each function, according to the number of participants and the design they intend to shape in space. (Merida, 2004; Almeida, 1994)

These functions carried out by the gymnasts are defined mainly according to their physical build and capacity, as well as the age factor, which can also interfere in the choice of a specific function. In official competitions, there are rules that relate the gymnast's height 9 and age to define the specific functions and each of their categories. These biological issues must be as aligned as possible to the needs and expectations of the gymnasts in relation to choice of function and partners. In this regard, Criley (1982), commenting on Jill Coulton's (1981) book Acrobatic Sports, says ACROGYM's exercises involve interaction and require mutual trust and cooperation, but stress can also make itself present in this scenario. Thus, the choice of partner should not be only based on physical aspects, but personality as well.

PYRAMIDS

Through the acroym projects, the whole team can be engaged regardless of the positive or negative stage level, different from the physical, motor performances, regardless of the morphological constitution.(Popescu, 2007) It is essential to know the different types of pyramids to expand possibilities, increase creativity and motor skills of students. Santana et al. 1996, suggest a proposal for organizing ACROGYM content. According to these authors, human formations are subdivided into: basic formations (corporeal figures and human pyramids), group formations (corporeal figures and human pyramids), and complete structures.

Basic formations are understood as formations performed in twos or threes, group formations with 4 to 9 members and formations of large groups with more than 9 members. Corporeal figures can be conceived as static formations made all members of the group without being one on top of the other. Human pyramids always imply a two-height structure, generally with the base larger than the upper part, where the weight of the top falls on the intermediaries and/or bases.

Corporeal figures can be subdivided into counter-balancing, support, equilibrium, inverted support and combined figures.

Human pyramids can be classified according to: positioning of bases: lying down, with four supports and two supports; number of bases: with two bases and one base. Figures and pyramids can be an open composition where the gymnasts are in the same line or closed, where the bases are closed forming a circle, square, among others, building a solid base for other heights.

They can also be classified as parts of the gymnasts' bodies, using height as a criterion for comparison (Marleux, 2019): floor pyramids: pyramids where the top's support is below the base's waistline, medium-height pyramids: pyramids where the top's support is at the base's waistline, first-height pyramids: pyramids where the top's support is at the base's shoulders; one and a half height pyramids (only trios and quartets): pyramids where one athlete's support is at the waistline and the other's is at the shoulders. Second-height pyramids (only trios and quartets): pyramids where one top's support is at the intermediate's shoulder, whose support is at the base's shoulders, two and a half height pyramids (only quartets): pyramids where one athlete's support is at the waistline and the others' is at the shoulders, third-height pyramids (only quartets): pyramids where the supports for the intermediates and the tops are at the shoulders.

Classification of pyramids (examples from the UNSS (Union Nationale du Sport Scolaire - score code): static (must be maintained for 3 seconds) - with mass compensation variant**;** bystacking**;** linkedup, dynamic – where dynamic movement of the flying acrobat occurs with a pass over the supporting/carrier acrobat**,** launch ingtheflying acrobat**,** capture/land of the flying acrobat.

In making the pyramid each of the partners has a well-established role (Popescu, 2011):
flying acrobat/Voltigeur: a gymnast that is not in contact with the ground and whose weight is supported by one or more acrobats carriers/getons. Flying acrobats finish the pyramid; bearer acrobat/porteur: a gymnast that is in contact with the ground and supports all or part of theweight of a partner = pyramid base and dynamic element motor (raises, designs and captures). She/he still has the role of help and insurance; intermediate carrier acrobat/semi-porteur (semi-carrier): is situated between the main carrier acrobat and the flying acrobat.

Pedagogical evolution of the figures

The next step for knowledge of pyramid types is to know there is a growing level of complexity between them and it is suggested that they be introduced gradually, from the simplest to the most complex, creating a pedagogical evolution. Criley (1994) proves to be a great

collaborator to ACROGYM's pedagogical issues by being the only author found who suggests some pedagogical principles for the evolution of figure and static pyramid learning: begin with pyramids with low positions and central supports;go to tall positions and central supports; go to low positions and supports at the extremities; finally, go to tall positions and supports at the extremities.

AIM

The purpose of the paper is to provide models of static constructions - pyramids, which can be made with primary school students. The following images (fig.1-12) show the possibilities of making static pyramids for primary school students. These constructions are made in such a way as to respect the age and training characteristics of the students in an appropriate methodical hierarchy.

Examples of construction that can be done in school at primary school(fig. 1-12)

Figure 1. Pyramid in group of three
(Source: Personal archive)

Figure 2. Pyramid in group of six
(Source: Personal archive)

Figure 3. Static pyramid of four
(Source: Personal archive)

Figure 4. Static pyramid of six
(Source: Personal archive)

Figure 5. Static pyramid of six
(Source: Personal archive)

Figure 6. Static pyramid of seven
(Source: Personal archive)

Figure 7. Static pyramid of six
(Source: Personal archive)

Figure 8. Static pyramid of six
(Source: Personal archive)

Figure 9. Static pyramid of eight
(Source: Personal archive)

Figure 10. Static pyramid of seven
(Source: Personal archive)

Figure11. Static pyramid of eight
(Source: Personal archive)

Figure 12. Human letters
(Source: Personal archive)

DISCUSSIONS

The Pyramids will be carried out according to the specific biomotrotic characteristics of students and the degree of training to avoid accidents and excessive loads. Biomechanics of positions and movements will be considered to ensure the safety of participants and the construction. The optimumsockets for both boarding and deboarding will be used. They should be fitted and removed easily. Models of construction/static pyramids in two, can be girls only, boys only or mixed.

CONCLUSIONS

Due to their young age, mixed pyramids can be achieved, with the same responsibility for both girls and boys. The musical accompaniment provides an emotional environment conducive to the education of a sense of rhythm. Team activity involves active socialization, creating well-welded intra-group relationships. Membership of a group in a curriculum or extracurricular activity provides added confidence, safety and support for students. The involvement in gymnasts and students with lower motric potential or different physical construction is another argument for taking part in this gymnastics variant. Given the low degree of difficulty in building, these can also be practiced by students with special educational requirements, thus increasing the possibilities for physical exercise. Pyramids can be used successfully in sporting demonstrations in school or county competitions, dance, contemporary dance, show-dance, cheer-leading and so on, both as a starting position and as a final position. Every performer has its role in the construction of a building, the motric memory, concentration and social integration are developing at the same time.

Aknowlegments

Nothing to be declared.

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Submitted: September 28, 2021

Revised: December 10, 2021

Accepted and published online December 15, 2021

Analele Universităţii din Oradea Rev. noXXXI **/2021** pp.53-62
Facicula Educaţie Fizică şi Sport Article no. **31107-871**
ISSN **2286-2870**, E-ISSN **1224-5100**

STUDY ON THE QUALITY OF SERVICE IN ROMANIAN 1ST DIVISION WOMEN'S VOLLEYBALL (2017-2019)

Mariana SZABO-ALEXI*
University of Oradea, Faculty of Geography, Tourism and Sport, e-mail: mariszabo@yahoo.com

Cătălin MIHĂESCU
A.C.S "Viitorul" Borş, e-mail: mihaescuc@yahoo.com

Cristian ŞANTA
Babes-Bolyai University, Faculty of Physical Education and Sport, Cluj-Napoca, e-mail: cristian.santa@yahoo.com

Paul Cătălin SZABO-ALEXI
University of Oradea, Faculty of Geography, Tourism and Sport, e-mail: szaboalexipaul@gmail.com

Abstract: Practicing the game of volleyball by millions of people, proves that it is one of the most beloved sports games in the world, in which it is aimed at keeping the ball in play in its own field in the best conditions and sending it as difficult as possible to the opposing court to force him to make mistakes. At the amateur level, the game is extremely attractive due to the lack of direct contact with the opponent, the involvement of all participants in the game and the easy-to-understand regulation. At the professional level, the game of volleyball excels through spectacularity, twists and reversals, therefore, increased tension for viewers. Many sports enthusiasts consider volleyball to be the team sport, in which every touch of the ball is directly influenced by the previous touch of a teammate or opponent. In this sense, each contact inevitably depends on the previous one and will then have an effect on subsequent contacts. However, as Karch Kilary (one of the greatest volleyball players of all time) says: "The game of volleyball cannot start without serving, and serving is the only technique that is totally under your control." (Kiraly, 2000). Thus, the service is the only technical process in which no previous contact directly affects the result of subsequent infringements. The other technical procedures such as passing, taking over, blocking or attacking make the difference between the teams in a match, but service remains the only technical process in which the player has direct control.

Key words: volleyball, attack, defence, service, efficiency.

*** * * * ***

INTRODUCTION

The research on the efficiency, technique and accuracy of the service are also relatively numerous, but the data it reveals are relatively homogeneous, which denotes the specificity of the game and the peculiarities of the teams and echelons of training. Previous research on the efficiency of service kicks, carried out with maximum efficiency i.e. aces, were carried out by Monge (2001) which obtained a value of 40%, a relatively high value we could say if we compare

* Corresponding Author

it with the one recorded by Anastasi (2011) which recorded an efficiency between 10-15%, at the level of the same echelon - division A.

The technical deficiencies highlighted by a low efficiency of the service facilitate the play of the opposing team. Within the teams in the upper echelon there is a constant concern to study the tactics of the opponent before the match, from the point of view of the team as well as individually, this also directing the training of the service to the areas or players with reception difficulties. The emphasis will be on improving the direction of the areas where the service will be performed, which will become a tactical weapon, which aims to increase the difficulty. In this case, the attacking phase I will suffer greatly giving its own team the opportunity to build its defense phase and counterattack phase II in accordance with the requirements of the coaches and the proposed objective, that of winning the point.

Over time, the service has gone through numerous transformations and attempts to increase the team's performance, by executing this game action both from a technical point of view and from the point of view of the force, speed and precision. If in the past the service was only the reinstatement of the ball, at present it is a formidable weapon for the team that owns it. "The service during the competitive game is manifested by specific individual executions, in which each player uses a single process adapted to his possibilities and perfected as such, by emphasizing one of the attributes: precision, force or gliding" (Ghenadi V,. 1984).

The evolution over time of the game of volleyball has also left its mark on the service, both in terms of "fixing the tests to one" and "on the diversity of the execution procedures" (Bac, O., Pop N., 1995). The diversity of services arose due to the constant concerns of players and coaches to find the ideal procedure that would combine the trajectory and intensity of the blow with precision and safety.

The technique at work has been constantly changing since its inception. Due to the changes in regulation, but also the evolution of the game and the players, the service can be the key element in a game of volleyball. In the "early period" (Bac, O., 1999) of volleyball, most of the services were performed from the bottom and did not put in too much difficulty the team at the takeover. This process is still preserved today in the mini-volley and beginner or amateur teams. The "classical stage (1947-1963)" is characterized, from the point of view of the service, by the appearance of the service from the side and the top one, procedures that went in parallel until the 80s, with an advance for the service from above, an increasingly consistent advance, until the almost complete disappearance of the service from the side, with the advent of the service from the jump. The jump service was first performed at the 1984 Olympics by Brazilian player Renan Dal Zotto. This type of service was quickly adopted by most teams, defending various variants of the service in the jump. We currently have the service in the jump in force, the service in the floating jump and the service in the hybrid jump, which is a combination of the two services mentioned above.

Figure 1 Jump Serve
(Source: http://www.volleyball-training-ground.com)

As for the speed of the ball reached at service, it is, on average, between 60 and 65 Km/h. The maximum service speed recorded for men's volleyball is 134 km/h (Ivan Zaytsev - Bulgaria). For women's volleyball, maximum values were recorded around 100 km/h. The main procedures for the execution of the service in the game of volleyball (Mârza, D., 2006) could be classified as such:

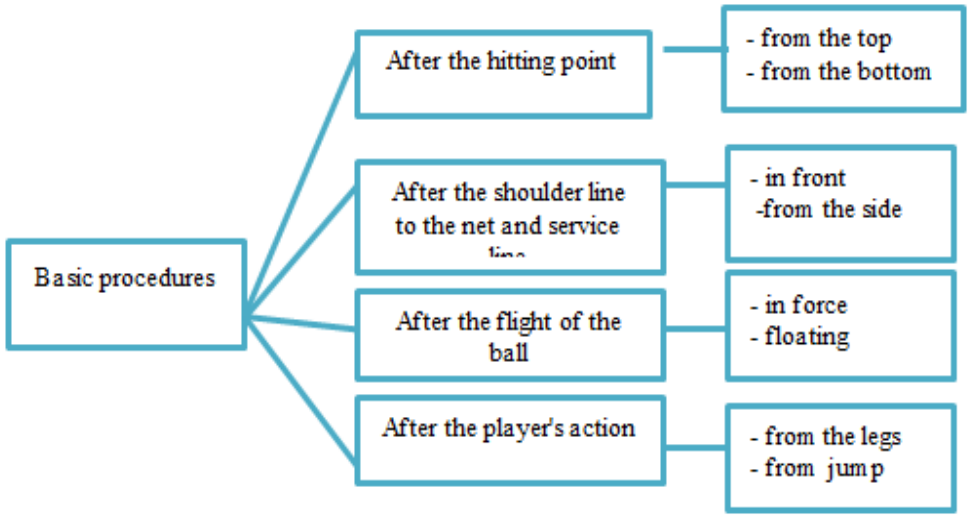

Figure 2 The main execution procedures of the service

Currently, the established execution procedures at work are: the service on the legs (in force and floating), the service in the jump in force and the service in the floating jump, processes that have been studied in the present research. With the upper echelons of the sports classification, the service becomes more and more perfected (whether it is run from the jump in great force or gliding), aspects that can lead to the end of the game cycle faster, without being able to continue with the next structures of the game. In the past, the services were executed mainly from zone 1 - about 80%, currently they are executed from all the areas that are behind the field: zone 1, zone 6, zone 5, depending on the tactics of the game approached by the opposing team in phase I of reception and the indications given by the coach both visually and verbally.

RESEARCH SUBJECTS

The research was carried out within the Women's National Volleyball Championship, the echelon of division A1, in the competitive seasons 2017-2018 and 2018-2019. The A1 Women's Division comprises a number of 10 teams, namely CSM Bucharest, CS Alba Blaj, CS Ştiinţa Bacău, CSM Târgovişte, ACS Agroland Timişoara, CSM Lugoj, CS Dinamo Bucharest, CS "U" NTT Data Cluj, ACS Penicilina Iaşi and CSU Medicina CSS Tîrgu Mureş. A number of 8 matches from the 2018-2019 competitive season were analyzed, carried out by the top 6 teams ranked at the end of the season. The matches were recorded personally with the help of a TV Tunner, from DigiSport TV broadcasts. The teams were, following the ranking at the end of the season, CSM Bucharest, CS Alba Blaj, CS Ştiinţa Bacău, CSM Târgovişte, ACS Agroland Timişoara and CS Dinamo Bucureşti (Table 1).

Table 1 Research subjects

Teams	Average age (years)	Height (meters)	Nationality	
			Romanian	Another
CSM București	26,5	1,84	5	6
Alba Blaj	28,2	1,84	3	8
Bacău	28,8	1,86	10	1
Târgoviște	28,6	1,84	5	6
Dinamo	25,1	1,81	11	0
Timișoara	23,1	1,81	10	1

According to the statistics existing on the website of the Romanian Volleyball Federation, in the 2018-2019 season, a number of 15,003 services were performed, out of which 1,303 aces and 1,431 wrong services were performed (Figure 3).

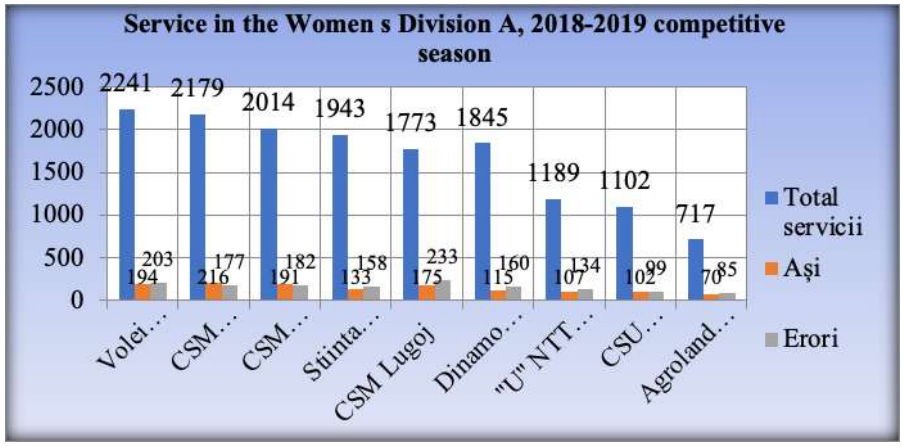

Figure 3 Service in the Women's Division A, 2018-2019 competitive season

MATERIALS AND METHODS

In this paper we watched a number of 8 official matches of the teams located on the first 6 places at the end of the 2017-2018 competitive season, in the first echelon of the Romanian women's volleyball. In these games we followed the services performed by both teams, in terms of their type, their directing to the different areas of the opposing field, their impact on the opposing defense. The study was conducted to highlight the efficiency and influence of the service in the game of volleyball, in the A1 Division of the National Women's Championship of Romania.

The service techniques were grouped into: Jump Serve (JS), Float Jump Serve (FJS) and Float Serve (FS). For each type of service, a number of parameters were recorded: the area from which the service was performed (Z), the defense area in the opposing court where the ball was directed (FZ), the result of the service highlighted by the quality of the reception (0^+,0^-) and its influence in winning the point by the team that served, the number of aces and mistakes at service.

The effectiveness of a service can be quantified on the basis of the ability of the receiving team to receive the service. The reception of the ball is qualitatively analyzed based on the number of attack options that the lifter has, after the receptions is carried out. Thus, the more attacking options at their disposal, the more likely it is that the incoming team will win the point.

Therefore, we considered to divide the quality of the service, according to the quality of the reception, into two categories: 0^{-}, which determines a good reception quality, which allows the possibility of passing by the setter to at least 2 players on the attack in line 1, making tactical attacking schemes; 0^{+}, which determines a poor reception quality, after the 3-meter line of the field, the setter not having the possibility of passing the ball in good condition to the players in line1; the setter passes with two hands from below; the setter does not reach the second ball, which is passed by another player; the ball is passed into the opposing court without attack; "ace" we considered the services that fell directly into the opposing court without being touched by the players in the reception, but also those who had a poor reception, which did not lead to the return of the ball to the opposing court.

As for the area from which the service is performed, it corresponds to the area of the field, from the second line, according to the numbering of areas in the official regulation of the game of volleyball, respectively 1, 6 and 5, from left to right. Regarding the division of the land into zones for the receiving team, we numbered the areas according to the same criterion.

The data collection was made on an observation sheet designed specifically for the present work, made by hand, a sheet that respects the cifric language specific to the volleyball game. The objective pursued by the records made was both qualitative (their effectiveness, reflected in the quality of the receptions) and quantitative (the total number of services performed, per area of the volleyball field). The registration sheet includes the observation of the service on each set separately, but also cumulatively over the entire game, contested by both teams involved.

RESULTS AND DISCUSSION

In the eight matches analyzed, a number of 1,032 services were executed, of which: 95, representing 9% of the total services, were marked with "-",was wrong services; 58, representing 6% of the total services, were marked with "+", services that turned into a direct point for the team at reception; 601, representing 58% of the total services, were marked with "0^{-}", services that had a good quality reception; 278, representing 27% of all services, were denoted by "0^{+}", services resulting in poor reception quality.

- **Table 2** The quality of serve

Quality serv./ Process	-	0^{-}	0^{+}	+	Total
FS	**23**	**154**	**64**	**15**	**256**
% from FS	9%	60%	25%	6%	100%
% from TS	2%	15%	6%	1%	25%
JS	**19**	**49**	**23**	**6**	**97**
% from JS	20%	51%	24%	6%	100%
% from TS	2%	5%	2%	1%	9%
FJS	**53**	**398**	**191**	**37**	**679**
% from FJS	8%	59%	28%	5%	100%
% from TS	5%	39%	19%	4%	66%
Total	**95**	**601**	**278**	**58**	**1032**
	9%	58%	27%	6%	100%

From the point of view of the procedure used at service, we note the following: the most used procedure at service was the Float Jump Serve (FJS), with 679 services, representing 66% of the total services; the least used procedure was the Jump Serve, with only 97 executions, representing 9% of the total services performed; the Float Serve (FS) had a total of 256 executions, representing 25% of the total services.

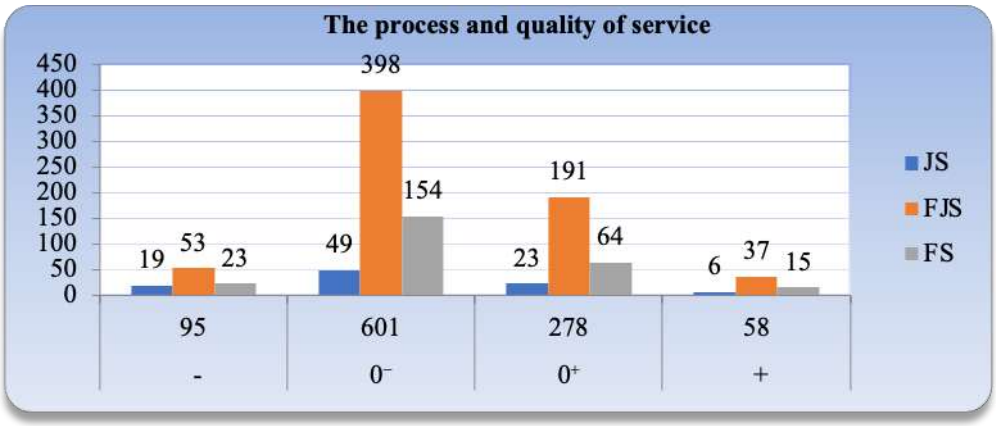

Figure 4 Comparative graph on the process and quality of service

In Figure 4 it can be seen that the highest number of aces was made from the FJS process (37 points directly from the service), but as a percentage, it was at the same level as those made from the other processes; the highest constancy was found in fs and FJS processes with only 9% and 8% of the respective wrong service process, respectively; The JS process was the most unsteady, with 19 wrong services, accounting for 20% of the total services of this kind; The process that generated the most poor quality receptions (0^+) was FJS, with 191 services, respectively 28% of the total FJS services and 19% of the total services; The FS and FJS processes generated good quality pickups in 60% of cases, while the JS process, which gives the ball a higher speed, had good receptions in 50% of cases.

Regarding the execution area, we note that most of the services were performed from zone 1 (496 services, representing 48% of the total services), followed by zone 5 with 387 services (representing 37.5%) and zone 6 (149 services, 14.4%).

Regarding the area of directing the service, we note that they were mainly directed to zone 5 (440 services, representing 42.6% of the total services), followed by zone 6 with 324 services, i.e. 31.4% and zone 1 with 268 services, representing 26% of the total services.

From the data presented we notice a more balanced distribution by area in terms of service targeting, compared to the execution area. We can also see that the services performed from zone 6 were directed equally to the 3 pickup areas, compared to the services performed from zone 5, which went to zone 5 of the opposing land (47.5% of the services executed in zone 5), representing a service with a straight trajectory, easier to execute. The services performed from zone 1 were also directed to zone 5 of the opposing land (41% of the total services performed from zone 1), followed by zone 6 (30.6%) and zone 1.

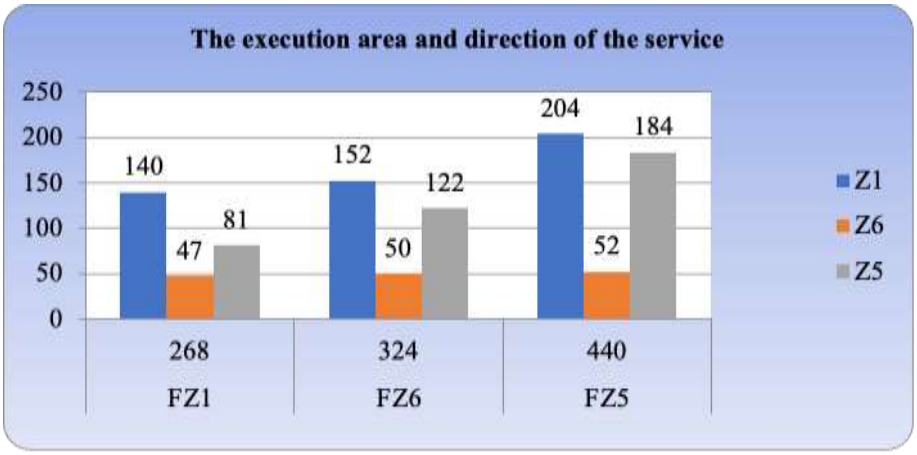

Figure 5 Comparative graph of the execution area and direction of the service

In figures no.6 and 7 we have graphically represented the quality and the process used at service, on each area of its execution, respectively on the targeting areas in this way: the services performed in zone 5 put in greater difficulty the opposing defense, regardless of the procedure used (121 services with a rating of 0^+, representing 31% of the total services performed in zone 5), compared to those in zone 1 (117 services, representing 23.5%) and those in zone 6 (40 services, 27%). Most of the wrong services were performed from zone 1 (48 services), the highest percentage being, however, in zone 5 (10.3% of the total services performed in this area).

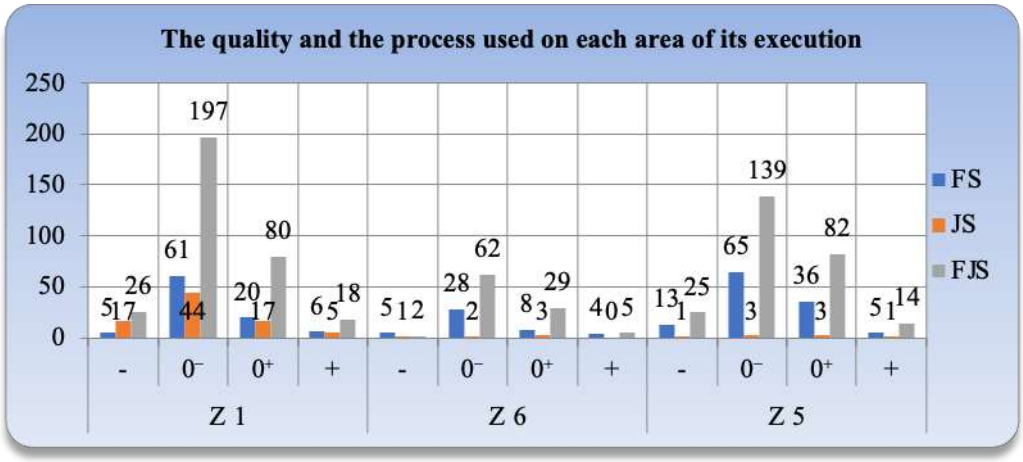

Figure 6 Comparative graph regarding the execution area, the quality of the service and the procedure used

The services performed to zone 5 put in greater difficulty the reception of the opposing team (124 services with a rating of 0^+, representing 28,2%), compared to zone 6 (84 services, 26%) and zone 1 (70 services, 26%); lowest percentage of wrong services were directed to zone 6 (5.2%), coming as a confirmation due to the placement in the middle of the field of this area; the largest number of aces were directed to zone 5 (6.6%), and as an execution process, the service in the jump in force has the highest percentage (6.2% of the total JS services).

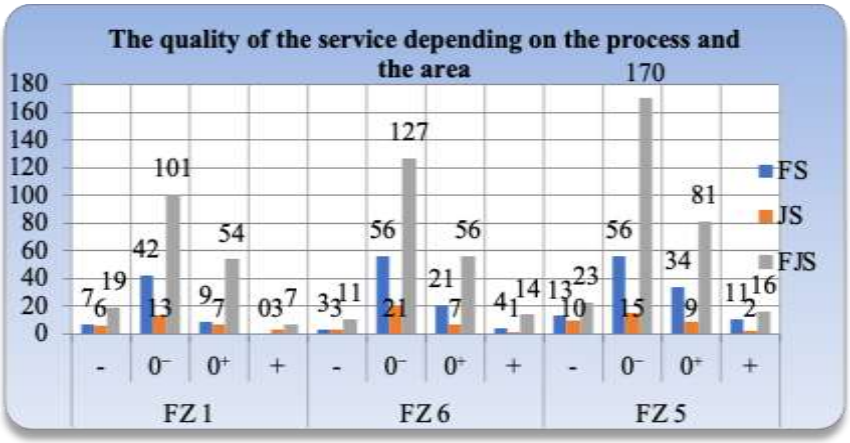

Figure 7 Comparative graph regarding the targeting area, the quality of the service and the process used

Here are the following in both centralizing tables the distribution of services according to the area of their execution and targeting, for each match analyzed in the present paper.

From the analysis of table no.5 we can see the following: the minimum regarding the service performed from an area, was reached in the match no.7, with only 1 service executed from zone 6; most of the services performed from an area were performed in the match no. 4, with 105 services in zone 1; the average of the services performed in zone 1 was 62 services, 3.33 times more than those performed in zone 6; the standard deviation is even greater as the area of execution or direction to the service is less used.

Table 5 Statistical index on the distribution of services by execution area and its directions

Game	Z1			T Z1	Z6			T Z6	Z5			T Z5	Total
	FZ1	FZ6	FZ5		FZ1	FZ6	FZ5		FZ1	FZ6	FZ5		
TOTAL	**140**	**152**	**204**	**496**	**47**	**50**	**52**	**149**	**81**	**122**	**184**	**387**	**1032**
%	28%	31%	41%	**48%**	32%	34%	35%	**14%**	21%	32%	48%	**38%**	100%
MIN	4	9	11	**33**	0	0	1	**1**	2	9	6	**31**	113
MAX	32	31	50	**105**	22	12	18	**48**	14	20	47	**69**	146
AVG	17,5	19	25,5	**62**	5,875	6,25	6,5	**18,6**	10,1	15,3	23	**48,4**	129
STDEV	10,8	7,1	15,2	**27,5**	7,1	4,5	6,3	**16,5**	3,9	3,7	13,0	**13,6**	9,9
C.V	62%	37%	60%	**44%**	121%	72%	97%	**89%**	39%	24%	57%	**28%**	8%

Thus, we can see that the services directed from zone 5 to zone 6, has the lowest standard deviation (3.7) but also the highest degree of homogeneity (24%); the high and very high values of the calculated variability coefficient indicate a large and very high lack of homogeneity due to the large dispersion of the obtained data. Most of the matches analyzed were played between teams with different styles at work, hence the large dispersion of data.

From the data presented in table no.6 we can see the following: most of the wrong services were recorded in the match no.1, with the FJS, and the highest number of aces, in match no.8, with 9 services by the same FJS procedurę; the highest number of good quality services (0^+) were

registered in match no.2, with 33 services from the FJS process; the average quality services 0^+ of the FJS process was 23.9, almost 3 times higher than those of type FS and 8 times higher than those of type JS; the calculated variability coefficient recorded high and very high values, except in the case of the FJS service, which, as we could see, is the most used process at work, having a high constancy compared to the other processes. It recorded a coefficient of 20%, indicating an average variability in terms of FJS service.

Table 6 Statistical index on the quality of processes

Game	FS				T FS	JS				T JS	FJS				T FJS	T
	-	0^-	0^+	+		-	0^-	0^+	+		-	0^-	0^+	+		
T	**23**	**154**	**64**	**15**	256	**19**	**49**	**23**	**6**	97	**53**	**398**	**191**	**37**	679	**1032**
%	9%	60 %	25 %	6%	25 %	20 %	51 %	24 %	6%	9%	8%	59 %	28 %	5%	66 %	100 %
MIN	1	2	2	0	6	0	0	0	0	0	3	35	14	1	62	113
MAX	5	38	13	4	54	5	13	5	2	20	11	72	33	9	110	146
AVG	2,9	19	8	1,9	32	2,38	6,13	2,88	0,75	12	6,63	49,8	23,9	4,6	84,9	129
STDEV	1,2	11,5	4,0	1,5	15,8	2,1	4,8	2,2	0,9	7,4	2,4	14,6	6,0	2,4	16,9	9,9
C.V	43 %	60 %	50 %	78 %	49 %	90 %	79 %	75 %	118 %	61 %	37 %	29 %	25 %	53 %	20 %	8%

CONCLUSIONS

Following the interpretation of the data collected in the graphs and tables drawn up, we conclude the following: the first 6 teams of Romania, in the 8 analyzed matches, mainly opted for zone 1 as the service execution area (48% of the total services) and for zone 5 as its targeting area (42.5%); the most used procedure at service was Float Jump Service (66%), and the least used, the Jump Service (9%); percentage of aces achieved was 6% of the total services, compared to 9% of the percentage of wrong services; services noted with good quality represented 27% of the total services, 2.15 times fewer than those that did not pose problems of taking over from the service. They were mainly directed to zone 5, being executed from zone 5, and the most used procedure was the Float Jump Service. Most unsteady procedure was the Jump Serve, with a percentage double that of the other procedures. This can also be influenced by the relatively small number of players who master this procedure, only 4 of the 6 teams analyzed using the Jump Serve. The Jump Serve can be very useful in increasing defensive "conflict zones" for the purpose of direct registration of "aces", or to make it difficult to play offensively following the reception of the service. Share of tactical services, directed to the areas of line 1, was below 0.5% per game, which is why these services were not taken into account. Tactics at service are different from match to match, in terms of both the area from which the service is performed and the area of its targeting, especially for the teams located at the top of the ranking, CSM Bucharest and Volleyball Alba Blaj.

By watching the execution of the services we noticed the lack of variation in terms of the distance from the bottom line of the field, most of the Float Services being from the boundary of the field.

The results obtained are in line with those reported by other studies, which have shown that the Jump Service is the one that creates the most aces, but at the same time the technique that

generates the most mistakes. This must be taken into account in the crucial phases of the game, the service techniques having to be used strategically.

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Submitted: September 14, 2021
Revised: December 13, 2021
Accepted and published online December 27, 2021