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QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF MOTIVATION IN THE FIELD OF PHYSICAL EDUCATION AND SPORTS

István SOÓS[1,*], Iulianna BOROS-BALINT[2], Pál HAMAR[1]

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ABSTRACT. Introduction: Learning the quantitative and qualitative characteristics of motivation provides important information for understanding the behavior in physical education and sports in young people. Sage (1977) describes motivation as one's effort towards certain activities and its intensity. Motivation is deeply rooted in the individual based on Vallerand's (1987) hierarchical model, and its type (intrinsic versus extrinsic motivation) can change during the activity, as well as sometimes remains hidden. **Method:** Four hundred and nine students took part in our research, whose average age was 15.0 years. In addition to the questionnaire based on the Theory of Planned Behavior (TPB), research participants filled out the Behavior Regulation in Exercise Questionnaire (BREQ-2) regarding to the Self-Determination Theory (SDT). Respondents also reported the support they received from their social environment for physical activity, as well as what their future intentions were and how their past behavior and current behavior have developed. Data analysis was performed by employing IBM SPSS v. 25 and AMOS v. 24 software packages. **Results and conclusions:** In our study social support influenced young people's intention to perform physical activity as a current behavior. According to the Trans-Contextual Model (TCM) results revealed how autonomous motivation transfers across contexts (e.g., from school/education to free living) and therefore explained how leisure time behavior is reinforced. Our data confirmed the strongest positive relationship between students' past behavior and current behavior followed by a moderate relationship in students' past behavior and intention. Thus, the relationship between past behavior and current behavior was also moderate. Results have implications beyond physical activity, and can help understanding

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of why young people make a range of choices related to health. Results can also aid the development of educational materials and practical methods to motivate young people to choose a healthy, physically active lifestyle. **In conclusion**, from a school context to leisure time can help educational and health practitioners to understand what influences health-related physical activity behaviors in young people. Physical education classes are supposed to instill behaviors and attitudes that promote physical activity in free-time and promote healthy lifestyle. Nevertheless, according to our findings, the expected function of physical education in schools fails to meet the criteria that lead to developing self-determined or autonomous motivation to young students' leisure time intention, and especially physical activity.

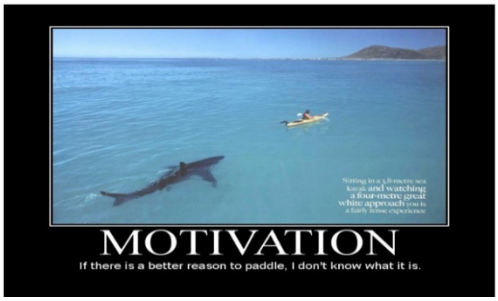
Key words: *Motivation, qualitative, quantitative, students, physical education*

Introduction and rationale

Ford (1992) thirty years ago introduced 32 theories of human motivation in her book. She also described the role of beliefs in personal actions as well as how goals and emotions influence individuals' motivated behaviours.

Learning the quantitative and qualitative characteristics of motivation provides important information for understanding the behavior in physical education and sports in young people. Sage (1977) describes motivation as one's effort towards certain activities and its intensity. Motivation is deeply rooted in the individual according to Vallerand's (1997) hierarchical model that was developed 25 years ago. Its type (intrinsic versus extrinsic motivation) can change during the activity, as well as sometimes remains hidden. It also depends on personality (global level of motivation), on context (e.g. sports activities in PE, learning at schools or situations (e.g. the importance of a specific sports competition or an exam situation, etc.).

Please see an example below of how intrinsic motivation (paddling for enjoyment) can change to extrinsic motivation (paddling for life saving).



Internationally, we can come across different approaches, and quite a few publications comparing cultures write in support of the pedagogical benefits of a favorable motivational atmosphere (e.g. task orientation in physical education at school) or of the freedom of decision and the supportive effect of the social environment in the sense that these with the help of motivational effects. It is possible to prevent the individual from becoming a habit of a sedentary lifestyle (sedentary behavior), which is especially important in adolescence (Biddle, Soós & Chatzisarantis, 1999). Not only the degree of motivation, but also its orientation and type play an important role in the spread of a physically active and healthy lifestyle among young people. The consolidation of internal regulation during the teenage years is a good indicator that the individual will most likely remain physically active for the rest of his life. Motivation means an individual's internal need, which begins with intention, and the more it becomes a determination, consequently enhancing the motive.

The motivational ladder for the individual: in addition to praise, he/she also receives sports equipment - praise and rewards -; earn discounts with prizes or camp for free; may appear in a newspaper; the method of emotional influence, the awakening of the conscience; activating a sense of responsibility or as an example - "You are capable of it, you can do it!" – the power of words, personalized, appropriate sentences. In order to achieve someone's goal, stricter behavior is necessary; someone can get the most out of themselves based on objective data; someone needs words of support. Group and individual discussion - short-term and long-term familiarization and acceptance of the realistically achievable goals of the community and the individual; good community, friendly relations; involving more experienced and successful athletes; setting goals, setting sub-goals and/or short, medium and long term goals. It should be possible, for example, to have a "challenge", when only one (partial) distance has to be completed, but within a specified time. If they are afraid of the challenge, we can ask them to fight not only for themselves, but also for others, for example their peers or even their parents (Hamar and Mocsai, eds., 2019). Young people should be considered partners, they can be involved in the planning of physical training, naturally under control, which means that, for example, the physical educator or the parent creates the framework within which they can move. Often it is enough to just listen to them and they can tell us about their real or perceived problems. Another motivational method is to observe what young people like and what they don't like during exercise, and at the same time to get information about them from their parents, family members and friends (autonomy support). Motivation is also considered the arousal of desires for an activity; the set of procedures and methods for training, learning, physical training or even competition; as well as the atmosphere which ensures that the young people, nourished by their inner need, successfully carry out their tasks with

adequate courage and self-confidence. In addition to arousing the internal demand, the means of motivation is also encouragement from the teacher or parent, on the one hand when setting goals, and on the other hand in the process of achieving performance. After achieving the set goals and results, higher-level demands, the formation of attitudes, and the mobilization of greater energies for health-supporting exercise or performance enhancement follow (Hamar and Mocsai, eds., 2019). Motivational theories have undergone tremendous development. For example, Franken (1998) found that motivation is related to arousal, orientation, and persistence of behavior. Motivation can be controlled by both external and internal driving forces (drives). In early motivational research, instincts, needs and drives were the factors of human behavior regulation. This represented a mechanistic view, and the main focus was on homeostasis, i.e. the stability-maintaining mechanism. Early theories were concerned with reducing arousal, protecting the self, and meeting needs, while human capacity for the self or self-regulation was not considered relevant. Concepts of motivation were later linked to cognitive theories, such as rational levels of decision as opposed to emotions and desires (Ford, 1992). The role of self-evaluation thoughts increased, the central question became the quality of motivation (e.g. the process of increasing and transforming motivation, shaping behavior, and the hope of success and perfection). Cognitive (learning theory) explanations were based on expectations, causal attributions and locus of control. Even today, primarily in Western cultures, the cognitive direction is the dominant approach, although it is often combined with the evaluation of different emotional processes. Among the earlier mentioned thirty-two motivational theories described by Ford (1992), some motivational theories play a particularly important role in research related to physical activity and sports, such as achievement motivation or achievement goal orientation theory (Achievement Goal Orientation Theory; Nicholls, 1984). The two parts of the theory are task-centric orientation and egocentric orientation. In addition to this theory, the Self-Determination Theory and Theory of Planned Behavior are the other most commonly used approaches in sports-related studies.

The aim of our study was to develop a model (Soós et al., 2019) that will be able to explain the relationships between different motivational factors that can determine health-related physical activity behaviors.

Method

Three hundred and eighty-nine Hungarian and one hundred and eighty-three Romanian students took part in our research, whose average age was 15.1 years. In addition to the questionnaire based on the Theory of Planned Behavior (TPB), research participants filled out the Behavior Regulation in

Exercise Questionnaire (BREQ-2) regarding to the Self-Determination Theory (SDT). Respondents also reported the support they received from their social environment for physical activity, as well as what their future intentions were and how their past behavior and current behavior have developed. Data analysis was performed by employing IBM SPSS v. 25 and AMOS v. 24 software packages.

Results

In our study social support influenced young people's intention to perform physical activity as a current behavior. According to the Trans-Contextual Model (TCM; Figure 1) that comprises SDT and TPB as well, results revealed how autonomous motivation transfers across contexts (e.g., from school/education to free living) and therefore explained how leisure time behavior is reinforced. Our data confirmed the strongest positive relationship between students' past behavior and intention followed by a moderate relationship in students' past behavior and attitude. The relationship between past behavior and current behavior was also moderate (Table 1). Results have implications beyond physical activity, and can help understanding of why young people make a range of choices related to health. Results can also aid the development of educational materials and practical methods to motivate young people to choose a healthy, physically active lifestyle.

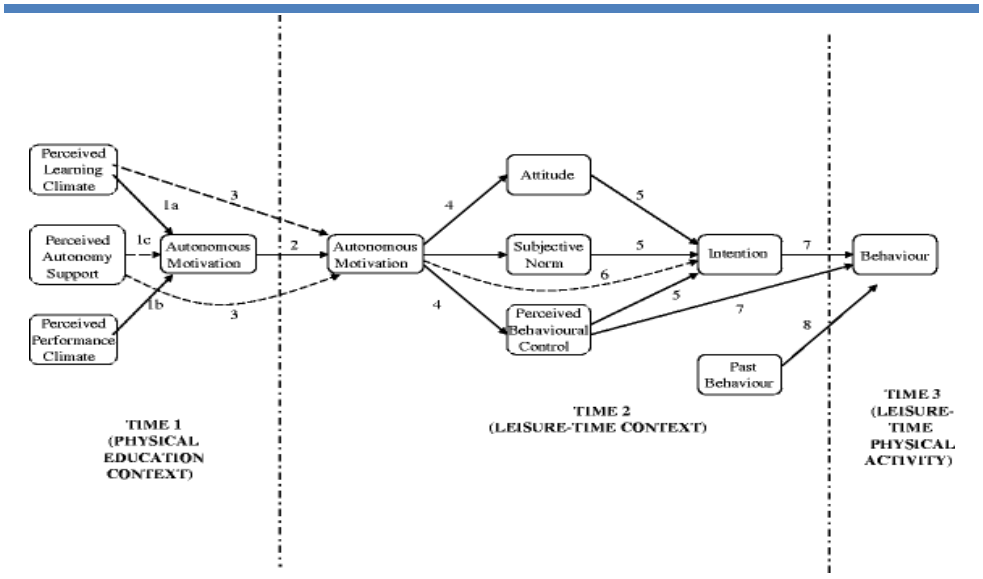


Figure 1. Trans-contextual model

Table 1. *Descriptive statistics and intercorrelations among the trans-contextual model components*

Factor	M	SD	1	2	3	4	5	6	7	8	9	10
1. PAS (PE Teacher)												
Hungarian	4.61	1.21										
Romanian	2.29	0.38										
2. Autonomous Motivation (PE)												
Hungarian	1.42	2.26	-.50**									
Romanian	1.10	1.86	-.06									
3. PAS (Peer)												
Hungarian	5.10	1.26	.23**	-.25**								
Romanian	4.91	1.16	-.23**	-.02								
4. PAS (Parent)												
Hungarian	5.48	1.14	.22**	-.27**	.72**							
Romanian	5.07	1.15	-.26**	-.01	.76**	-						
5. Autonomous Motivation (LT)												
Hungarian	7.05	5.07	.12*	-.41**	.38**	.42**						
Romanian	6.98	5.02	-.07	-.07	.32**	.31**						
6. Attitude												
Hungarian	5.81	0.88	.26**	-.28**	.54**	.64**	.42**					
Romanian	5.84	1.25	-.32**	-.02	.43**	.47**	.43**					
7. Subjective norm												
Hungarian	5.36	1.06	.18**	-.20**	.55**	.69**	.25**	.55**				
Romanian	5.09	1.12	-.20**	.12	.54**	.61**	.10	.41**				
8. PBC												
Hungarian	5.69	0.97	.23**	-.27**	.49**	.57**	.36**	.68**	.57**			
Romanian	5.81	1.31	-.17*	.10	.34**	.46**	.36**	.58**	.45**			
9. Intention												
Hungarian	5.41	1.50	.16**	-.27**	.50**	.51**	.41**	.41**	.49**	.34**		
Romanian	5.03	1.48	-.31**	.04	.36**	.39**	.35**	.54**	.39**	.47**		
10. Behaviour												
Hungarian	3.72	0.52	.09	-.04	.08	.05	.05	.02	.05	.10*	.09	
Romanian	3.73	0.65	-.04	.11	.03	.14*	-.03	.12	.12	.05	.11	
11. Past Behaviour												
Hungarian	3.58	1.51	.21**	-.25**	.40**	.38**	.30**	.40**	.36**	.32**	.60**	.13*
Romanian	3.58	1.43	-.17*	-.02	.23**	.21**	.24**	.36**	.29**	.28**	.53**	.28**

Note. For Hungarian sample, N = 389; Romanian sample, N = 183; PAS = Perceived autonomy support; PE = Physical Education context; LT = Leisure-Time context; PBC = Perceived behavioural control. *$p < .05$. **$p < .01$.

Conclusion

In conclusion, from a school context to leisure time can help educational and health practitioners to understand what influences health-related physical activity behaviors in young people. Physical education classes are supposed to instil behaviors and attitudes that promote physical activity in free-time and promote healthy lifestyle. Nevertheless, according to our findings, the expected function of physical education in schools occasionally fails to meet the criteria that lead to developing self-determined or autonomous motivation to young students' leisure time intention, and especially physical activity. Further investigation is required to uncover the causes of this problem and possibly find a solution to deal with these issues in schools as well as other part of life.

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STUDY REGARDING THE IMPORTANCE OF MONITORING PHYSIOLOGICAL PARAMETERS IN ELITE FENCING

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ABSTRACT. Introduction. Fencing is a sport that requires psychomotor skills, explosive power, movement speed, reaction speed and physical endurance. Epée and foil fencers have higher aerobic capacity than sabre fencers, whereas épée and foil fencers have similar aerobic capacity. In fact, this can be due to more aerobic nature of épée and foil weapons compared with sabre. Measurement of maximum oxygen uptake (VO_2max) is the standard index of cardiorespiratory fitness, but is practical only in a laboratory setting. Over time, numerous VO_2 tests have shown that VO_2max is a quantifiable and reproducible parameter of the cardiorespiratory system's ability to meet maximum oxygen requirements. **Objective**. The *aim* of this study is to show the importance of monitoring physiological parameters by the Bruce protocol in elite fencing, specifically women's épée, in order to manage the physical training plan. **Methodology.** Cardiopulmonary fitness is monitored in dynamic conditions by testing VO_2max with the Bruce protocol of *the COSMED treadmill Ergometer.* This study was carried out over period of 8 weeks in 2021. It should be mentioned that these tests were performed after a specific training plan adapted to the pandemic period. Were included 4 female *épée* fencers, members of the Romanian National Fencing Team, aged between 22 and 36 years and with outstanding results at national and international levels. **Results**. From the total of tested physiological parameters were selected the protocol parameters (speed, treadmill incline, time) and metabolic parameters (absolute oxygens consumed (ml/min), maximum oxygens consumed (ml/min/kg), metabolic equivalents, respiratory coefficient, heart rate). These indicators were assessed for anaerobic threshold, respiratory compensation point and at the end of the test. The evolution of these parameters was followed between tests for each subject.

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Discussions and conclusions. The Bruce Protocol estimates maximal oxygen consumption (VO_2 max) as a measure of the athlete's aerobic capacity during sustained effort. In this context, the obtained results highlight an increase of the cardiorespiratory fittness to the women's *épée*, an efficient distribution of the oxygen to the tissues and a better adaptation of the cardiac function to the effort. In conclusion, the cardiorespiratory capacity monitoring through the Bruce Protocol can be an important guideline for the physical training to the elite *épée* fencers.

Keywords: *cardiopulmonary fitness, Bruce protocol, women's* épée, *elite fencing*

REZUMAT. ***Studiu privind importanţa monitorizării parametrilor fiziologici în scrima de performanţă*****. Introducere.** Sportivii care practică spadă şi floretă au o capacitate aerobă mai mare decât cei care practică sabie, întrucât scrimerii de spadă şi floretă au o capacitate aerobă similară. **Obiective.** Scopul acestui studiu este de a demonstra importanţa monitorizării în dinamică a parametrilor funcţionali la sportivele lotului naţional de scrimă, mai precis spadă, în vederea dirijării planului de pregătire. **Mijloace şi metode**. Capacitatea cardiorespiratorie a fost monitorizată în dinamică, prin aplicarea protocolului Bruce COSMED treadmill Ergometer. S-au evaluat 4 spadasine, cu vârste între 22 şi 36 de ani, membre ale lotului naţional de scrimă şi cu performanţe mondiale şi olimpice, pe o perioadă de 8 săptămâni, în 2021. Trebuie menţionat faptul că aceste testări s-au efectuat după un program de antrenament adaptat perioadei pandemice. **Rezultate.** Din totalul indicatorilor înregistraţi prin protocolul Bruce s-au selectat parametrii de testare (viteza de alergare, gradul de înclinare al platformei, timpul) şi parametrii metabolici (consumul absolut de oxigen (ml/min), VO_2 maxim (ml/min/kg), frecvenţa cardiacă, echivalentul metabolic şi coeficientul respirator). Aceşti indicatori au fost apreciaţi pentru pragul anaerob, punctul de compensare respiratorie şi la finalul testului. Pentru fiecare subiect s-a urmărit evoluţia acestor indicatori între testări. **Discuţii şi concluzii.** Testul Bruce estimează absorbţia maximă de oxigen (VO_2 max), ca măsură a capacităţii aerobe a atletului în efort susţinut. Toate sportivele s-au adaptat rapid la planul de pregătire după „blocajul" pandemic, reuşind în 8 săptămâni de pregătire fizică să-şi îmbunătăţească sau să-şi menţină capacitatea cardiopulmonară la pragul „excelent" conform normelor de referinţă standard. În acest context, rezultatele obţinute evidenţiază şi o distribuire eficientă a oxigenului la ţesuturi corelată cu o bună adaptare a funcţiei cardiace la efort. În concluzie, monitorizarea funcţiei cardiorespiratorii prin protocolul Bruce poate reprezenta un important criteriu în dirijarea pregătirii fizice a spadasinelor din lotul naţional.

Cuvinte cheie: *capacitate cardiorespiratorie, protocol Bruce, scrima de performanţă*

Introduction

Fencing is a combat sport that requires psychomotor skills, explosive power, movement speed, reaction speed and physical endurance. At the same time, reaching the tournament finals involves both anaerobic and aerobic performance during bouts. (Bhatt et al., 2021)

Fencing belongs to a group of martial arts with variable conditions of competitive activities that determine priority in the training structure of athletes' opportunities for the effective achievement of tactical and technical set of moves (Semeryak et al., 2013).

Fencing competitions take place throughout a whole day (often lasting around 10 hours) and consist of about 10 bouts, with resting time between them ranging from 15 to 300 minutes. Roi & Bianchedi, 2008 provide data on the time-motion characteristics of winning fencers in women's épée, men's épée and men's foil at an international competition as follows: on average, an action lasts 5 seconds in foil and 15 seconds in épée (during which time the exercise is mostly submaximal) before each resting or interruption period. Moreover, during a bout, the fencer covers a total distance of 250-1000 meters, attacks 140 times and changes direction nearly 400 times in women's épée and about 170 times in men's épée and foil. In addition, Roi and Pittaluga (1997) reported a significantly higher number of changes of direction when comparing female athletes with high and low technical abilities, suggesting the existence of different tactical levels.

Abdollah et al. (2017) found that both épée and foil fencers had higher aerobic capacity than sabre fencers, whereas épée and foil fencers had similar aerobic capacity. In fact, this can be due to more aerobic nature of épée and foil weapons compared with sabre. This finding is also supported by other specialists (Aquili et al., 2013; Lavoie et al., 1985; Roi & Pittaluga, 1997) who analysed the action-pause ratio and highlighted different values for the three weapons: 1:1 for épée, 1:3.5 for foil and 1:6.5 for sabre.

Urzeală et al. (2015) highlight that valuable results can be obtained in any sport if computerised devices are used to measure cardiovascular fitness. This allow identifying the effectiveness of different training methods for the development of aerobic and anaerobic performance, monitoring the consumed energy during various motor or routine activities and determining biomechanical efficiency in performing motor skills such as walking and running.

Hill and Lupton (1923, as cited in Hawkins et al., 2007) pointed out that VO_2max measurements helped define the limits of the cardiovascular and respiratory systems to transport oxygen. Over time, numerous VO_2 tests have shown that VO_2max is a quantifiable and reproducible parameter of the

cardiorespiratory system's ability to meet maximum oxygen requirements. According to Hawkins et al. (2007) VO_2max is a valid index measuring the limits of the cardiorespiratory system's ability to transport oxygen from the air to the tissues at a given level of physical conditioning and oxygen availability.

Therefore measurement of maximum oxygen uptake (VO_2max) is the standard index of cardiorespiratory fitness, but is practical only in a laboratory setting. Current cycle ergometer tests to estimate VO_2max are difficult for inactive adults because most of these tests are lengthy and require a high initial exercise rate (Siconolfi et al., 1982).

Objective

The *aim* of this study is to show the importance of monitoring physiological parameters by the Bruce protocol in elite fencing, specifically women's épée, in order to manage the physical training plan.

Materials and methods

The participants of this study are 4 female *épée* fencers, members of the Romanian National Fencing Team with aged between 22 and 36 years. The athletes have outstanding results at national and international levels, and their competitive experience is at least 12 years.

Cardiopulmonary fitness test was performed by *the Bruce protocol of the COSMED treadmill Ergometer* to measure VO_2max consumption and heart rate. This study was carried out over a period of 8 weeks in 2021. It should be mentioned that these tests were performed after a specific training plan adapted to the pandemic period.

VO_2max testing with the Bruce protocol is a specialised and advanced investigation that offers complex information about the athlete's exercise capacity. This protocol provides a common, parallel analysis of the data that allow a complete assessment of the cardiovascular, respiratory, muscular and metabolic systems during exercise. The main function of the cardiovascular and respiratory systems is to ensure the exchange of gases between the body cells and the external environment.

Breathing is performed through a mask while simultaneously monitoring the athlete's heart rate, the dynamics of respiratory gases during exercise, the relationship between them and their relationship with heart rate and lung ventilation.

Endurance capacity indicators are maximum oxygen consumption (VO_2) and ventilation thresholds (VT1 and VT2). In addition, the athlete's anaerobic capacity, economy of motion and mechanical efficiency can be determined by gas exchange measurements.

With the help of cardiopulmonary tests, the exercise intensity zones are also defined and subsequently used in the training sessions. These intensity levels can be and are actually individualised for each tested athlete, which greatly reduces the risk of chronic fatigue and decline in performance.

VO_2max testing with the Bruce protocol is performed on a treadmill in five different speed stages of 3 minutes each, and its total length does not exceed 15 minutes (Figure 1). At each stage, the speed and gradient of the treadmill are elevated to increase work output, and thus the test becomes increasingly difficult and exhausting.

Figure 1. The Bruce protocol

The international ethical guidelines were respected: the participants' informed consent was obtained, and the anonymity and confidentiality of the data were ensured.

Results

The Bruce Protocol is used as an effort test meant to investigate the cardiovascular capacity. The main benefit of this assessment tool is the identification of the fitness level by means of the cardiac function and maxim oxygens consumption. Also, it is considered an indirect maximal oxygen uptake test because it estimates VO_2max using a formula and the person's performance on a treadmill as the workload is increased.

From the total of the Bruce test parameters were selected the protocol parameters: time (s), speed (Kmh), treadmill incline (grade %) and metabolic parameters: absolute oxygen consumption (ml/min), maximum oxygen consumption (ml/min/kg), metabolic equivalents (MET), respiratory coefficient (RQ), heart rate (bpm). Were singled out the indicators for anaerobic threshold, respiratory compensation point and at the end of the test. The time spent on the treadmill represent test score and can be used to estimate the VO_2 maxim. The evolution of these parameters was followed between tests for each subject (table 1, 2, 3, 4).

Table 1. The values of the Bruce test parameters for subject 1 (V.G.)

	Evaluation 1			*Evaluation 2*		
Parameters	*AT*	*RCP*	*Maxim*	*AT*	*RCP*	*Maxim*
Protocol						
Time (s)	10:17	11:08	11:55	5:59	9:19	11:56
Speed (Kmh)	6.8	6.8	6.8	4	6.8	6.8
Grade (%)	16	16	16	12	16	16
Metabolic						
VO_2 (ml/min)	2697	2614	2741	1610	2251	2570
VO_2 (ml/min/kg)	43.5	42.2	44.5	26	36.3	41.4
MET	12.4	12	12.7	7.4	10.4	11.8
RQ	1.03	1.1	1.01	0.96	1.17	1.21
HR (bpm)	194	198	201	135	179	196

According to the norms of the Bruce protocol, related to the aged and sex, we notice that for the athlete V.G. was registered 44.5 ml/min/kg oxygen consumption at the first assessment, which corresponds to a *"excellent"* standard for cardiopulmonary fitness and 41.4 ml/min/kg oxygen consumption corresponding to an *"good"* standard at the second evaluation.

Table 2. The values of the Bruce test parameters for subject 2 (B.B.)

	Evaluation 1			*Evaluation 2*		
Parameters	*AT*	*RCP*	*Maxim*	*AT*	*RCP*	*Maxim*
Protocol						
Time (s)	07:34	10:56	13:15	05:39	09:30	12:50
Speed (Kmh)	5,5	6,8	8	4	6,8	8
Grade (%)	14	16	18	12	16	18
Metabolic						
VO_2 (ml/min)	2404	2921	2963	1424	2614	3096
VO_2 (ml/min/kg)	37.6	45.6	46.3	21.9	40.2	47.6
MET	10.7	13	13.2	6.3	11.5	13.6
RQ	0.96	1.1	1.18	1.01	1.12	1.37
HR (bpm)	150	180	188	115	158	182

For the fencer B.B. was registered 46.3 ml/min/kg oxygen consumption at the first assessment, which corresponds to a *"excellent"* standard for cardiopulmonary fitness and 47.6 ml/min/kg oxygen consumption corresponding to a *"excellent"* standard at the second evaluation.

Table 3. The values of the Bruce test parameters for subject 3 (A.T.)

	Evaluation 1			*Evaluation 2*		
Parameters	*AT*	*RCP*	*Maxim*	*AT*	*RCP*	*Maxim*
Protocol						
Time (s)	10:06	12:15	14:07	10:31	12:22	13:29
Speed (Kmh)	6,8	8	8	6,8	8	8
Grade (%)	16	18	18	16	18	18
Metabolic						
VO_2 (ml/min)	2776	3123	3086	3257	3613	3571
VO_2 (ml/min/kg)	41.4	46.6	46.1	49.3	54.7	54.1
MET	11.8	13.3	13.2	14.1	15.6	15.5
RQ	0.98	1.03	1.17	0.96	1.02	1.1
HR (bpm)	185	194	198	181	190	194

For the athlete A.T. was recorded 46.1 ml/min/kg oxygen consumption at the first assessment, which corresponds to an *"excellent"* standard for cardiopulmonary fitness and 54.1 ml/min/kg oxygen consumption corresponding to a *"superior"* standard at the second evaluation.

Table 4. The values of the Bruce test parameters for subject 4 (A.P.)

	Evaluation 1			*Evaluation 2*		
Parameters	*AT*	*RCP*	*Maxim*	*AT*	*RCP*	*Maxim*
Protocol						
Time (s)	07:40	09:55	11:47	03:15	07:42	11:22
Speed (Kmh)	5.5	6.8	6.8	4	5.5	6.8
Grade (%)	14	16	16	12	14	16
Metabolic						
VO_2 (ml/min)	2033	2776	2618	1285	2021	2867
VO_2 (ml/min/kg)	31.5	43	40.6	19.9	31.3	44.4
MET	9	12.3	11.6	5.7	9	12.7
RQ	1	1.04	1.18	0.96	1.16	1.41
HR (bpm)	161	180	186	88	137	178

According to the norms of the Bruce protocol, related to the aged and sex, we notice that for the athlete A.P. was registered 40.6 ml/min/kg oxygen consumption at the first assessment, which corresponds to a *"good"* standard for cardiopulmonary fitness and 44.4 ml/min/kg oxygen consumption corresponding to an *"excellent"* standard at the second evaluation.

Discussions

It has been demonstrated that, although the VO_2 threshold cannot be observed every time during testing, the obtained VO_2max is very useful in determining cardiorespiratory fitness during exercise/training.

According to Lee & Zang (2021) VO_2max values increase as a result of short-term high-intensity training, but hereditary, genetic factors should not be neglected either.

Koutedakis et al. (1993) have found that VO_2max has significant seasonal variations in performance related to fencers' physiological parameters, with in-season values lower than off-season values. Given that, the athlete's performance

lasts 3 minutes per bout in the *épée* and foil events, aerobic capacity has an important contribution to athletic success. A decrease in the VO_2max level can lead to lower performance in elite fencing. This reflects a non-systematic approach to extended training sessions.

The presence of aerobic training during the competition period is normally associated with: demanding competition hours - increase in workload, increasing concentration and the time scheduled for sport-specific technical and tactical training, limited encouragement from fencing coaches.

Conclusions

Fencing is a predominantly anaerobic sport, the energy contribution of aerobic exercise being lower and mainly involved in the submaximal movements performed in the "en-guard" position and during recovery periods.

The computerized Bruce treadmill test, as an effort test, investigate the cardiovascular capacity in order to identified the fitness level by means of the cardiac function. Applying the Bruce protocol we can identify, at the same time, the effort intensity zones, energy expenditure during physical training or metabolic rate. In conclusion, the monitoring of these parameters leads to the individualization of the physical training reducing the risks of chronic fatique and the decreased of sport performance.

Authors contribution

All authors have equally contributed to this study

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STUDY ON ELDERLY PEOPLE AS RESOURCE IN SOCIETY AND FAMILY

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ABSTRACT. In this paper, our interest has been that of identifying the possibilities of using elderly people as human resource in family and society, taking into account the present trend of doing away with the dependence state of elderly people, providing solutions to identify some active social roles that keep them active, values promoted by the theory of activity. Looking through the literature in the field, we have observed that it does not offer too many data on the social and cultural needs of retirees, on their spending free time, data which should help us find solutions to increase the quality of life. We have attempted and to a greater extent we have succeeded in promoting activities that can lead to "more active ageing", so that these people remain active on the community and territorial level as long as possible.

Key words: *retirees, family, activity, society*

REZUMAT. ***Studiu privind persoanele vârstnice ca resursă în societate şi în familie.*** În această lucrare, interesul nostru a fost de a identifica posibilităţile de utilizare a persoanelor vârstnice ca resursă umană în familie şi în societate, luând în considerare tendinţa actuală de înlăturare a stării de dependenţă a persoanelor vârstnice, oferind soluţii pentru a identifica unele roluri sociale active, care să-i menţină în activitate, valori promovate de teoria activităţii. Căutând în bibliografia de specialitate, am observat că aceasta nu ne oferă prea multe date despre nevoile sociale şi culturale ale pensionarilor, despre petrecerea timpului liber al acestora, date care să ne ajute în a găsi soluţii pentru creşterea calităţii vieţii. Am încercat şi în mare măsură am reuşit să promovăm activităţi care să ducă la o „îmbătrânire cât mai activă", astfel încât aceste persoane la nivel comunitar şi teritorial să rămână active cât mai mult timp.

Cuvinte cheie: *pensionari, familie, activitate, societate*

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Definition of the research problem

The situation of the elderly people in Romania is described in the literature of the field from rather a demographic and medical point of view. From a social perspective, there are a few regional studies that describe the differences between retirees and people employed or studies regarding the relations between generations (Ionescu, Bunescu, 2007; Tîrhaş, 2007).

The present research targets the identification and definition of aspects referring at the social and cultural life of retirees, to offer operating models of spending their free time, with the objective to keep an active and independent life, which is first of all, qualitative.

We have to mention that the instruments used in research are, generally, determined by a pre-survey (pilot research) which allows the testing of the descriptive scheme, of the instruments and procedures for work, and also the estimation of costs and anticipation of results (Mărginean, 2000). In the qualitative research on the elderly people in the municipality of Cluj-Napoca, we have used the interview as method, the technique used being that of face-to-face semi-structured interview.

The steps of the qualitative research are the following:

- The confirmation of the social self (of the researcher's position in society);
- The adoption of a perspective - in the present research we have used the functionalist paradigm;
- The choice of the study design (the face-to-face semi-structured interview);
- Collection of data – the period between July-October 2021;
- The analysis of data – the period between April-May 2022.

Introduction of subjects

The qualitative research was carried out on a number of 27 people with residence in the municipality of Cluj-Napoca, 12 men and 15 women, all subjects being above the age of 60. They have a medium level of education, respectively elementary studies/ 8 grades or less (6); 10 grades/vocational school (7), high school (10), post-high school studies (2), higher education (2).

The reason of retirement is, mostly, the age limit (19 people), the pre-retirement (4 people) and sickness retirement (4 people).

The profession of the subjects taking part in the interviews, before retirement, has the following structure: workers (10 people), personnel with medium level studies (health, education, services) (6 people), retirees (5 people), clerk, technician, supervisor (4 people), personnel with higher education (2 people). All these socio-demographic data are synthetized in the following matrix, for a better view and identification of the people taking part in the interviews (table 1):

Table 1. Socio-demographic data in qualitative research

Subjects	Age	Gender	Civil status	Education level	Profession	Reason of retirement
1	68 years	Male	married	10 grades	lathe operator	Sickness
2	66 years	Male	married	Higher education	teacher	Age limit
3	64 years	Male	married	Supervisor training	technician	Age limit
4	73 years	Male	married	10 grades	machinist	Sickness
5	68 years	Male	married	Highschool	mechanic	Age limit
6	67 years	Male	divorced	Vocational school	warehouse worker	Age limit
7	64 years	Male	divorced	highschool	warehouse worker	Pre-retirement
8	71 years	Male	married	Vocational school	retiree	Age limit
9	67 years	Male	married	Vocational school	rectifier	Age limit
10	70 years	Male	married	8 grades	retiree	Age limit
11	66 years	male	married	Military school	retiree	Age limit
12	68 years	male	married	10 grades	mechanic	Age limit
13	65 years	female	married	8 grades	textile worker	Age limit
14	68 years	female	married	Post-highschool	medical assistant	Age limit
15	58 years	female	divorced	8 grades	tailor	sickness
16	61 years	female	widowed	highschool	accountant	Age limit
17	63 years	female	married	highschool	accountant	Sickness
18	59 years	female	divorced	highschool	kindergarten teacher	Age limit
19	65 years	Female	married	highschool	cook	Age limit
20	72 years	Female	married	8 grades	care-taker	Pre-retirement
21	84 years	Female	widowed	highschool	accountant	Age limit
22	66 years	Female	married	Higher education	horticulturist engineer	Age limit
23	59 years	Female	married	highschool	chemical operator	Pre-retirement
24	74 years	Female	widowed	highschool	school teacher	Age limit
25	67 years	Female	married	Vocational school	tailor	Age limit
26	58 years	Female	widowed	10 grades	retiree	Pre-retirement
27	66 years	Female	married	8 grades	retiree	Age limit

The retiree's life style

1. The importance of the family

For most of the respondents, family remains the reference point of their lives, most answers highlighting the importance of the family in the activities carried out within it.

Table 2. Importance of the family after retirement

CATEGORY	SUBCATEGORIES	Number
IMPORTANCE OF FAMILY AFTER RETIREMENT	Involvement in grandchildren's lives	11
	Increased attention to family	6
	Other activities	5
	Accommodation of spouses to each other	2
	Same as before	3

2. The retiree's role in the family

Most elderly people see their life within the life of a family, therefore, ignoring the aspects related to family life means ignoring the most important part of the elderly's life. Keeping in touch with the family is very important, regardless of frequency.

Table 3. The retiree's role in the family

CATEGORY	SUBCATEGORIES	Number
RETIREE'S ROLE IN THE FAMILY	Administrative/household	10
	Educational	5
	Decision making	5
	Advisor	4
	Affective support	3

3. Joys/problems of retirement

Wishing to find out the pleasant and less pleasant parts of retirement, this being one of the most important parts of life, besides school, marriage, birth of children, we asked the following questions: "Which is the most unpleasant side when you are retired? Which is the most pleasant part?

Table 4. Unpleasant sides of retirement

CATEGORY	SUBCATEGORIES	Females	Males
UNPLEASANT SIDES OF RETIREMENT	Lack of activities/socialization	2	6
	Discrimination	5	
	Financial status	2	3
	Health problems	2	2
	Perspective of death	3	
	No sides	1	1

Table 5. Benefits of retirement

CATEGORY	SUBCATEGORY	females	males
BENEFITS OF RETIREMENT	Family	5	3
	Spare time/freedom	5	3
	Ability to work/health	2	2
	Spare time activities/ socialization		4
	Other benefits	3	

4. Achievements before and after retirement

To observe the differences of joys and satisfaction between the period of employment and the period of retirement, we asked the following associated questions: "Can you list the most important achievements (joys) in your life before retirement? What about those after retirement?" The subcategories formed determined us to present life situations separately from the satisfactions before retirement, and joys and satisfactions after retirement, each of them shaping a category with various subcategories.

Table 6. Achievements before retirement

CATEGORY	SUBCATEGORIES	Number
ACHIEVEMENTS BEFORE RETIREMENT	Family-related achievements	18
	Material achievements	10
	Professional achievements	3
	Social life-related achievements	2
	Hobby-related achievements	2

Table 7. Achievements after retirement

CATEGORY	SUBCATEGORIES	Number
ACHIEVEMENTS AFTER RETIREMENT	Family-related achievements	12
	Material achievements	7
	No achievement	4
	Does not mention	3
	Social life-related achievements	2

5. New acquaintances/new friends after retirement

To identify the socializing level of the elderly in the retirement period, we asked the following associated questions: "Have you met new people after retirement? Have you made new friends?" The resulting subcategories, after answer coding, were Yes or No.

Table 8. New friends/acquaintances after retirement

CATEGORY	SUBCATEGORY	female	male
NEW FRIENDS/ NEW ACQUITANCES	Yes	6	10
	No	9	2
	Total	15	12

6. Social/cultural needs of retirees

As one of the study objectives entailed the identification of the social and cultural needs of the elderly, we asked the question: "Can you mention some social and cultural needs you feel that you have as a retiree?"

Table 9. Social /cultural needs of the elderly

CATEGORY	SUBCATEGORIES	number
SOCIAL/ CULTURAL NEEDS OF THE ELDERLY	Culture	10
	Socialization	9
	Information	8
	Organized activities	5
	Health care	2
	Does not have	2
	Has an organized program	1

7. Hobbies of the elderly

One of the premises at the basis of research was the fact that the effects of retirement, as the main period in the life of an individual, can be attenuated by the availability of an extra-professional activity so that, at the moment of retirement, the individual should not feel the lack of professional roles so acutely. Research (Popovici, 2001) shows that people who prepare for the moment of retirement manage to cope with it more successfully and retirement is no longer considered a loss if the intervention of certain motivational factors is possible, such a the extra-professional activities (hobbies).

Also, to identify the motivations behind the category of "spending free time", we asked the associated questions: "Do you have a hobby? How long have you had it? How often do you practice it?"

Table 10. Hobbies of the elderly

CATEGORY	SUBCATEGORY	number
HOBBIES OF THE ELDERLY	I have no hobbies	8
	Information	4
	Manual activities	4
	Music auditions	3
	Cultural activities	2
	Others	5
	Civic responsibility	1

We mention that the qualitative research is only a stage in the study carried out on the elderly in the municipality of Cluj-Napoca, as the data obtained on qualitative research have only an orientative value, following that through further research we will complete these results with those of quantitative research, to meet the requirements of validity and fidelity specific to sociological research.

Conclusions

Influences on the identity of the elderly are mostly provided by both family and social services. These influences can be both positive and negative, in relation to the approach to the problems that face an elderly person. The family can provide a protective climate of balance by avoiding conflict, psycho-affective traumas, wants and affective frustrations, as well as factors of super and subchallenge, but such a behaviour, which takes over all the tasks of the elderly, can make them feel useless. On the other hand, even though all the social services for the elderly are so organized that they come to their aid, these services can be labelling by their own destination: the elderly, whose subculture may thus be formed.

The main objective of this paper was that of identifying the possibilities of using the elderly as human resource in the family and society, taking into account the present trend of doing away with the state of dependence of the elderly and providing solutions, by identifying active social roles, to keep them within activity - values promoted by the theory of activity.

Analysing the qualitative data of research, we can observe that the elderly can be a valuable resource for both family and community in the society they live in.

They wish to remain active and in touch with the society, taking into account the main needs signaled by them: cultural, socialization and information needs. It is interesting that these needs may be satisfied by the day centres/clubs for the elderly, but which are not accessed by them due to various reasons: they are not interested in the integration into such a collectivity or do not know of such a club. The present paper confirms the fact that the elderly can be a valuable resource to both family and society.

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COMPARATIVE STUDY ON THE LEADERSHIP STYLES OF ICE HOCKEY ACADEMY COACHES

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ABSTRACT. Leadership style is an essential component of the effectiveness of the coach's work. There are three styles of coaches generally accepted in sports: dictatorial, democratic and negligent. Each of these styles has its own advantages and disadvantages, which is why it is important to understand each of them. **Purpose of the study.** The purpose of this research was to determine, by means of an applied questionnaire, to what extent coaches use leadership styles and their impact within a sports organization. **Methods and means.** To carry out this study, the questionnaire-based survey method was used - The Coaches' Interpersonal Style Questionnaire (Pulido et al., 2018). It included 10 questions with reference to the leadership style of the coaches. The questionnaire measured 3 forms of leadership style – democratic, authoritarian and negligent. The collected data were measured using a 5-item Likert scale represented by the numbers 1 – never, and 5 – frequently/always. **Results.** The comparative graphic clearly shows an absolute dominance of the democratic style in each center, in the dictatorial style there is a predominantly significant difference between clubs, and the negligent style is used less often or never. **Conclusions.** In general, the coaches have understood the modern trends and that is why the democratic leadership style prevails, managing to involve even very young athletes in decision-making, which also implies responsibility for both parties.

Keywords: *leadership styles, sports organizations, performance in sport*

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REZUMAT. ***Studiu comparativ privind stilurile de conducere ale antrenorilor din cadrul academiei de hochei pe gheaţă.*** Stilul de conducere este o componentă esenţială a eficienţei muncii antrenorului. Exprimă modul în care antrenorul, în calitate de lider, este capabil să îşi influenţeze subordonaţii, sportivii, respectiv modul în care este capabil să influenţeze activităţile acestora. Există trei stiluri de antrenor general acceptate în sport: dictatorial, democratic şi neglijent. Fiecare dintre aceste stiluri are propriile avantaje şi dezavantaje, motiv pentru care este important să le înţelegem pe fiecare dintre ele. **Scopul cercetării.** Scopul acestei cercetări a fost de a determina, prin intermediul unui chestionar aplicat, în ce măsură utilizează antrenorii stilurile de conducere şi impactul acestora în cadrul a unei echipe/organizaţii sportive. **Metode de cercetare.** Pentru realizarea acestui studiu s-a utilizat metoda anchetei pe bază de chestionar - The Coaches' Interpersonal Style Questionnaire, acesta a cuprins 10 întrebări cu referire la stilul de conducere ale antrenorilor. Chestionarul a măsurat 3 forme ale stilului de conducere – democratic, autoritar şi neglijent. Datele colectate au fost măsurate folosind scala Likert cu 5 itemi reprezentată prin numere 1 – niciodată, iar 5 – frecvent/întotdeauna. **Rezultate.** Pe diagrama comparativă se vede clar o dominanţă absolută al stilului democratic în fiecare centre, în stilul dictatorial există o diferenţă preponderent semnificativă între cluburi, iar stilul neglijent este utilizat mai rar sau niciodată. **Concluzii.** În general, antrenorii au înţeles tendinţele moderne şi de aceea predomină stilul democratic de conducere, reuşind să implice chiar şi sportivii foarte tineri în luarea deciziilor, ceea ce presupune însă şi responsabilitate pentru ambele părţi.

Cuvinte cheie: *stilurile de conducere, organizaţii sportive, performanţă în sport*

Introduction

The coaching profession has acquired a special importance and appreciation in the social life of the contemporary world. This profession is closely related to the achievement of the nation's sports performance capacity in any particular sports branch or discipline. In other words, the higher the knowledge and professional skills of the coaches will be, at all training levels of the athletes, the higher the nation's performance will be (Casey-May, 2019).

Different leadership styles and coaching attitudes have different meanings for each athlete, causing each player to react differently to the coaching style. Athletes perceive coaches in different ways, so what one athlete sees in a coach may be seen in a completely different way by another athlete (Casey-May, 2019).

As coaches spend so much time with their athletes, it is important to understand that they not only influence athletes' abilities, but also their psychological development (Brinton et al. 2017).

With these things in mind, no single style can be applied. Sometimes there is an overlap between coaching styles, but most coaches have their own dominant style. In the case of a team, not all styles will work for certain athletes, especially if the team is full of players who cannot identify with a certain style, in which case the coach will have to change-their approach. Regardless of how good a coach is, athletes must also be able to accept one's style for their joint work to be fruitful (Aly, 2014).

Organization, administration and management are the action forces of sports organizations in any country. These three elements must work together for an association, club, league, event organizer or regional sports organization to achieve the highest level of efficiency and solve the problems that arise (Gomboș, 2012).

Leadership style is an essential component of the effectiveness of the coach's work. It expresses the way in which the coach, as a leader, is able to influence his subordinates, the athletes, respectively the way in which she is able to influence their activities (Irvin, 2016).

There are three styles of coaches generally accepted in sports: dictatorial, democratic and negligent. Each of these styles has its own advantages and disadvantages, which is why it is important to understand each of them. For the development of personal style it is important, first of all, that each coach knows their own identity and their own system of values. Generally, a coach will incorporate elements of each style in their own philosophy (Casey-May, 2019).

Table 1. Comparing different leadership styles (Irvin, 2016)

	The dictatorial style	**The democratic style**	**The careless style**
Philosophy	Focused on winning	Focused on athletes	There is no defined philosophy
Objective	Objective-oriented	Task-oriented	No objective
Decisions making	The coach takes all decisions	Involves the players	The players take the decisions
Communication style	The only who can speak	Talk, ask questions and listen	Listen
Communication Development	Little or nothing	High level	No
The meaning of victory	Coach decides	Defined by coach and athlete	Undefined
Athlete development	A low confidence	Trust the athletes	Does not show confidence
Motivation	Never or sometimes	Motivates everyone	No motivation
Training structure	Inflexible	Flexible	None

Purpose of study

The purpose of this research was to determine, by means of an applied questionnaire, to what extent coaches use leadership styles and their impact within a sports organization.

Methods and means

Subjects of study

This study was carried out in the period 01.03.2022-25.03.2022 where the coaches from the Ice Hockey Academy participated, which includes the following centers: Gheorgheni, Cârţa, Miercurea Ciuc, Tîrgu-Mureş, Tîrgu Secuiesc and Sfântu Gheorghe. A number of 32 subjects answered the questionnaire from the Ice Hockey Academy (6 from Gheorgheni, 5 from Cârţa, 6 from Miercurea Ciuc, 5 from Tîrgu-Mureş, 5 from Tîrgu-Secuiesc, 5 from Sfântu Gheorghe).

Instruments used on study

To carry out this study, the questionnaire-based survey method was used - The Coaches' Interpersonal Style Questionnaire (Pulido et al., 2018). It included 10 questions with reference to the leadership style of the coaches. The questionnaire measured 3 forms of leadership style – democratic, authoritarian and negligent.

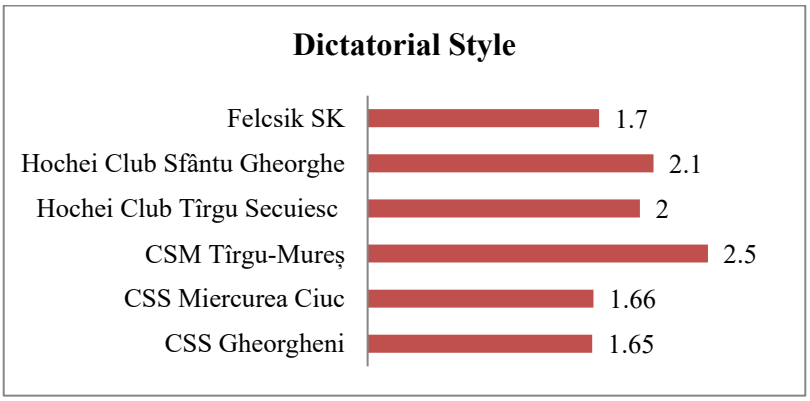
The collected data were measured using a 5-item Likert scale represented by the numbers 1 – never, and 5 – frequently/always.

Table 2. The questions from the questionnaire

Category	Number of items
Dictatorial style	2, 3 ,6
Democratic style	1, 4 ,9
Negligent style	5, 7, 8

Results

The results presented below show leadership styles of the Hockey Academy coaches for each category presented in table no. 2.

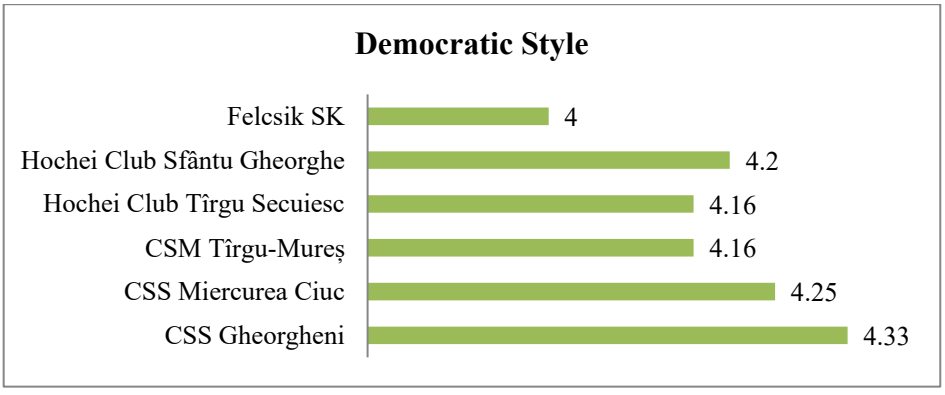


Graph 1. Dictatorial style

As it can be seen in the graph above, the centers had a different result in the "dictatorial style" category, which represents the fact that every coach sometimes also uses the dictatorial style, the most at CSM Tîrgu-Mureș, and the least at CSM Miercurea Ciuc and at CSS Gheorgheni.

The category "Dictatorship style" is exemplified in graph 1 and includes the following statements from the questionnaire:

- The coach decides for themselves what must be done and how it must be done;
- The coach avoids consulting the group regarding the decisions they want to make;
- Refuses to compromise with athletes.

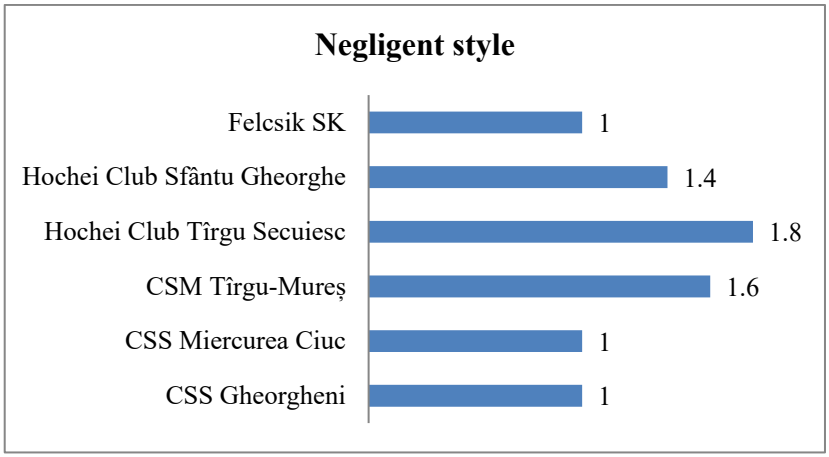


Graph 2. Democratic style

This category sees almost perfect equality between clubs, the democratic style has a massive dominance which means that most coaches often prefer this style.

The "Democratic Style" category is exemplified in graph 2 and includes the following statements from the questionnaire:

- Helps athletes with their personal problems;
- After explaining the exercise, gives the athletes the opportunity to ask questions;
- Accepts suggestions for change from the group and if he/she agrees with them, implements them.

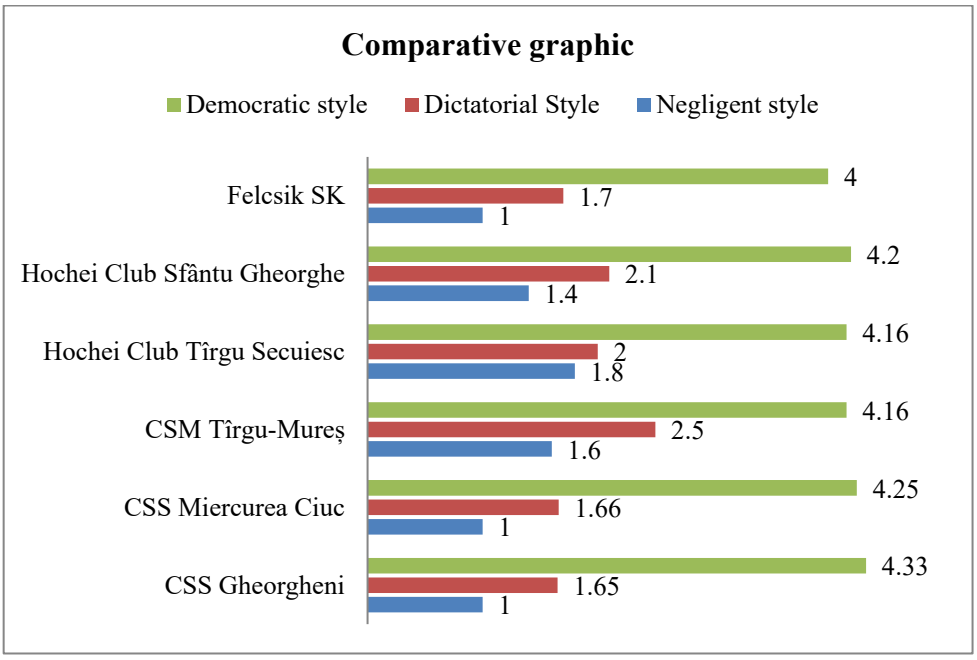


Graph 3. Negligent style

In this category, Hockey Club Tîrgu Secuiesc had a higher percentage compared to the other clubs, but in general there is no significant difference between the centers. Coaches rarely use (Hockey Club Tîrgu Secuiesc, Hockey Club Sfântu Gheorghe, CSM Tîrgu-Mureş) or never (Felcsik SK, CSS Miercurea Ciuc and CSS Gheorgheni) this style.

The "Negligent Style" category is exemplified in graph 3 and includes the following statements from the questionnaire:

- They only intervene in a situation when the problems become serious;
- They avoid getting involved when important problems arise;
- They are absent when they are needed.



Graph 4. Comparative graphic from all organizations sports

The comparative graphic clearly shows an absolute dominance of the democratic style in each center, in the dictatorial style there is a predominantly significant difference between clubs, and the negligent style is used less often or never.

Discussion

By interpreting the first item (dictatorial style), we can observe a different scores for the six centers (1.7 Felcsik SK, 2.1 Hockey Club Sfântu Gheorghe, 2 Hockey Club Tîrgu Secuiesc, 2.5 CSM Tîrgu-Mureș, 1.66 CSS Miercurea Ciuc and CSS Gheorgheni). This result implies that the dictatorial leadership style, although not dominant, is present at all centers, being the most present at CSM Tîrgu-Mureș and the least present at CSS Gheorgheni and CSS Miercurea Ciuc. When the situation calls for it, coaches also adopt this leadership style.

This type of coaching style has been shown to work better in team sports than in individual sports, and there is some evidence that the gender of the athlete also influences the level of acceptance of a coach who takes a dictatorial approach. Studies show, for example, that players on a female team

respond better to instructions from a male coach with autocratic training methods than from a female coach with the same style (Reinboth et al., 2004; Irvin, 2016).

It's a style that is generally preferred by older players over younger ones, as they have the experience and discernment to understand why they are being asked to perform certain tasks at certain times. While young players may need an autocratic approach to developing raw skills, in the long run it can be harmful for them to have no say in how training is conducted, as they do not develop a sense of autonomy in regarding training, which may affect their attitude towards sport later in life (Lyle & Cushion, 2010; Pope & Wilson, 2015)).

The second feature is shown by the democratic style, with similar results for all clubs with little variation between them. In this case, the scores were: 4 Felcsik SK, 4.2 Hockey Club Sfântu Gheorghe, 4.16 Hockey Club Tîrgu Secuiesc and CSM Tîrgu-Mureş, 4.25 CSS Miercurea Ciuc and 4.33 CSS Gheorgheni. There is a clear preference of the coaches for the democratic style at all centers. This means that the leaders also involve the athletes in their decisions and that they give them enough autonomy.

This style can be applied more effectively to individual sports. Younger players, up to the age of 14, tend to prefer the democratic style, and studies show that this style helps early teens and young adults develop a sense of leadership over their training and prepares them to work with a potential autocratic coach later in their careers (Casey-May, 2019).

The last item measured is the negligent style, where there is also little variation in results between the six clubs surveyed. Under this aspect, the scores were as follows: 1 Felcsik SK, 1.4 Hockey Club Sfântu Gheorghe, 1.8 Hockey Club Tîrgu Secuiesc, 1.6 CSM Tîrgu-Mureş, 1 CSS Miercurea Ciuc and CSS Gheorgheni. In this case, it can be seen that this is the style least used by coaches as a possible leadership style. Given that this is junior training, it would not be appropriate to apply this leadership style to these athletes.

This style is best suited to mature players who already have the skills, creativity, self-awareness and motivation to self-manage. For the coach, this approach involves building relationships and committing to athletes as individuals. Although it requires additional work, it can be effective for experienced teams if they are mature enough to handle being out of control (Sprecher & Fehr, 2011; Casey-May, 2019).

The summary chart shows the overall scores for each center for different leadership styles. There is an absolute dominance of the democratic leadership style (no score below 4), some variation of the dictatorial style depending on the club, and the careless leadership style is present either not at all (Felcsik SK, CSS Miercurea Ciuc, CSS Gheorgheni) or only to a very small extent (Hockey Club Sfântu Gheorghe, Hockey Club Tîrgu Secuiesc, CSM Tîrgu-Mureş).

Conclusions

In each of the six centres, as it can be seen from the results, the democratic leadership style is the predominant one, with every club scoring a 4 or higher on this aspect. Comparing the clubs, I can say that there is very little variation in this style of management. With this in mind, I can say that there is a higher level of satisfaction among the athletes at each club, i.e. a better quality of performance.

Regarding the dictatorial leadership style, there is some variation between the different centres, with scores between 1.65 and 2.5 based on totaling the results, which means that, to a lesser or greater extent, when it is necessary, coaches also apply this style. In such cases, work performance is higher, but this requires constant monitoring.

Comparing negligent leading style, there are some variations too, but it cannot be said that this style is dominant. Here, the scores ranged from 1 to 1.8, meaning that this leadership style is not at all or very rarely present, which is understandable given that these are junior athletes.

In general, the coaches have understood the modern trends and that is why the democratic leadership style prevails, managing to involve even very young athletes in decision-making, which also implies responsibility for both parties.

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A PERSPECTIVE ON COACHING AND ITS INTEGRATION INTO THE ANTHROPOLOGICAL CONTEXT OF SPORT COMPETITION. CASE STUDY: ROMANIAN 3RD LEAGUE, FOOTBALL

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ABSTRACT. The Romanian 3rd Football League is a socio-cultural universe of its own. The large number of participants (teams, players, technical-administrative staff, supporters, etc.), the fact that it takes place in a predominantly rural or small-town setting and its heterogeneous nature give it a specific diversity. Being a coach in this environment is a challenge. Merayo (2021) believes that the coach has to be part of the team, the club and the culture they are part of. However, in Romania's 3rd league, coaching can be considered a veritable art, with circumstances not found in any other sporting context. Coaches change very often, are caught between the same teams, having to radically change their perspective on a team, a player or a context in an extremely short time. Microsystem, mesosystem, exosystem and macrosystem are part of a model proposed by Bronfenbrenner (1976, 1987), and still considered relevant in the sport context by Merayo (2021). We also identify this in the 3rd league. The third league coach spends his whole life caught between these systemic units. And yet the whole coaching process must be seen as part of a competition with strong anthropological valences. So, is it the specific culture of third league football that is best developed in rural or small-town environments, or does the environment of these towns generate the culture of the third league and is it, in fact, a culture of theirs translated into football?

Key-words: *coach, third league, football, competition, anthropology*

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REZUMAT. ***Perspectivă asupra coachingului și a integrării sale în contextul antropologic al competiției sportive. Studiu de caz: Liga a 3-a de fotbal din România.*** Liga a 3-a de fotbal din România este un univers socio-cultural aparte. Numărul mare de participanți (echipe, jucători, personal tehnic-administrativ, suporteri etc), desfășurarea într-un cadru preponderent rural sau al orașelor mici și caracterul lor eterogen aduc acestui mediu o diversitate specifică. A fi cu adevărat coach în acest mediu este o provocare. Merayo (2021) consideră că antrenorul trebuie să se integreze în universul echipei, al clubului și al culturii din care acestea fac parte. Dar, în liga 3-a, din România, coaching-ul poate fi considerat o adevărată artă, cu situații care nu se mai regăsesc în alt context sportiv. Antrenorii se schimbă foarte des, sunt prinși între aceleași echipe, fiind nevoiți să schimbe radical perspectiva în care văd o echipă, un jucător sau un context într-un timp extrem de scurt. Microsistemul, mezosistemul, exosistemul și macrosistemul sunt parte dintr-un model propus de Bronfenbrenner (1976, 1987), și considerat încă de actualitate, în contextul sportiv, de către Merayo (2021). Identificăm acest lucru și în liga a 3-a. Coach-ul de liga a 3-a își desfășoară întreaga viață prins între aceste unități sistemice. Și, totuși, tot procesul de coaching trebuie considerat ca parte unei competiții cu puternice valențe antropologice. Așadar, este cultura specifică fotbalului de liga a 3-a cea care se dezvoltă mai bine în mediul rural sau al orașelor mici sau, mediul acestor orașe generează cultura ligii a 3-a și este, de fapt, o cultura a lor transpusă în fotbal?

Cuvinte cheie*: antrenor, liga a 3-a, fotbal, competiție, antropologie*

Introduction

Ralph Linton (1936), one of the most important anthropologists, considers status as the *place occupied by an individual at a given time in a system and his relationship to that system*. Thus, Dragnea et al. (2016) describe a coach's set-status as the totality of statuses that the coach has. A coach's set-status is broad because, in addition to the (main) teaching role, he or she also fulfils different functions within the club, family or group of friends. Coaches often work under pressure, manage problems, set goals, make decisions, etc. (Merayo, 2021).

We believe that in order to understand what it really means to be a coach, it is necessary to understand the context in which a coach works and the factors that influence their results.

The coaching process primarily includes the performer, the coach, the form, nature and extent of the relationship between them, the intervention programme, the sport performance and the context. Each of these elements is interdependent and has many sub-elements.

The Complexity of interaction Coach - Athlete - Performance (Teodorescu, Ganera, 2013)

However, the coaching process is circumscribed in the socio-cultural environment in which the sporting activity takes place, which led Merayo (2021) to state that we are dealing with an open system, concentrically included in the team, the club and the culture of the environment where the team exists (fig. 1).

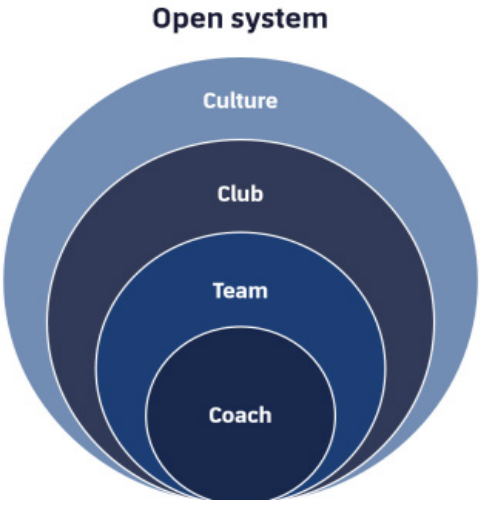

Figure 1. Open coaching system in the football team - Merayo (2021)

From this point of view, the Romanian 3rd football league represents a special system, in which we can say that being a coach is really a challenge, as the athlete-coach relationship implies a commitment, a social activity with emotional ups and downs, success or failure, interaction with different organizations, consumption and personal fulfilment, as well as a combination of short-, medium- and long-term professional satisfaction.

In performance sport, the coach is the person who ensures the optimisation of performance by raising the quality of the athlete's results and learning capacity, by providing feedback in the training process, but also by using methods of motivation, awareness and empowerment, development of creativity, communication skills and initiative, while the coach can be defined as the specialist who is in charge of designing, programming and directing the training process of athletes in order to develop their performance capacity and achieve victories in competitions.

As a result, the status of the coach includes a series of roles that cover managerial, projective, instructive-educational, scientific research and consultancy activities, but also a succession of behaviours and practices aimed at the stable and sustained increase in performance, by coordinating and integrating into the sports training all the input/ inputs specific to the coaching process.

Purpose

The purpose of this paper is to observe the defining elements of the 3rd league football setting, the anthropological perspective of competition in the context of this league and finding appropriate coaching strategies in these contexts.

The issue of the paper

Football environment in the 3rd league

The world in which we live involves a constant exchange of information and constant change, phenomena that also make people change. The environment influences the lives of people who, in turn, can reshape the social, physical and cultural landscape around them, a process that affects even the safest environments as they bring together subjects from the most varied backgrounds (Bronfenbrenner 1987). Sports environments are thus not immune to these changes and bear the brunt of them, resulting in socialisation, involvement and engagement effects. In this context, the coach must be a person in a continuous process of development and adaptation, with the ability to act in the environment while the environment acts on him/her (Merayo, 2021).

In the Romanian 3rd League, changes exist on all levels. Although the number of coaches working at the 3rd league level is not very high, it is notable that they actually rotate among themselves moving to different teams[2], so that

[2] Although there are many examples, we will use the situation of coach Virgil Nițoi, who is constantly changing his 3rd league teams. It is remarkable that, although we are talking about an area where sources of information are not very rich, we still find enough information about these coach permutations. The year 2011 finds Virgil Nițoi, on the bench of CS Tunari, making fun of the defeat against Steaua Bucharest, with the score of 11-0. "Steaua surprised us with their two-touch game" (http://m.indexstiri.ro/virgil-nitoi-steaua-ne-a-surprins-cu-jocul-din-doua-atingeri.html). In 2012, coach Virgil Nițoi took over the reins of Victoria Chirnogi! Mayor promises support - https://liga2.prosport.ro/liga-3/stiri/virgil-nitoi-a-preluat-fraiele-chirnogiului-primarul-promite-sustinere-9850342). In 2017, he coached the Modelu team. The Calarasi team scored an away win,

they must be constantly prepared for changes. Unfortunately, for coaches change doesn't just mean changing the "name" of the team where they work, it means changing the players they work with and the coaching staff they have to prepare matches with.

Based on the premise that performance coaching is a way to achieve maximum results in the objective-pursuing competitions through fundamental changes in attitude and behavior by making athletes responsible and aware of their actions (Teodorescu, Ganera, 2013), it is necessary to analyze the specific elements of this process, in which the direct interaction of the coach with the players - "the team" is essential.

At the level of the 3rd league football, players are different in many ways - age, social status, level of training, level of aspiration, motivation etc. This requires a great deal of knowledge on the part of the coach in order to relate optimally to any of these players.

The second level of interaction of the coach with the club is affected quite a lot at the level of the Romanian 3rd league. Unfortunately, in the 3rd league, because, for financial reasons, a coach rarely transfers to a team together with his technical staff - assistant coach, physical trainer, etc., most of the time these specialists are considered as "club's staff", having their own circuit between teams. Thus, in the new club an environment is totally unfamiliar, and foreign to the coach. Bringing in some of his collaborators would have been beneficial for all parties involved, but is rarely seen in the 3rd league.

The final aspect of the sporting environment in which the coach operates - the culture - is, as Figure 1 shows, the one that governs everything else. Although the level of sport is not very high, the group culture is a particularly strong element in this league. This is particularly due to the rivalries between teams. The current format of the 3rd league sees teams divided into ten geographical series. This encourages rivalry in most championship games, making it even more difficult for coaches to switch from one culture to another, as they have to practically repudiate their former team every time.

Niţoi made his debut on the Modelu bench - https://www.frf.ro/competitii/competitii-masculin/liga-3/seria-a-iia-calarasenii-au-dat-lovitura-in-deplasare-nitoi-a-debutat-cu-dreptul-pe-banca-celor-din-modelu. Year 2019 finds him at Agricola Borcea (Agricola Borcea, drawn at the start with a chess-mindedness from coach Niţoi Virgil - http://obiectiv-online.ro/agricola-borcea-csm-medgidia-1-2-un-rezultat-mincinos/)

The coach in the Microsystem - Mesosystem - Exosystem - Macrosystem relationship

While first proposed more than four decades ago, the Systems Ecology model proposed by Bronfenbrenner (1976, 1987) is still considered topical and with minor modifications is adopted by Merayo (2021) who believes that for optimal team leadership, the coach must be integrated into the four systems, each with its own characteristics.

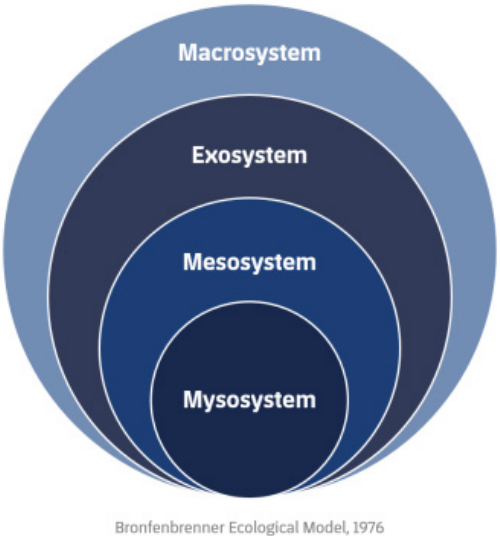

Figure 2. Model proposed by Bronfenbrenner (1976, 1987), adopted by Merayo (2021)

The microsystem is the environment in the coach's immediate vicinity, the one in which the coach lives and interacts on a daily basis. Values, beliefs, personality traits are shaped in this environment. The family, the sports club, the institution of continuous education (if any), friends can be considered as distinct microsystems. The more relationships in the microsystem increase in number, the greater their influence becomes. At 3rd league level we can exemplify this by the fact that a coach may initially have an assistant coach, then the club will also employ a goalkeeper coach. Thus, a new relationship will be created and a new element within the coach's microsystem will emerge. In the context of the 3rd league, noting the relatively frequent coaching changes mentioned above, we can say that the relationship with family and friends may suffer.

Mesosystem - is described by the interaction between two or more microsystems in which the coach lives. For example, if there is a regular meeting in the club restaurant with all the members of the coaching staff, it can be considered that they are part of the microsystem of friends, although they are part of the microsystem of the sports club. As a practical situation at 3rd league level such meetings are quite frequent, most of the time the interaction even includes the family microsystem, with coaches being accompanied by family members.

The exosystem - the coach is not an active part of the exosystem, but this environment includes him and everything that happens in the exosystem affects him. Mann (1995) finds that spectators and sports consumers have a wide range of reasons for attending sporting events. The exosystem is associated with cultural norms, values, beliefs and practices in the vicinity of the club. In this case we can say that the exosystem is created according to the rules and philosophy of the club, the geographical area it represents, the wishes of the supporters, etc. All these elements influence the behaviour of the coach and when a change occurs in the exosystem, the coach has to adapt his actions. In the 3rd league this is most often found in a team's "philosophy" of play. Unfortunately, the factors that lead to the change are often in the exosystem - the supporters, the team manager (mayor/local councillors).

The *macrosystem* - is the system that includes, in form and content, the other three systems - microsystem, mesosystem and exosystem, which it integrates as aspects of the same culture. For example, even an identically named team (e.g., "Dynamo") or a café ("Starbucks") will be created on identical principles, but the final form will not be identical, as it must have specific characteristics in order to fit into the macrosystem of which it is part. Therefore, at the level of the 3rd league, the value, religious and regional system specific to the area influences the whole sporting activity and therefore the coach. There are teams in areas with a predominantly neo-Protestant population that cannot schedule their games or training sessions on Saturdays, while other teams do not give the coach the chance to have the last word before taking the field, but meet and say a Christian-Orthodox prayer together.

Anthropological perspective of sports competition in the 3rd league

Anthropology can be defined as the complex, cumulative, integrative and synthesizing science of multilateral knowledge about man and his phylogenetic evolution, from hominids to humanoids, from the first racially undifferentiated human beings to the great diversity of ethnogenetic processes, from his biological,

social and psychological complexity to his creative activity (Vulcănescu 1979). At the same time, anthropology is a science that aims to study the man as a whole, both in terms of his biological structure and his human achievements; a science that studies in parallel the external and internal influences on human behaviour, work and social-historical community (Dragnea 2022).

In our opinion, the study of the anthropological phenomenon from the perspective of sociological and cultural anthropology is relevant to the competitive football context of the 3rd league in Romania.

From the perspective of cultural anthropology, the focus should be on the analysis of the cultural phenomenon of the 3rd league competition in its natural environment. It is worth noting that only 31% of the teams registered in the 2022-2023 championship, the 3rd League, come from the county capitals, while in the 2nd League we have 80% and in the 1st League 87%. So, the question arises, *is it the specific culture of 3rd league football that is best developed in rural areas or small towns, or does the environment of these towns generate the culture of the 3rd league and is it, in fact, a culture of theirs translated into football?*

Of course, the answer to this question cannot be revealed through research. Perhaps it is, in fact, an intertwining of the two. It can be said that every culture is governed by an inner will, a common motivation. Thus, the cultural values of football find a counterpart in the everyday life of the environment where the third league teams exist. It is possible that the main architects of football teams (the players, especially those in leadership positions or with considerable seniority within the group) become real cultural 'images' for the community. The practice of the 3rd league shows us that the leaders of the group of players create a real tradition and culture around them. They manifest their culture from simple "cultural" decisions of no apparent importance in the economy of the phenomenon - today we play in X colour; we can't order red equipment because Y team has it, etc., to important decisions in sports performance - we don't transfer a certain player because two years ago he injured me and I missed 4 games; Mister, next game you move me to the right because there's one there I know.

We can talk about creating a cultural value. The team itself starts to become a cultural asset with its own identity, tradition and customs. Although the level at which this competition takes place is not very high, from a sporting point of view, we can say that the coaches and players of these teams become creators of culture. They become themselves a community that develops in the community of which they are a part, and the two coexist. The audience becomes a consumer of culture and thus the cultural act takes place. Accordingly, as Wann et al. (1999) point out, the sporting event satisfies both the cultural need

of male consumers (increased self-confidence, aesthetic aspects, motivation) and female consumers (belonging to family aspects). At the same time, Dietz-Uhler et al. (2000) note that men will also participate individually as spectators, while women tend to associate stronger social values with participation (attendance largely with their family or group of friends). Mahony (2002) considers team attachment, community pride, drama, attachment to players and 'delegating success' as reasons why people in the community attend sporting events. Thus, in the most varied contexts, the act of sport is a living action in the midst of the community.

Within this culture that is created in and around a football team, the central element remains competition. Fletcher (2010) sees competition as a defining element of man but at the same time it is a vast, insubstantial field of study (Swab 2010). Competition is the cultural element for which the team exists. In small communities where there are 3rd league teams home match day is a real event. Regardless of social status, every member of the community knows they must exist in this cultural movement - the team match. Whether it's a discussion started (or continued) in the early morning hours between mere spectators of the game, or the families of the players, everyone tries to contribute to the event. Competition keeps the cultural spirit of the game alive in environments less exposed to outside interference. Since we are talking about a culture of competition, we cannot fail to notice the differences that occur from match to match. Each host team has its own cultural elements when organising a game. From elements of hospitality - sometimes opponents find snacks and coffee at their discretion in the common areas, other deliberately the changing room is makeshift and far more unwelcoming than the hosts'. Team administrators emphasise the importance of games from a cultural perspective. Not infrequently it is rivalry that determines the reward for victory, not place in the ranking. A win against a team with which, culturally, there is a certain history is much more coveted than a win against the first-placed team.

Discussion and conclusions

Consequently, there are many situations in which a coach is placed at the 3rd league level. This requires a special psychological ability on his part. Hence, we believe that the coach should be a "coach-psychologist", addressing the training of athletes based on and following the analysis of their personality (not only taking into account the essential skills detected during selection), "coach-innovator", "coach-democrat" - characterized by a high sociability. The coach should maintain many relationships, giving athletes a lot of freedom and shaping

their more independent behaviour, cultivating a sense of responsibility, organising and advising, encouraging creative discussions, teaching athletes to behave well in their relations with others, giving the process a profound educational character (Teodorescu, 2022).

At the same time one can see that the cultural element can hardly be separated from the social one. The artisans of culture are social beings and the culture they create is based on their social relations. At the level of any 3rd league team (and beyond) close social relationships are created. Many times, these go beyond the boundaries of the team or club. A player's experiences of the competition are transferred to the social environment of the family to which he belongs. A mayor who manages the team may take certain decisions based on social considerations relating to the team, etc. Thus, we can speak of a real social network that these football teams are becoming. It is the social network that supports the running of competitions. Without validation from family, colleagues in other workplaces, the community, the football team could not survive. The phenomenon is all the more interesting because even when a team is seemingly unable to cope with the competition it is involved in (either in sporting or financial terms), it continues to exist and is sustained by the social factor. The lack of funds is covered by the various members of the social network's own 'budgets'. Gilbert (2019) considers it absolutely necessary to explore the leadership dimension in the context of supporting leaders and developing the domain. A true coach needs to know and understand these aspects and be able to integrate them into the training of the athlete. The whole training process must be understood as part of the athlete's life, especially in such an environment where the social implications are big. We believe that the coach's efforts should be focused on harmonizing all social and economic factors in order to achieve performance.

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STUDY REGARDING LEARNING THE FOOTBALL GAME TECHNICAL PROCEDURES AT PRIMARY STUDENTS

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ABSTRACT. In the methodology of sports games, it is stipulated that the teaching of any technical procedure is based on some models, these models as the result of many biomechanical studies that refer not only to the main procedure, but also to all details specific to different styles. **Hypothesis.** In the case of some primary school students, are increase of their technical level, can be motived. This has been possible because the methods are carefully selected and suitable for their age. **Methods and means**. The subjects of this research are students from Elementary School, Gâlgău Almaşului, Sălaj County, the research lasts from 2021-2022. 15 students has been involved: 9 from the third form and 6 from the 4th. At the beginning of the study, their technical abilities have been tested: kicking-precision frequency, the ability of keeping the ball in the air as much as possible, dribbling through obstacles. Data processing used statistical tests like: accepted standard deviation, variability coefficient, the T test. **Results.** The frequency of kicking precision the 3 rd form – 7.11 – (T.I) executions and 8.44 (T.F) executions, all the 4th form 7.50 T.I executions and 9.66 executions T.F. **Conclusions.** The results obtained shows that the selected methods lead to the technical improvement of in football game. A key factor represents a well knowing of the students' training level and the methodology.

Key words: *sports, students, technical abilities, procedure*

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REZUMAT. Metodica jocurilor sportive, precizează că învăţarea oricărui procedeu tehnic se realizează pe baza unor modele stabilite de specialişti, în urma unor numeroase şi aprofundate studii biomecanice, care se referă, în principal, la mecanismul de bază al procedeului, dar şi la detaliile de execuţie specifice diferitelor stiluri. **Ipoteze.** Se poate constata o creştere a nivelului tehnicităţii elevilor ciclului primar prin utilizarea unui ansamblu de mijloace bine selecţionate şi adaptate la particularităţile lor de vârstă şi pregătire. **Metode şi mijloace**. Activitatea de cercetare s-a desfăşurat la Şcoala Gimnazială Gâlgău Almaşului, judeţul Sălaj, în anul şcolar 2021-2022. Pentru realizarea acesteia au participat la acest studiu 15 elevi: 9 din clasa a III-a si 6 elevi din clasa a IV-a. La începutul studiului s-au efectuat testări iniţiale privind probele tehnice (frecvenţa de lovire-precizie, menţinerea mingii în aer, lovirea mingii cu capul, dribbling printer jaloane, şut la poarta). Pentru interpretarea datelor s-au utilizat testele statistice precum: abaterea standard, coeficientul de variabilitate, testul t. **Rezultate.** Frecvenţa de lovire-precizie. După aplicarea probei s-au calculat următoarele medii aritmetice: la clasa a III-a 7,11 execuţii (T.I.) şi 8,44 execuţii (T.F.) şi la clasa a IV-a 7,50 execuţii (T.I.) cu 9,66 execuţii (T.F.). **Concluzii.** Cercetarea evidenţiat faptul că sistemele de acţionare utilizate au fost bune pentru însuşirea şi îmbunătăţirea tehnicii jocului de fotbal, dar acest lucru s-a efectuat numai după cunoaşterea nivelului de pregătire al elevilor, precum şi cu condiţia respectării metodicii de specialitate.

Cuvinte cheie: *sport, elevi, abilităţi tehnice, proceduri, rezultate*

Introduction

The methodology of sports games specifics that the learning of any technical procedure is made on the basis of some models established by specialists, these models are the result of numerous in depth biomechanical studies that mainly refer to the most important mechanism of the procedure and to the execution details specific to various styles.

The technique of the football game has a special content and all its definitions underline the same idea, namely, that it represents the ensemble of specific motor skills, they are carried out according to the laws of the superior nervous activity and the game technique, with maximum efficiency (Tudor & Ciolca, 2010; Şerbănoiu & Tudor, 2013).

The process of acquiring the football game technique during the physical education classes, involves a variety of exercises and motrical structures it also implies the students abilities of perception, analysis and reflection, the capability of transforming simple movements into more complex motor actions (Creţu, 2016, Santi, 2018).

In the didactic approach aimed at learning technical elements and procedures by students in primary school, the initial level of their motor skills is very important. In order to learn more easily and quickly, it is advisable to develop as many motor skills as possible, starting from the age of 7 or 8, being known that the technique is learnt better and easier during childhood (Dragomir & Scarlat, 2004; Stănescu, 2012).

Hypothesis

An increase in the technical level of primary school students can be seen through the use of a set of well selected models, adapted to the particularities of their age and training.

Methods and means

The research activity takes place at the Secondary School from Gâlgău Almaşului, Sălaj county, between 2021-2022. 15 students are participate in this study: 9 from the 3rd grade and 6 from the 4th.

At the beginning of the study, many technical tests are applied regarding the frequency, of hitting accuracy, the keeping of the ball in the air, heading the ball, dribbling full round between posts, shots at the gool.

For the data interpretation, some statistical tests are used: the standard deviation, the variability coefficient, "t" test.

$$t = \frac{\sum D}{\sqrt{\frac{n \cdot \sum D^2 - (\sum D)^2}{n-1}}}$$

For improving the technique of the students, there are used a number of means regarding the ball kicking, gaining the ball possession, driving the ball.

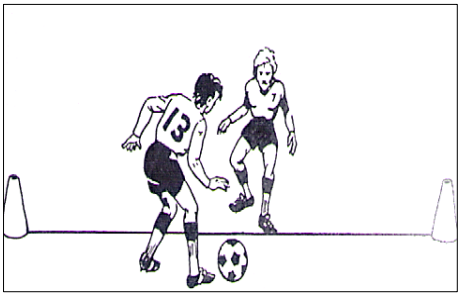

Fig. 1. Placing the ball betwen posts

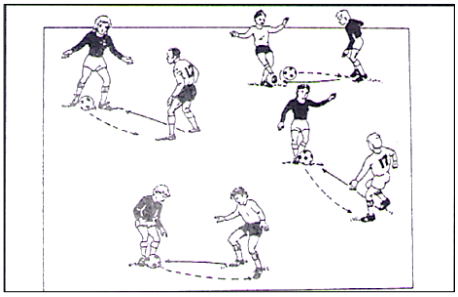

Fig. 2. Dancing feet

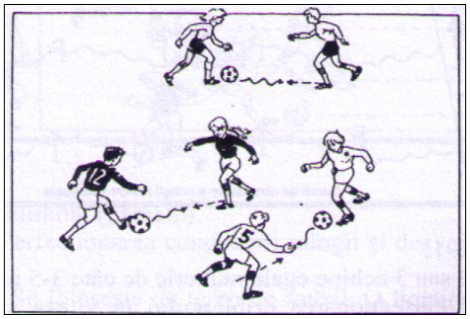

Fig. 3. Taking over the ball

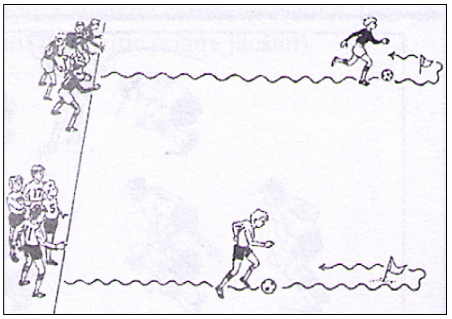

Fig. 4. Running around the flag

Results

Table 1. Statistical parameter values calculated at the frequency of kicking-precision

	3rd grade		4th grade	
	T.I.	T.F.	T.I.	T.F.
Σ	64	76	45	58
$\bar{x}$	7.11	8.44	7.50	9.66
W	3.00	3.00	3.00	3.00
Rp%	15.78%		22.41%	
(±)S	±0.92	±1.01	±1.04	±1.03
Cv	13.04%	12.00%	13.98%	10.68%
t	5.65		11.00	
p	>0.01		>0.01	

The frequency of kicking-precision

After applying the test, the following arithmetic averages are obtained in the 3rd grade, 7.11 (T.I.) executions and 8.44 (T.F.) executions and in 4th grade, 7.50 (T.I.) executions with 9.66 (T.F.) executions.

It is concluded that the results are equal for all the rows (3.00 executions), so the dispersions are high and the results homogenity is low.

It is found that there is progress in all the rows, the higher being noticed in 4 th grade (22.41%) and the lowest in the 3rd grade (15.78%).

The standard deviation evolved with large values, meaning that the individual results are quite for from the central values of their rows, indicating that their dispersions are high and their homogenity is poor.

The variability coefficient has values between 10-20 %, for both classes, resulting that the rows homogenity is medium.

The calculated "t" values for the initial and final results are higher than 0.01 threshold in Fisher's table, so the differences are significant of 99%.

Table 2. Statistical parameter values calculated when keeping the ball in the air through successive kicks

	3rd grade		4th grade	
	T.I.	T.F.	T.I.	T.F.
Σ	41	65	37	50
$\bar{x}$	4.55	7.22	6.16	8.33
W	3.00	3.00	2.00	3.00
Rp%	36.92		26.00%	
(±)S	±1.01	±0.97	±0.75	±1.21
Cv	22.25%	13.45%	12.20%	14.53%
t	12.00		7.05	
P	>0.01		>0.01	

Keeping the ball in the air through successive kicks

The arithmetic averages at this sports test are: 4.55 (T.I.) executions and 7.22 (T.F.) executions at the 3rd grade and 6.16 (T.I.) executions and 8.33 (T.F.) executions at the 4th grade.

Calculating the amplitudes, it can be noticed that the results extend on large scales between 3.00 executions and 2.00; so, the dispersions are large and as consequence the results homogenity is poor.

The progress rate has high values in all rows, the highest being noticed at the 3rd grade (36.92%) and the lowest at the 4th grade.

The standard deviation has evolved with large values, which means that the individual results deviate quite a lot from the central values of their rows, indicating that their dispersions are high so the rows homogenity is low.

The variability coefficient has values between 10-21 % for both classes. The consequence is that the rows homogenity is low; it is found the lack of homogenity at the initial testing from the 3rd grade.

The "t" values, calculated for the initial and final results, are higher than 0.01 threshold in Fischer's table, so that the differences are significant.

Table 3. Statistical parameter values calculated when heading the ball, from the spot or from the distance

	3rd grade		4th grade	
	T.I.	T.F.	T.I.	T.F.
Σ	57	58.90	43.60	46.30
$\bar{x}$	6.33	6.54	7.26	7.71
W	1.30	1.30	1.10	1.00
Rp%	3,22%		5,83%	
(±)S	±0.43	±0.47	±0.38	±0.37
Cv	6.83%	7.21%	5.27%	4.87%
t	6.82		4.53	
p	>0.01		>0.01	

Heading the ball from the spot or from the distance

After the spots testing, the following arithmetic averages are calculated: 6.33 (T.I.) and 6.54 (T.F.) at the 3rd grade and 7.26 (T.I.) and 7.71 (T.F.) at the 4th grade.

Calculating the amplitudes, it can be seen that the results are between 1.30-1.00 m, so the dispersions are high. As a consequence the results homogenity is reduced.

The progress rate shows that the greatest progress is at the 4th grade (5.83%) and the lowest at the 3rd grade (3.22%).

The standard deviation evolved with relatively high values meaning that the individual results deviate quite a lot from the central values of their rows indicating that their dispersions are high and the rows homogenity is poor.

The "t" values calculated for the initial and final results are higher than 0.01 threshold in Fisher's table (appendix 7), so that the differences are significant with 99% confidence.

Table 4. Values of statistical parameters calculated for dribbling among 5 cones

	3rd grade		4th grade	
	T.I.	T.F.	T.I.	T.F.
Σ	157.05	150.10	102.98	96.02
$\bar{x}$	17.45	16.67	17.16	16.00
W	2.55	3.36	0.76	1.47
Rp%	4.63%		7.24%	
(±)S	±0.86	±1.05	±0.31	±0.61
Cv	4.92%	6.33%	1.84%	3.85%
t	6.42		6.71	
p	>0.01		>0.01	

Dribbling between 5 goalposts

At this sports test, the arithmetic averages of the results are: 17”45 (T.I.) and 16”67 (T.F.) at the 3rd grade; 17”16 (T.I.) and 16.00 (T.F.) at the fourth grade.

From the amplitude calculation it can be concluded that the results extend over large scales between 3”36 and 0”76 so the dispersions are high and as a result the homogenity of the results is low.

The progress rate showed that the greatest progress in at the 4th grade (7.24%) and the poorest at the 3rd grade (4.63%).

The standard deviation has high values, meaning that the individual results deviate quite a lot from the central values of their rows indicating that that their dispersions are relatively high and the rows homogenity low.

The calculated “t” values for the initial and final results are greater than 0.01 threshold in Fischer’s table (appendix 7) so that the differences are significant with 99% confidence.

Table 5. The values of the statistical parameters calculated in the case of goal shot divided into squares

	3rd grade		4th grade	
	T.I.	T.F.	T.I.	T.F.
Σ	60	80	53	69
$\bar{x}$	6.66	8.88	8.83	11.50
W	3.00	4.00	2.00	3.00
Rp%	25.00%		23.18%	
(±)S	±1.11	±1.26	±0.98	±1.37
Cv	16.77%	14.27%	11.13%	11.98%
T	8.00		8.00	
P	>0.01		>0.01	

Shot at the goal divided into squares

The score obtained has generated the following arithmetic averages: 6.66 (T.I.) points and 8.88 points (T.F.) at the 3rd grade; 8.83 (T.I.) points and 11.50 (T.F.) points at the 4th grade.

Measuring the amplitudes, it can be noticed the results extend on relatively large scales between 2.00-4.00 points; so, the dispersions are relatively high, while their homogenity is low.

The progress rate shows that the grater progress is in the 3rd grade (25%) and the lowest in the 4th grade (23.18%).

The standard deviation values are also high, meaning that the individual results deviate quite a lot from the central values of their rows and that their dispersions are large and homogenity low.

The coefficient of variability has values between 10-20 % in both grades and at both tests, which means an average homogenity.

The "t" values calculated for the initial and final results are higher than the 0.01 threshold in Fisher's table (appendix 7); so, the differences are significant (99% accuracy).

Conclusions

The physical education and sports programs of the 3rd and 4th grade have, as their main purpose, the acquisition of some technical elements of the mini-football game, such as: kicking the ball, shooting the ball, receiving the ball, returning the ball, all these elements consider the game practicing.

The means and the theoretical base of the school football game have contributed to the development of the students competences and the acquisition of some specific motor skills, physical development, consolidation of moral-volitional qualities.

The research highlighted the fact that the used systems are good for acquiring and improving the football game technique. But this should be done often the training students level is clearly established.

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A REVIEW ON THE INFLUENCE OF SWIMMING ON POSTURE DEFICIENCIES

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ABSTRACT. Introduction: All sports bring health benefits when practiced correctly, but swimming has, without a doubt, some special features that no other aerobic exercises have, due to the special conditions the aquatic environment requires: the position of the body, the stresses imposed on the body necessary for movement in water (floating, immersion etc.). **Objectives:** Through this study we want to analyze the specialized literature regarding the influence of swimming on body posture and at the same time we wish to observe the effectiveness of posture-correction interventions used and which of them had the best results. **Material and method:** The present study analyzed articles from the following databases: PubMed, Scopus, Google Scholar and ResearchGate published between 2013 and 2022. After applying the inclusion and exclusion criteria, 18 articles were selected for analysis. **Results:** According to selected studies, it was observed that swimming exercises have multiple beneficial effects on the human body, especially in people suffering from various diseases of the lumbar spine. but there are also specialist studies that underline the possible harmful effects on posture. **Conclusions: A**lthough many studies have confirmed the positive effects of swimming on postural deficiencies due to the peculiarities of the aquatic environment, more and more studies have recently emerged that contradict them. According to the latter, it is recommended that swimming should be combined with physiotherapy, therapeutic massage and/or hydrokinetic therapy in order to achieve the desired effects in the treatment of postural deficiencies.

Keywords: *swimming, spine, body posture, children, physical deficiencies, scoliosis, kyphosis, frontal, sagittal plane*

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REZUMAT. Introducere: Toate sporturile aduc beneficii pentru sănătate atunci când sunt practicate corect, dar înotul are, fără îndoială, câteva particularităţi pe care nu le au alte exerciţii aerobice, datorită condiţiilor speciale pe care le impune mediul acvatic: poziţia corpului, solicitările impuse corpului necesare mişcării în apă (plutire, imersiune etc.). **Obiective:** Prin acest studiu dorim să analizăm literatura de specialitate în ceea ce priveşte influenţa înotului asupra posturii corporale şi, în acelaşi timp, să observăm eficienţa diferitelor intervenţii utilizate pentru corectarea posturii. **Material şi metodă:** Au fost analizate articole din următoarele baze de date: PubMed, Scopus, Google Scholar şi ResearchGate publicate între anii 2013 şi2022. În urma aplicării criteriilor de includere şi excludere, au fost selectate pentru analiză 18 articole. **Rezultate:** Conform studiilor selectate, s-a observat că exerciţiile de înot au multiple efecte benefice asupra organismului uman, în special la persoanele care suferă de diverse afecţiuni ale coloanei lombare. dar există şi studii de specialitate care subliniază posibilele efecte nocive asupra posturii. **Concluzii:** Deşi multe studii au confirmat efectele pozitive ale înotului asupra deficienţelor de postură datorită particularităţilor mediului acvatic, au apărut, recent, din ce în ce mai multe studii care le contrazic. Conform acestora din urmă, se recomandă ca, pentru a avea efectele dorite în tratamentul deficienţelor posturale, înotul să fie asociat cu kinetoterapia, masajul terapeutic şi/sau hidrokinetoterapia.

Cuvinte cheie: *înot, coloană vertebrală, postură, copii, deficienţe fizice, scolioză, cifoză, plan frontal, plan sagital*

Introduction

Swimming is recognized as one of the healthiest physical activities, due to the special conditions the aquatic environment requires: the position of the body, the stresses imposed on the body necessary for movement in water (floating, immersion etc.), all these aspects can contribute to a harmonious development of the locomotor system, cardiorespiratory functions and metabolism (Zuzana et al., 2022).

Swimming can be used as an associated means in various therapies, as a utilitarian means, for prophylactic purposes, for recreational purposes or in various sports activities. Regardless of how swimming is used as a motor activity, it influences the body through its demands, contributing to healthy growth and development, to maintaining an optimal morphofunctional status, giving it increased resistance to pathogenic factors (Waller et al., 2014; Zarzeczny et al., 2022).

At the same time, the influence on body posture is determined by practicing swimming regularly through the stress that the locomotor apparatus is subjected to, especially the musculoskeletal system, the joints being freed from the weight of the body (according to Archimedes' principle), the muscular effort being able to be reduced or increased depending on the exercises addressed (Tate et al., 2020; Taşkıran, 2020).

It is worth noting that postural attitude in different individuals is determined by gender, age, state of fatigue, profession and lifestyle. Many people, especially children, suffer from spinal deformities caused by congenital malformations, certain degenerative diseases, spinal trauma, but especially caused by poor posture formed from the childhood (Łubkowska et al., 2014; Stoychevski, 2021).

Objectives

Through this study we want to analyze the specialized literature regarding the influence of swimming on body posture and, at the same time, to observe the effectiveness of various posture-correction interventions used.

Materials and methods

A search of the databases PubMed, Scopus, Google Scholar and ResearchGate was conducted for all publications related to the topic. Only articles published between 2013 and 2022 were searched, and we used the following keywords: swimming, spine, body posture, children, physical deficiencies, scoliosis, kyphosis, frontal, sagittal plane.

The following inclusion criteria were used in order to select the articles:

- to be drafted in English,
- to contain swimming as a means of treating postural deficiencies or to have a comparison between swimming and another form of treatment,

Exclusion criteria:

- the articles that I could not read full-text,
- the articles that did not use swimming as a means of treating spinal conditions.

Results

We identified our records through database search (PubMed, Scopus, ResearchGate and Google Scholar) and found 114 studies. 0 records were found in other sources (newspaper articles). After removing the duplicates, the articles that did not have the full-text available, we screened the remained records for eligibility and removed the articles that did not meet our inclusion criteria. Seventeen records were included in our qualitative synthesis. The main characteristics of the studies are presented in Figure l.

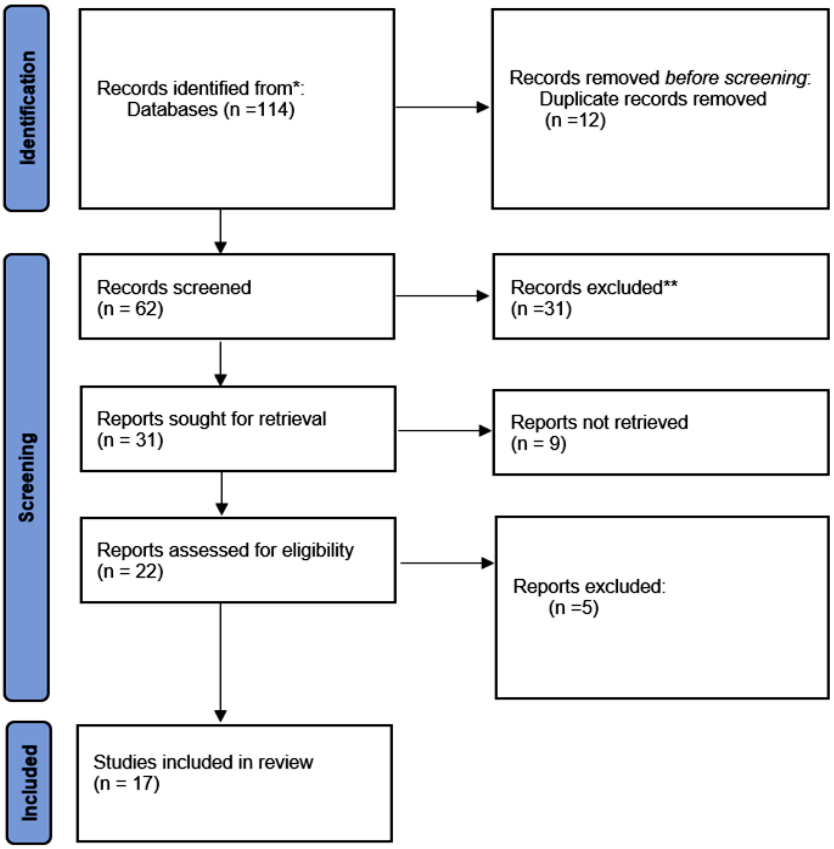

Fig. 1. PRISMA flow chart demonstrating identification, screening and selection of included studies (Page et al., 2021)

Table 1. Main characteristics of the included studies

Author	Title	Participants	Intervention	Results
Torlakovic et al., 2013	Effects of the combined swimming, corrective and aqua gymnastics programme on body posture of preschool age children	50 boys, 5.2±0.6 yrs.	16 weeks, twice a week for 60 minutes.	High level of statistical significance in the variables of shoulder posture assessment (SPA p=.000), overall body posture assessment according to Wolanski (OBPAW p=.000), spinal cord posture assessment (SCPA p=.000),
Barczyk-Pawelec et al., 2012	The influence of exercises in the water on the mobility of the chest and shape in the spine in sagittal plane of children with scoliosis	36 children aged 8–13 years	5 mounts, 3 time/week of swimming	The whole spine length (DCK) and the real length of thoracic kyphosis (RKP) ($p < 0,05$), increased. The angle of inclination of the upper thoracic and the reduction of thoracic kyphosis angle (KKP), were significant, as well.
Karaleic, 2014	Influence of 12 months swimming trainings on postural status of 6-14 year old children	156 children (81 boy and 75 girls), 6-14 years.	12 mounts, 3 time/week.	The number of children with lateral deviations was decreased for 13 (8.33%), of which number of boys was decreased for 5 and number of girls was decreased for 8. Swimming can have positive effect on lateral asymmetry and scoliosis suspected postural status in children
Torlakovic et al., 2014	Evolution of sports-medical team management in the program of posture correction in children	70 girls, aged 11.9±2.3 years	corrective gymnastics, aqua gymnastics and swimming, 28 weeks, 3x1h/week	T-test showed clearly high statistical significance in all variables of posture status, score for shoulders posture (ODRA p=0.000); scapulae (ODLO p=0.000); thorax (OGRK p=0.000); posture of the spine (OKIS p=0.000); abdomen (ODST p=0.000)

Author	Title	Participants	Intervention	Results
Ganciu, 2015	Improving the quality of life of the students with deficiences of the spine, through the program of medical gymnastics and swimming	40 students were divided into two groups including swimming (n = 20) and control (n = 20) group.	combined programs of medical gymnastics and therapeutic swimming, 1 year, 45-60 min/week	pain intensity drops significantly, due therapeutic programs, the decrease being greater than the experimental group (Ott test, schober test, pain intensity p=0,05).
Zaina, 2015	Swimming and Spinal Deformities: A Cross-Sectional Study	112 teens that participate to swimming competitions and 217 students that practice swimming as a free time activity.	The ACS group trained at least 4 (up to 6) times a week for an average of 2-2.5 hours per session. The control group attend physical education classes 3 times a week	Swimming can increase the spinal deformities and Back-Pain conditions. Swimming also increased the risk of hyperkyphosis (OR, 2.26; 95% CI, 1.35-3.77) and hyperlordosis (OR, 2.24; 95% CI, 1.06-4.73), and increased LBP in females by 2.1-fold (95% CI, 1.08-4.06).
Martens et al., 2015	Electromyography in the four competitive swimming strokes: A systematic review	43 studies included	Competitive swimmers	The muscles that most influence the postural and functional aspects are the muscles stressed in freestyle and butterfly style
Folkvardsen et al., 2016	Does elite swimming accelerate lumbar intervertebral disc degeneration and increase low back pain? A cross-sectional comparison	196 students were divided into two groups including swimmers (n = 100) and no swimmer (n = 96), age 19-21	Swimming group: 30 km/week. Control group: 3h/week, physical activities, swimming.	Elite swimmers and controls had similar prevalence of disc degeneration (DD) and LBP, although the pattern of DD differed between the groups. In case of DD, swimmers reported less LBP, although N.S.
Benedek et al., 2017	Correction physical disabilities kyphosis by kinetic means of a sports performance	1 subject	Dynamic exercises for kyphosis, shallow and deep water exercises, 4 mounts, 2 time a week	Swimmers reported less LBP than the no-sport group. However, this was not statistically different (52 vs. 66.7 %, P = 0.41)

Author	Title	Participants	Intervention	Results
Paskaleva et al., 2017	Isometric training and swimming in children with spinal deformities	15 children were divided into two groups including practice (n = 8) and control (n =7). Age 10-14	a 6-month treatment consisting of 30 sessions of kinesitherapy, massage and swimming exercises.	The scoliosis was corrected in 77% of children from the first experimental group and 55% from the second group.
Aliakbar et al., 2017	The effect of swimming exercise on the correction of thoracic kyphosis in patients with muscle dystrophy	11 children were divided into two groups including practice (n = 6) and control (n =5).	8 weeks, 3x1h/week	After eight weeks of specific reforms training, thoracic kyphosis angle decreased significantly in the experimental group. $p<0.001$
Shi Z, Zhou H, Lu L, et al., 2018	Aquatic exercises in the treatment of low back pain	A total of 331, 38.1% (n = 126) of patients were men and 61.9% (n = 205) were women.	8 articles, water exercises	The analysis result revealed that aquatic exercise could statistically reduce pain and increase physical function in patients with LBP ($p<0.05$)
Aksamit et al., 2019	The impact of a 60-minute swimming training on the quality of body posture and the level of balance in young adults	12 subjects, age 20-22,	60 min of swimming	There was a significant increase in pelvic rotation ($p = 0.02$).
Maniu et al., 2021	Does swimming exercises improve posture for blind and visually impaired children?	30 children, 14 boys and 16 girls, age 8-14.	practiced swimming, 2/ week, 60/session, 32 sessions	Swimming has positive effect in improving sagittal deviations of the spine for visually impaired and or blind children cervical $p<0.001$, dorsal $p<0.001$, lombar $p<0.001$
Vizitiu et al., 2021	Dorsalgia rehabilitation in static disorders of the spine by therapeutic swimming in young adults	15 subjects, aged 18-22	5 months. 2x1h/week, therapeutic swimming	Swimming can optimize health, reduce back pain and improve patients' lung capacity. Where the tests show a $p<0.05$, the statistical link is significant

Author	Title	Participants	Intervention	Results
				(S, 95% confidence) and when the tests show a p< than 0.01, the statistical link is significant (S, 99% confidence).
Pocovi et al., 2022	Walking, Cycling, and Swimming for Nonspecific Low Back Pain: A Systematic Review with Meta-analysis	320 retired athletes with chronic LBP; age, 37.6 ± 5.4; 40.0% female	swimming plus physical therapy, 30 min of swimming, 5 times per week for 6 months	There was low-certainty evidence that swimming was more effective than minimal or no treatment in the short term
Kozinoga, et al., 2022	Regular School Sport versus Dedicated Physical Activities for Body Posture—A Prospective Controlled Study Assessing the Sagittal Plane in 7–10-Year-Old Children	167 children (control group), 233 received (intervention group), aged 7–10 years	CG- were involved in regular school sport, IG- both school sport and a dedicated physical activities program (swimming and dance), 10 months, 1h/week	In 7–10-year-old children, participation in dedicated physical activities tends to improve their body posture compared to regular school sport.

Discussions

Swimming is a sport where the influence of gravitational force on the spine is reduced to a minimum. The posture adopted during swimming does not accentuate the curves of the spine. Also, the increased curvature of the spine creates more resistance and negatively affects the movement of the body during swimming (Torlakovic et al. 2014).

Aldvin Torlakovic has come to the conclusion that the implementation of a combined program of therapeutic swimming and hydrokinetotherapy, carried out over a period of 16 weeks, with a frequency of 2 times a week and a duration of 60 minutes, significantly improved the muscle tone, an aspect that contributed to improving children's posture (Torlaković et al., 2013).

The same conclusion was reached by Ganciu (2015), in their research, they have used swimming and medical gymnastics as a treatment method. The research involved 40 students of the University of Bucharest. In the “experiment” group, the program with swimming exercises and medical gymnastics was

implemented, whereas the "control" group followed the traditional physical education lessons learned in college. Due to the influences it exerts on the body, swimming is considered one of the most important means of achieving the objectives of physical education and sport, but also of physical therapy (Ganciu, 2015).

Benedek, in the research conducted, says that the combined program of physical therapy and swimming can be considered an effective method of reducing pain in the chest area and in correcting the kyphotic attitude, as well as in raising awareness of the importance of adopting a correct daily posture and improving the quality of life (Benedek & Raţă, 2017).

Muscular dystrophy is one of the muscle diseases in which deformations of the spine occur due to muscle atrophy and neuromuscular disorders. In the study conducted by Derikvandi, it can be established that specific backstroke exercises have a positive effect in correcting kyphosis in patients with muscular dystrophy (Derikvandi & Goudarzi, 2017).

Also a swimming programme implemented over a period of 4 months, 2 sessions of 60 minutes per week has a positive effect, according to Maniu, in correcting spinal deviations in the sagittal plane in visually impaired children (Maniu et al., 2021).

Karaleic states the fact that, swimming is a cyclic and symmetrical sport where both parts of the body are expected to perform the same movement, at the same time or alternatively, depending on the swimming style, so due to this principle, practicing swimming regularly positively influences the body asymmetry (Karaleic, 2014).

In his study, Martens says that posture is also influenced by the swimming styles we practice. In consequence, he analyzed a group of 200 swimmers, divided into 4 groups. With the help of electromyography, he analyzed each pull, depending on the style of swimming practiced and came to the conclusion that the muscles that influence the posture the most are the ones used in the backstroke and butterfly (Martens et al., 2014).

Modern lifestyle and reduced locomotor activity are the main factors in the occurrence of abnormal posture and a variety of spinal deformities (Kozinoga et al., 2022). The purpose of the research carried out by Ruska Paskaleva was to monitor the effect of isometric training and swimming in children with spinal deficiencies. They used a 6-month program, consisting of physical therapy sessions, massage and swimming, carried out three times a week. The obtained results concluded that the implemented program has a significantly positive effect on posture, muscle tone and mobility. Also, scoliosis was corrected in 77% of the children in the first group and in 55% of the children in the second group (Paskaleva, 2017).

Over the last decades, there has been an increased awareness of the possible harmful effects of performance sports on the lumbar spine and it was discovered that can cause spinal pain. Folkvardsen analyzed whether the practice of performance swimming leads to the occurrence of spinal pain. 196 children participated in this study, of which 100 have been practicing performance swimming for at least 8 years, and 96 of the children have only been practicing physical education in schools for a maximum of 3 times a week. From the results obtained, the author concluded that both groups had similar values, so it could not be established that performance swimming negatively influences the spine (Folkvardsen et al., 2016).

On the other hand, Zaina confirms that swimming is associated with an increased risk of trunk asymmetry and hyperkyphosis. Furthermore, although swimming has been considered a beneficial sport for treating scoliosis, the data presented by Zaina contradicts this aspect. A total of 329 teenagers participated in this study. These subjects trained at least 4 (up to 6) times per week with an average of 2-2.5 hours per training session. After analysing the results, the author concluded that swimming can increase the risk of kyphosis, lordosis, body asymmetry and can negatively influence lumbar pain in girls (Zaina et al., 2015).

However, the effects that the aquatic environment has on the gravitational force and the benefits that immersion in water has on the joint system are known. But there are not enough studies to confirm that practicing swimming, without selecting certain specific exercises according to the particularities of the deficiencies, has a positive effect on posture. Aksamit concluded that exercises improving the breaststroke did not affect the depth of thoracic kyphosis and lumbar lordosis. After 60 minutes spent in a relaxed sitting position, deepening thoracic kyphosis was observed. It is also not recommended that swimming replace medical gymnastics, but rather be an additional treatment in the correction of spine deficiencies (Aksamit et al., 2019).

In the "Aquatic exercises in the treatment of low back pain" study, Zhongju Shi tells us about the benefits that aquatic exercises have on back pain, especially in the lumbar area. The aim of this study was to systematically review all the evidence available in the specialty literature on the effectiveness of aquatic exercise. Through the PubMed, Cochrane Library, Embase and Allied Health database, according to PRISMA procedures, 8 studies were presented, involving 331 patients. In consequence, it was concluded that exercises in the aquatic environment significantly reduce pain in the lumbar spine and improve physical condition (Shi et al., 2018).

Thus, in the study conducted by Vizitiu in 2021, the researcher aims to discover the most effective methods of therapeutic swimming, in order to reduce the pain of the spine, 15 subjects participated in this experiment. They participated in one-hour treatment sessions twice per week, for a period of 4 months. The subjects were diagnosed at a physical therapy clinic in Suceava. After the statistical analysis of the data, we can see a significant improvement in spinal pain, therefore the adaptation and dosage of specific swimming exercises positively influences back pain (Vizitiu et al., 2021).

Also Pocovi, reached the same conclusion, investigating the effect of swimming, compared to the lack of a treatment, on acute back pain. From the analysis of the results, it appears that in the medium and short term, swimming insignificantly improves acute back pain (Pocovi et al., 2022).

In his paper, Stoychevski set out to discover the opinion of specialists in the field regarding the therapeutic effect that swimming has on children with postural deficiencies. For that reason, he used a questionnaire which he applied to 32 swimming coaches from Bulgaria. After analyzing the results, it was found that 70% of the coaches have children with posture problems or spinal deformities in their groups. More than 65% of the coaches say that the number of children with spine problems in their groups is up to 5 children, and 30.8% - up to 10 children. Most of the surveyed experts had children with spinal deformities in their groups and actively worked with them. That being the case, swimming coaches played a key role in preventing and correcting children's posture, as well as in training their motor skills and improving their physical condition. At the same time, they are of the opinion that the systematic practice of swimming positively influences posture deficiencies (Stoychevski, 2021).

Conclusions

The need for in-depth analysis of the effects of swimming on posture and spinal impairments persists. The analysis of specialized literature demonstrates that there are divided opinions on this subject. On the one hand, many specialists present the positive effects of this sport, due to the particularities of the aquatic environment. On the other hand, more and more studies appear to contradict this statement. Instead, most specialists recommended that swimming be accompanied by physical therapy, therapeutic massage or hydrokinetotherapy in the treatment of postural deficiencies in order to have the desired results. Furthermore, swimming coaches must have specific training in this regard and constantly communicate with the physiotherapist.

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PANDEMIC EFFECTS AT PHYSICAL AND PSYCHOSOCIAL LEVEL OF THE ATHLETES

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ABSTRACT. The pandemic COVID-19 has globally affected the physical activity behavior, forcing many people to isolate themselves for a long period of time. These actions caused and increased sedentary behaviors such as excessive sitting or using mobile devices. The lockdown and sedentary behavior have affected the health status and decreased the physical fitness, weakening one's body and inducing a low immunological response. The aim of the study was to determine how elite handball players were affected at physical and mental during the restrictions imposed by the spreading of the SARS - CoV - 2 virus. A questionnaire-based survey was used to conduct the study. For the questionnaire design we used Likert style with three or five level items. The participants voluntarily consented to anonymously participate in our study before completing the questionnaire. The participants were informed that the data would be used only for scientific purpose. The results of our study suggest that pandemic negatively influenced the sport preparation of the handball players due the fact that subjects trained themselves for a period of over 2 months and that meant a reduction of the physical activity (influencing the physical fitness level) to half comparing to a collective preparation for competition. At mental level more than 2/3 felt an increased level of anxiety due to the pandemic, the way that their life was changed and worries concerning their personal and professional future. This period of incertitude had a negative impact at mental level confirming our hypothesis.

Keywords: *pandemic, training, handball, communication, team*

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REZUMAT. ***Efecte pandemice la nivel fizic şi psihosocial ale sportivilor*.** Pandemia COVID-19 a afectat la nivel global activitatea fizică, forţând mulţi oameni să se izoleze pentru o perioadă lungă de timp. Aceste acţiuni au cauzat şi au amplificat comportamentele sedentare, cum ar fi lipsa de activitate sportivă sau utilizarea dispozitivelor mobile. Restricţionarea ieşirii din case şi comportamentul sedentar au afectat starea de sănătate şi au scăzut condiţia fizică, slăbind organismul şi inducând un răspuns imunologic scăzut. Scopul studiului a fost de a determina modul în care jucătorii de handbal de elită au fost afectaţi fizic şi psihic în timpul restricţiilor impuse de răspândirea virusului SARS - CoV - 2. Pentru realizarea studiului folosit metoda anchetei pe bază de chestionar. Pentru proiectarea chestionarului am folosit scala Likert cu trei sau cinci itemi de nivel. Participanţii au consimţit voluntar să participe în mod anonim la studiul nostru înainte de a completa chestionarul. Participanţii au fost informaţi că datele vor fi utilizate numai în scop ştiinţific. Rezultatele studiului nostru sugerează că pandemia a influenţat negativ pregătirea sportivă a jucătorilor de handbal din cauza faptului că subiecţii s-au antrenat singuri pentru o perioadă de peste 2 luni şi asta a însemnat o reducere a activităţii fizice (influenţând nivelul de fitness) la jumătate comparativ cu pregătirea colectivă pentru competiţie. La nivel mental, mai mult de 2/3 au simţit un nivel crescut de anxietate din cauza pandemiei, a modului în care le-a fost schimbată viaţa şi a îngrijorărilor cu privire la viitorul lor personal şi profesional. Această perioadă de incertitudine a avut un impact negativ la nivel mental confirmând ipoteza noastră.

Cuvinte cheie: *pandemie, antrenament, handbal, comunicare, echipă*

Introduction

The COVID-19 pandemic and the measures imposed by the governments of the world states: isolation at home, closure of schools and cultural institutions, ban on night traffic adopted to reduce interactions and the virus spread (Mutz & Gerke, 2021), meant negative consequences at global level, for all social categories of the population (Leuciuc, 2021). It was recommended social distancing and contact from person to person in order to prevent transmission of SARS-CoV-2 (Wong et al., 2020). The negative effects covered the national economies, leisure activities, travels, daily activities, work, education (Latella & Haff, 2020). The pandemic COVID-19 has globally affected the physical activity behavior, forcing many people to isolate themselves for a long period of time (Hammami, Harrabi, Mohr and Krustrup, 2020). These actions caused and increased sedentary behaviors such as excessive sitting or using mobile devices (Chen, Mao, Nassis, Harmer, Ainsworth and Li, 2020).

Immediately after the virus spreading, many sports competitions were transferred, reprogrammed and then cancelled (Bowes, Lomax and Piasecki, J., 2020), firstly in Asia, and, as the virus spread globally, all sport events were postponed or cancelled. These lockdown and cancellations of the sport events represented public health problem for the population, default for professional and amateur athletes (Mann, Clift, Boykoff and Bekker, 2020). The impact of the pandemic badly affected sport industry, especially sports events (Haddad, Abbes, Mujika and Chamari, 2021). Evans et al. (2020) expressed the conviction that everyday life and physical activities routine practices "had to change, pause or stop because of the pandemic", because in the midst of a global pandemic affecting millions of people, staying active is a good thing, but staying safe is essential (Wong et al., 2020). However, practical recommendations for staying active at home, with aerobic exercise on ergometers, bodyweight training, dancing or active video games, can help counteract the harmful physical and mental side effects of COVID-19 lockdown (Hammami et al., 2020).

Athletes have experienced significant changes in their lifestyle and routines, human relationships, financial situation (for example, job loss or sponsor loss) and as well as the futility of aspirations and self-fulfillment (Taku & Arai, 2020).

The lockdown and sedentary behavior have affected the health status and decreased the physical fitness, weakening one's body and inducing a low immunological response (Hermassi et al., 2021). At the same time, it could cause anxiety, depression, mental health problems and common chronic health diseases (Ammar et al., 2020); the elite athletes were on the list of those affected by the pandemic (Hakansson, Jonsson and Kentta, 2020), being those who faced the pandemic stress, used strategies for cognitive and behavioral adaptation, the level of sports activity depending on strategies for coping with the stress of the COVID-19 pandemic (Szczypinska, Samelko and Guszkowska, 2021); collective experience and team spirit were affected during lockdown (Kehl, Strobl, Tittlbach and Loss, 2021). Researches have shown that athletes' levels of anxiety, stress and depressive symptoms were relatively low, and the use of coping strategies, such as cognitive restructuring and emotional calm, have been associated with lower levels of negative emotional states (Leguizamo et al., 2021). The Association for Applied Sports Psychology suggested that during this period, athletes might have experienced an emotional roller-coaster due to "a constant flow of information, changes in daily routines, uncertainty about personal health and the others' health, together with rapidly changing situations" (Samuel, Tenenbaum and Galily, 2020). At the same time, studies exploring the psychological implications of previous epidemics and pandemics showed that social distancing measures were particularly detrimental to psychological health (Taylor, 2019); the impact of COVID-19 social distancing measures on elite athletes was deep (Woodford & Bussey, 2021), with symptoms such as post-traumatic stress exacerbated by

fears of infection, longer duration of care, frustration, boredom (Brooks et al., 2020). Prolonged pandemics and the process of social isolation can cause anxiety to escalate. Increased anxiety for athletes negatively affects both physical and cognitive athletic performance (Ozen, Koc and Aksoy, 2020). In other words, it should be mentioned that family members were the greatest emotional supporters for professional athletes during the period we are referring to (Parm, Aluoja, Tomingas and Tamm, 2021).

In this context, athletes, namely handball players, were encouraged for individual training, knowing that, in modern handball maintaining individual physical fitness is a key factor for performance (Fikenzer, Fikenzer, Laufs, Pietrek and Hepp, 2021).

While many athletes were adversely affected by this, others have seen positive effects (Taku & Arai, 2020), as free time used for recovery after trauma, improve the quality of motion / mobility, setting new goals, psychological development and enhancing physical activities for health (Latella & Haff, 2020).

The aim of the study was to determine how elite handball players were affected at physical and mental during the restrictions imposed by the spreading of the SARS - CoV - 2 virus.

The hypothesis of the study was that physical activities would decrease as a result of the restrictions imposed by the state authorities and that would influence the level of the physical fitness level and the mental health of the subjects.

Materials and Methods

Participants

The study involved 208 senior handball players from the teams of the Romanian National Handball League (the highest ranked male competition in Romania), players from all playing positions, aged between 18 and 44 years old (table 1).

Table 1. Distribution by age groups and playing positions

Playing position	Under 20 years old	21-25 years old	26-30 years old	31-35 years old	36-40 years old	Over 40 years old	Total
Center back	7	9	8	7	0	0	31
Backcourt	10	13	12	5	3	0	43
Wing	27	18	7	4	4	1	61
Pivot	14	6	9	7	0	0	36
Goalkeeper	13	10	3	6	2	0	34
Defender	1	0	0	1	0	1	3
Total	72	56	39	30	9	2	208

Procedure / Method

A questionnaire-based survey was used to conduct the study. Thus, in August 2020, 208 handball players of the Romanian National League completed a Google Forms form containing 12 questions that referred to various aspects related to the new way of life during March-July 2020, when the emergency (March, April, May) and alert (June, July) state were established in Romania.

For the questionnaire design we used Likert style with three or five level items.

The participants voluntarily consented to anonymously participate in our study before completing the questionnaire. The participants were informed that the data would be used only for scientific purpose.

The questionnaire was applied to the senior handball players from the teams of the Romanian National League (highest level of handball in Romania). There were collected answers of 208 respondents, players from all playing positions, aged between 18 and 44 old: center back 31 (15%), backcourt 43 (20.6%), wing 61 (29.3%), pivot 36 (17.3%), goalkeeper 34 (16.3%) and defender 3 (1.5%).

Statistics

To analyze obtained data from research we used SPSS version 26 package by applying descriptive statistics (frequencies, percentages, means and standard variations) and one-way analysis of variation (ANOVA) in order to determine the statistical significance (for p was set a value of 0.05).

Results

A synoptic view of the questions and answers given by the subjects is presented in table 2.

Table 2. The questionnaire and the answers given by the subjects

Question	Answers (number / %)
During the emergency and alert period, with who did you keep in touch?	Trainers – 8 / 3.8% Team mates – 48 / 23.1% Trainers and team mates – 152 / 73.1%
During the reference period:	Did you gain weight? – 51 / 24.5% Did your weight stay the same? – 110 / 52.9% Did you lose weight? – 47 / 22.6%

Question	**Answers (number / %)**
During the emergency and alert period did you exercise?	Daily – 74 / 35.6% Every other day – 105 / 50.5% Once a week – 11 / 5.3% Twice a week – 18 / 8.6% I didn't do any exercises – 0 / 0%
The length of physical activity during one day was:	1 hour – 92 / 42.2% 1.5 hour – 86 / 41.3% 2 hours – 24 / 11.5% 2.5 hours – 4 / 2% Other – 45 minutes – 2 / 1%
The physical activity was:	Moderate – 63 / 30.3% Intensive – 7 / 3.4% Combined – 138 / 66.3
The exercises aimed:	Strength – 65 / 31% Speed – 29 / 14% Endurance – 54 / 26% Coordination – 25 / 12% Flexibility – 35 / 17%
The preparation was achieved:	Only indoors – 21 / 10.1% Only outdoors – 16 / 7.7% Both indoors and outdoors – 171 / 82.2%
How did you practice these exercises home?	Already known exercises – 92 / 44% A program sent by trainers – 68 / 33% Watching YouTube and influencers on socializing networks – 31 / 15% Following the advice of professional sportsmen – 15 / 7% Other – personal trainer program – 2 / 1%
During this period, the attitude of your family members towards you was:	Total support – 151 / 72.6% Understanding/Indulgence – 54 / 26% Indifference – 3 / 1.4%
Do you consider that your level of anxiety (disquietude, worry, fear) was:	Very high – 8 / 3.8% High – 35 / 16.8% Moderate – 96 / 46.2% Low – 52 / 25% Very low – 17 / 8.2%
Choose from the following chapters which were the most difficult in the first training session after restarting the activity?	Strength – 39 / 19% Speed – 41 / 20% Endurance – 76 / 36% Coordination – 21 / 10% Flexibility – 31 / 15%

Question	Answers (number / %)
What is your level from the physical point of view by the end of the isolation (in percentage compared to the moment of the activity interruption?)	80-100% - 21 / 10.1% 60-80% - 84 / 40.4% 40-60% - 84 / 40.4% 30-40% - 16 / 7.7% 20-30% - 3 / 1.4% Below 20% - 0 / 0%

The answers to the first question, *During the emergency and alert period, with who did you keep in touch?* were as follows: 8 handball players kept in touch only with the coaches, 48 handball players kept in touch with their teammates and 152 handball players kept in touch both with their coaches and teammates. Most of the respondents kept in touch both with their coaches and teammates, this facilitating an efficient training during the considered period. It is known that "the coach is the one who designs the objectives to be achieved and the stages of training, whether the structure of the group is stable, communicates with the sports group and the external environment, clarifies the objectives and leads the activity, develops a motivational climate, focuses on responsibility and autonomy, organizes the interactions between the coach and those trained, constantly evaluates the activity proposals according to the athletes' resources, the effects of the training according to the objective, the results obtained, as well as their causes" (Rohozneanu, 2019), this being entirely true not only in the case of home training, but also in the room intended for the handball player. In the same context, we note the opinion of Epuran, Holdevici and Toniţa (2008), according to which "little importance and little time are given to the individual discussions of the coach with athletes, to writing self-monitoring journals, to establishing the perspectives of each athlete and personal self-improvement or harmonization of individual goals with those of the group".

To the second question: *During the reference period: a. You gained weight; b. You maintained your weight; c. You lost weight,* 51 handball players stated that they gained weight, 110 maintained their weight, and 47 lost weight. The fact that 110 handball players maintained their weight (52.88%) and 47 (22.59%) even lost kilograms proves that the athletes were aware of the need to maintain a proper physical fitness in order to start the training with the team in good conditions.

Researches have shown that physical activity performed at least 3-5 times per week is optimal for a good physical fitness (Latella & Haff, 2020; Chen et al., 2020; Hermassi et al., 2021; Evans et al., 2010, Leuciuc, 2020). *The third question* precisely deals with the rhythmicity of the workout. 74 athletes worked

daily, 105 every 2 days, 11 once a week, and 18 twice a week. It can be easily observed that 179 handball players (86.05%) approached this aspect with the most seriousness, maintaining an ideal physical fitness due to a sustained workout rhythm.

To *the fourth question,* regarding the information about physical activity performed during each session - 92 worked for one hour, 86 for 1.5 hours, 24 for 2 hours, 4 for 2.5 hours, and 2 exercised 45 minutes in each of the held sessions. Handball players' rigor is evident in terms of organizing the physical activities in each session, so that 87% of respondents indicated 1-1.5 hours, as well as the length's training in the gym (Kehl et al., 2021; Fikenzer et al., 2021).

The *fifth question* took into account the level of physical activity performed: a. moderate; b. intense; c. combined: moderate + intense. The answers were as follows: 63 performed a moderate physical activity, seven - intense, and the rest, 138, a combined physical activity, which demonstrates the handball players awareness of the need to perform both types of physical activity (Chen et al., 2020; Haddad et al., 2021).

The *sixth question* concerns the motor skills on which the exercises performed by the handball players during the training sessions were channeled. Most of the handball players had in view several of the proposed motor qualities. The distribution of the exercises used for the motor skills development is shown in figure 1.

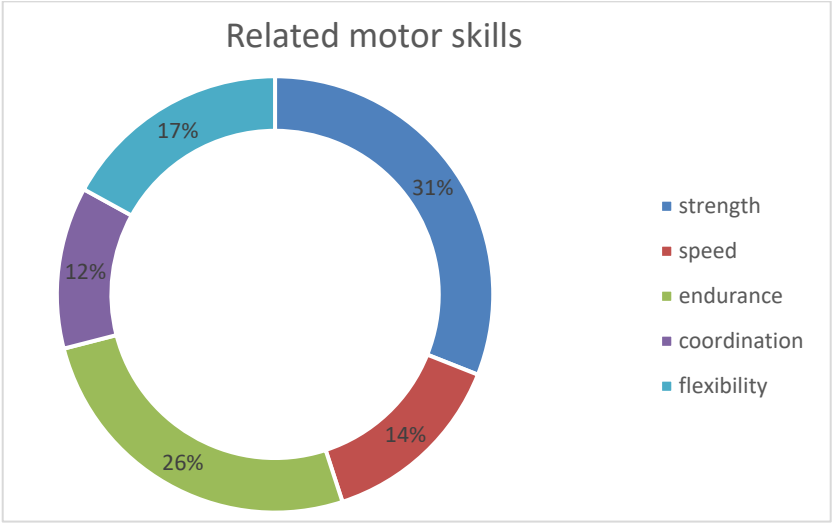

Figure 1. Related motor skills used during the sessions

The main objective of physical training is the development of basic and specific motor skills of athletes by using the most efficient training methods and means. It is considered that a good physical training is the foundation for consolidating and improving technical training, which in turn conditions the achievement of tactical training (Rohozneanu, 2015), in order to be efficient and achieve performance in competitions (Leuciuc, 2018).

An important aspect of maintaining physical fitness is that it does not require large spaces, but helps maintain in normal parameters (Fiorilli et al., 2021).

Considering the state of emergency decreed during two months and then the state of alert, when the official trainings were resumed, *question no. 7* took into account the place where the training of handball players took place: a. indoors; b. outdoors; c. both indoors and outdoors. 21 athletes ticked the option "a" - indoors, 16 - only outdoors and 171 trained both indoors and outdoors (Bowes et al., 2020, Evans et al., 2020; Hermassi et al., 2021).

Wanting to find out how they practiced these exercises at home, the source was variate for many of them: performing well-known exercises, following / practicing the programs recommended by coaches, watching the YouTube channels or influencers on social networks, listening to the advice of some performance athletes or performing exercises proposed by the personal trainer. It can be seen that most of the handball players focused on the known exercises, practiced during their training, and those who kept in touch with the coach followed the program transmitted by him (figure 2) (Kehl et al., 2021; Fikenzer et al., 2021).

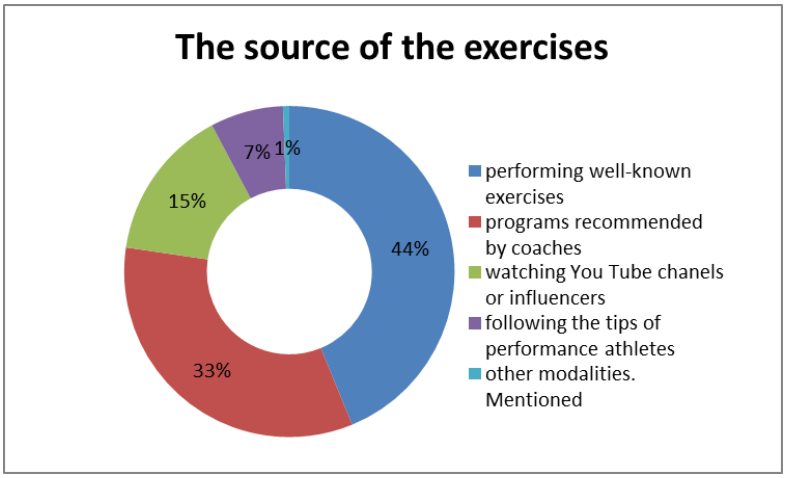

Figure 2. The source of the exercises

Expertise and related knowledge (psychology, physiology, nutrition, recovery, sociology) stand always in the coach's attention who must be up to date with the news in the field in order to transmit it to his athletes. Thus, the coach-athlete discussions, the analysis of the training, the analysis of the competitive evolutions, the video analysis, the previous sports experience are means representing the basis for the theoretical or intellectual training and must be oriented towards reaching the established goals (Hossain, Sultana and Purohit, 2020).

The psychological aspect of the hard measures taken against citizens is not a priority concern for anyone, although such concerns are justified by the authorities precisely by the intention of the authorities to show care for people (Evans et al., 2020; Woodford & Bussey, 2021; Ammar et al., 2020). In the spirit of these statements, *question 9* asked the athletes for information on the attitude of family members towards them, and 152 handball players answered that the family offered them full support during the state of emergency and alert, and for 54, the family showed understanding / indulgence. Unfortunately, three of the handball players felt indifference on the part of the family. The problems faced by people during this period include depression, anxiety, psychological distress, posttraumatic stress disorder, insomnia, fear, stigma, low self-esteem, lack of self-control and other results negative effects on mental health (Hossain et al., 2020). Assessing the level of psychological stress for athletes during the isolation at home (Fiorilli et al., 2021), we find out that one third of respondents were affected by subjective suffering and social interactions, specific to team sports, being crucial to ensure endurance and psychological health. Thus, communication is decisive for improving their response to adaptive stress.

The *question 10* required to determine the level of anxiety in that period and the received answers complete Fiorilli's findings (2020): 96 handball players (46.15%) considered that their worries, fears were at a moderate level and 52 (25%) at a low level. Eight of the athletes (3.8%) felt a very high level of anxiety, 35 (17%) a high level and for 17 of them (8.17%) the level was very low.

The answers of the handball players emphasize their good mental health (80%), knowing that this is, in fact, one of the components of the training program, along the with physical training, technical training, tactical training, theoretical training and recovery. Every component of the training is characterized by a specific role, their importance being different, depending on the training planning, but the approach of all, successively or simultaneously, is a basic principle for ensuring performance (Parm et al., 2021; Fiorilli et al., 2021; Hossain et al., 2020).

The 11th question focused on the motor skills in which they identified difficulties at the first training after resuming the activity: 59 encountered difficulties in terms of strength, 63 in terms of speed, 115 in terms of endurance, 28 in terms of coordination, and 45 in terms of mobility. It must be said that 116 athletes (55.76%) mentioned that they had encountered difficulties with a single motor skill, 62 (29.8%) with two, 22 (10.57%) indicated three, 3 handball players indicated difficulties at 4 motor skills and 5 handball players mentioned difficulties for all motor skills. For these reasons, it is necessary to have a period to adapt to the effort and to be uniform regarding the physical condition of the athletes when the team training is resumed (Wond et al., 2020; Latella & Haff, 2020; Hermassi et al., 2021; Dobrescu, 2020).

Regarding the last question, the handball players were asked to estimate their physical fitness at the end of the lockdown (in percentage, relative to the moment of interruption of activity): a. 80-100%; b) 60-80; c) 40-60%; d 30-40%; e) 20-30%; f) under 20%. The estimates were as follows: 21 were in the first category, meaning that the physical training was very good; 84 indicated the range of 60-80% and 84 considered that they had fallen within the range of 40-60%; 35 mentioned a level between 30% and 40%, and three between 20% and 30%. No player was below 20%. The respondents managed to maintain a moderate level of their physical condition, but, within the common training it would be necessary to work for every component of the training in order to ensure the premises of a complete and efficient sports training for the competition. That is why an important role is played by the activity supervision through control tests and the use of electronic devices in order to monitor the athletes' effort (Leuciuc, 2020).

Discussion

At performance level, the handball game demands from players high-intensity intermittent activities to achieve the goals. The specific sports training must help handball players to perform in competition and they need continuous preparation during the season. All the competitions of the 2019-2020 season were stopped due to the pandemic and the championship was concluded. The confinement imposed by the pandemic there was a unique situation for the humanity, including for the athletes. The handball players needed to adapt to a new context at personal and professional level. Lockdown forced to stop all sports activities, sports trainings and, in many cases, the rapidly changing situation made it impossible to plan and implement a contingency plan.

Our questionnaire was designed in Likert style with 3 or 5 answers. That design allowed to apply ANOVA in order to determine if there are significant differences among the answers of the subjects (table 3).

Table 3. The subjects' answers analysis by ANOVA

Question	Answers, df	F	p
During the emergency and alert period, with who did you keep in touch?	1, 2 vs. 3; (1.54)	19.88	0.0004
During the reference period:	1, 2 vs. 3; (1.35)	5.37	0.002
During the emergency and alert period did you exercise?	1, 2 vs. 3; (1.177)	85.92	0.0006
The length of physical activity during one day was:	1, 2 vs. 3, 4, 5; (1.176)	46.34	0.001
The physical activity was:	1, 2 vs. 3; (1.68)	11.78	0.001
The exercises aimed:	1, 2 vs. 2, 4, 5; (1.117)	60	0.003
The preparation was achieved:	1, 2 vs. 3; (1.35)	5.37	0.002
How did you practice these exercises home?	1, 2 vs. 3, 4, 5; (1.158)	18.43	0.0003
During this period, the attitude of your family members towards you was:	1, 2 vs. 3; (1.203)	10.49	0.001
Do you consider that your level of anxiety (disquietude, worry, fear) was:	1, 2 vs. 3, 4, 5; (1.41)	18.50	0.0001
Choose from the following chapters which were the most difficult in the first training session after restarting the activity?	1, 2, 3 vs. 4, 5; (2.153)	61.31	0.0002
What is your level from the physical point of view by the end of the isolation (in percentage compared to the moment of the activity interruption?)	1, 2 vs. 3, 4, 5; (1.103)	47.78	0.0004

df – degree of freedom; F - MS factor/MS residual; p - statistical significance.

In order to keep the level of the physical fitness and also to socialize, the subjects (73.1%) stayed in touch with coaches (especially for sport preparation aspects) and teammates (to socialize) being an significant difference between first two and the third answer ($F(1.54)=19.88$ for $p=0.004$) (Latella & Haff, 2020; Evans et al., 2020; Woodford & Bussey, 2021).

Concerning the individual sports preparation, due to the confinement, the handball players had to adapt to a new and challenging context in order to maintain the level of their fitness; most of them trained indoors and outdoors

(82.2%) by using already known exercises (44%), programs sent by coach (33%), following the advice of professional athletes (7%) or program designed by personal trainer (1%). At ANOVA test there was registered statistical significance between third and first two answers ($F(1.35)=5.37$ for $p=0.02$) (Hammami et al., 2020; Chen et al., 2020; Hermassi et al., 2021; Fiorilli et al., 2021).

The use of these adapted programs aimed to maintain or develop strength, speed, endurance, coordination and flexibility as much as possible in the specific context of the handball game. Many of them (66.3%) used a combination of moderate and intensive workout lasting between 45 minutes and 2.5 hours, but most of them (83.5%) trained for 1-1.5 hour. Usually, professional handball players trained 1.5-2 hours per session, had 6 to 8 training sessions per week and an official match weekly during the competition period, being statistical significant between first two answers and last three ($F(1.176)=46.34$ for $p=0.001$). Many of them (86.1%) prepared daily or every other day, but there were some subjects who prepared once or twice per week, this being visible at body weight: one quarter lost weight, half kept the same weight and another quarter gained weight; at ANOVA test were obtained significant differences between those who maintain their body weight and those who gain or lose weight ($F(1.96)=55.90$ for $p=0.001$). There is a connection between the number of training sessions per week, the length of these sessions and the evolution of body weight of the participants in our study (Bowes et al., 2020; Ammar et al., 2020; Parm et al., 2021).

The efficiency of the individual preparation imposed by the lockdown was visible at the start of the collective training preparation in August 2020, when 90% of the subjects had encountered difficulties concerning endurance (34%), speed (18%), strength (17%), flexibility (13%) and coordination (8%), being a statistical significance between those who have chosen first three answers and those who have chosen last two ($F(2.153=61.31$ for $p=0.0003$) (Kehl et al., 2021; Parm et al., 2021; Fikenzer et al., 2021).

The self-evaluation of the physical level prior and after confinement for the participants in our survey showed that only 10% had been at full or almost full potential and 80.8% at a moderate level, but we must keep in mind that most individuals are not objective in self-evaluation, tending to over or underestimate themselves. Between respondents that claimed a good or very good level and those with an moderate or weak ones was registered a statistical significance for $F(1.103)=47.78$ and $p=0.004$ (Wong et al., 2020; Haddad et al., 2021; Kehl et al., 2021).

At social level 98.6% found support and understanding form their family ($F(1.203)=10.49$ for $p=0.001$ compared to other two answers) and only 1.4% (3 subjects) felt the indifference in this difficult moment for the humanity (Woodford & Bussey, 2021; Parm et al., 2021).

Psychologically, the handball players felt a certain level of anxiety being moderate for 96 of them, low and very low for 69 respondents, high and very high for 43 participants. At ANOVA analysis comparing those with a high or very high level to other three answers (moderate, low, very low) were obtained statistical significance for $F(1.41)=18.50$ for $p=0.0001$. The level of anxiety concerning the future especially affects athletes at personal and professional level and may be a cause for preparation issues when resuming the team trainings (in our case 90% of the participants) (Leguizamo et al., 2021; Broks et al., 2020; Ozen et al., 2020; Hossain et al., 2020).

The season interruption influenced the performance of elite handball players and required to adapt to an evolving negative situation with bad outcomes at physical, psychological and health level. Quickly implementation of the lockdown did not allow time to prepare a monitoring system for athletes in the situation of individual training at home.

When resuming official training, most of them faced problems with endurance, speed and strength (Parm et al., 2021; Fikenzer et al., 2021), fact confirmed by ANOVA test results.

The resumption of sport activity requires to assess the athlete's physical fitness and health status by a multidisciplinary team. It is necessary to monitor athletes' evolution during the training to avoid health problems caused by the pandemic restrictions (Ammar et al., 2020; Sarto et al., 2020).

These results show that sport activities had positive consequences both physically and mentally, as it was revealed during this pandemic, but we must mention that 90% of the participants were affected at physical level and they struggled to adapt to the conditions of the collective preparation at mental level, where 66.8% reported a moderate to very high level of anxiety; the ANOVA test confirming the statistical significance at respondents answer items (Parm, et al., 2021; Fiorilli et al., 2021; Hossain et al., 2020; Löllgen et al., 2020; Tayech et al., 2020; Ammar et al., 2020).

The results of our study suggest that pandemic negatively influenced the sport preparation of the handball players due the fact that subjects trained themselves for a period of over 2 months and that meant a reduction of the physical activity (influencing the physical fitness level) to half comparing to a collective preparation for competition (Hermassi et al., 2021; Kehl et al., 2021; Fikenzer et al., 2021; Sarto et al., 2020).

The practical implications of our study lie in providing an overview of the Romanian elite handball during pandemic and the effects of the confinement at physical and mental level, issues that must be solved by specialists in order to help handball players to reach their full potential personally and professionally, leading to benefits in competitions. For future pandemic situations, the findings

from this study could be used to efficiently manage the entire situation in a proper manner in the benefit of sport activity.

The study highlights the effects of the pandemic on male handball players, but also there is a limitation because it is not possible to generalize these results due to the sample size. The survey is a subjective method, especially when participants must do a self-evaluation, the level of objectivity being moderate. Additionally, we did not use a physical activity questionnaire to assess their physical fitness before and after confinement in order to determine if there are some differences. We used only questions to determine the level of specific handball preparation and the effects of individual workout before pandemic and after they restarted collective training activities.

The strengths of our study are: providing an overview for a unique situation in the last century for humanity – pandemic – and its effects for professional handball players in Romania at physical and mental level; presenting data concerning their self-preparation during this period and its effects; presenting data concerning their self-evaluation of the physical fitness and giving the opportunity to identify new modalities to copying these kinds of situations.

Conclusions

The COVID-19 lockdown led to individual consequences on the physical fitness and mental level of the elite handball players.

The subjects trained individually by using already known exercises or by applying programs sent by coach or personal trainer for a period of over 2 months.

Comparing to a normal situation training, their physical activity was reduced to half (from 12-16 hours to 6-8 hours per week) and also, the training conditions were not appropriate. All these factors negatively affected their physical fitness.

At the beginning of the collective preparation most of them faced problems to efficiently adapt to the coach requirements due to a low-level physical fitness and that fact increased the risk of injuries.

We can conclude in these conditions that our findings confirm the hypothesis concerning that physical fitness was affected in the period of lockdown.

At mental level more than 2/3 felt an increased level of anxiety due to the pandemic, the way that their life was changed and worries concerning their personal and professional future. This period of incertitude had a negative impact at mental level confirming our hypothesis.

The reduction of the social interactions caused psychological issues for athletes as well for general population, but athletes, due to the previous special preparation, showed a better state comparing to that of ordinary people.

Future study must include more variables concerning training conditions, especially monitoring devices to objectively assess the quality and quantity of the physical activity. Also, the relationship physical fitness level - mental state - wellbeing can be approach more closely approached.

The limits of the study are the number of the participants, only from one collective sport from one country. This kind of study is necessary to identify the needs and problems that athletes dealt with during this period and to find ways to solve them in an appropriate manner in order to optimize the training process to this type of unexpected situations caused by pandemic and its restrictions.

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ANALYSIS OF THE MOTOR PERFORMANCE OF THE FOREARM PASSING SKILL, IN VOLLEYBALL, AT THE FIRST YEAR STUDENTS OF THE FACULTY OF PHYSICAL EDUCATION, TISHREEN UNIVERSITY

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ABSTRACT. Volleyball is one of the most representative team sports all over world. It already has two Olympic disciplines (regular and beach volleyball) with a 3rd one under expectation for winter Olympics in the following years (snow volleyball). It is known that is a connection between proper biomechanics and performance in sports (Robertson, 2011). As willing to study the progress of the students regarding the forearm passing skill and the training methodology used we undertook this research. A number of 108 students were involved in the study, from the first year of Faculty of Physical Education, Tishreen University. They practised the volleyball classes two times a week, during the February – June 2022 period. Were divided into four groups, two of them as the experimental group and two as the control group. In the first two groups (consisting of 54 students), the experimental group, we eliminated the pair exercises, so they practised only self and against wall exercises. The other two groups, the control, did the regular training, including self, wall and pair exercises. As there is no standard methodology of evaluate the forearm passing skill, we decided to use a scoring system adapted by author to the needs of the students. After the testing and retesting, the control groups scored better, improved more their skills regarding the forearm passing, comparing to the groups that haven't practices pair exercise.

Key words: *volleyball, forearm pass, exercise with partner, exercise without partner, first year students*

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Introduction

Volleyball is currently considered to be a dynamic game, during which low intensity and high intensity movements alternate (Kutac, 2020). As Ajayati (2017) notice, the involvement of students in learning volleyball program is expected to help optimize the growth and development of students, improve students' physical fitness components, such as endurance strength, power, flexibility, agility, balance and motor coordination. Gazali (2016) divides the basic techniques in the volleyball game in service, passing, smash, and block. The underarm pass is the most versatile gesture in volleyball (Villanueva, 2020). It is very often used to play the ball when it comes low and with high speed. As Villanueva defines, it consists of four phases:

- The static position before hitting. It is one crucial aspect of the pass, the player has to move very quick to the ball and set up the right static position before hitting.
- Placing of the feet. The feet have to be placed wider than the shoulders, but not too much. The knees will be bended, so the body is in a slightly forward position. The position is similar to sitting on an imaginary chair. In the mean time one feet is placed a little bit in from of the other. This will help the player to give direction of the ball.
- Position of the arms. The arms have to be completely extended and in an almost parallel to the tights position. The thumbs have to be placed together, leaving no gap between them.
- Setting the pass. Is the last phase of the forearm pass, similar with the lift up from the imaginary chair. The ball has to be hit with the forearms (so the name of forearm pass) – not with the wrists, with a dry hit, not abrupt, always followed by the extension of the legs.

When undertaking a forearm pass, there are varied types of mistakes that students could experience: bad hand positioning, bent arms, bad placing against the ball, inadequate trunk inclination, incorrect direction of the arms, failure in the coordination of kinematic chain by legs and arms, asymmetrical hit of the ball.

Objectives

In the literature could be identified more types of exercises used in volleyball. Under research of different authors (Villanueva 2020, Ozawa 2021, Astuti 2021 etc) we could identify three main types of exercises self-

administered, with partner or against the wall. Because of the limited amount of time students have to practice the forearm pass we considered to find out the best design for their training. The hypothesis that we find out was: "*Do the same number of exercises have a better effect if their specific is varied (with or without partner) or if are practised only without partner (self administration of the ball or against the wall)?*"

Materials and Methods

The study was carried out on a group of 108 students from the first year of Tishreen University. They were divided into four groups. Group A and B (practising only exercises without partner) – 54 students and group C and D (practising both exercises with and without partner) – other 54 students. The students were all of them students of the University, none of them practising performance volleyball. They were asked for participation approval and all ethical criteria were respected.

The study was carried out between February – June 2022, consisting of two training sessions (100 min each) for all groups. Because a specific test for the lower pass is not defined in the literature, for testing the initial level of the lower pass we used an adapted scoring board.

The self and the wall assessment consisted of self playing at least 20 forearm passes for 30 seconds The partner assessment requested two players forearm passing the ball over the net for 30 seconds. Each test was taken two times, with 30 seconds recovery between repetitions, keeping the best scoring for each aspect. For game assessment, regular sets were played where each player was substitute after playing 3 forearm passes.

The tests were carried out for all participants in first week of February 2022 without any volleyball training before. Between February – June 2022 all groups participate in the volleyball training with the same frequency, 2 times per week, 100 min per training session. Two of the groups practised only exercises without partner (self and wall) and the other two groups, both exercises with partner and without partner. The number of exercises during each training session was the same and as well all the other aspects of the training (physical training, video training, games against opponent etc).

After ending the training the same tests were taken, in the same conditions – number of repetitions, scoring card, scoring points etc.

The results in the initial testing were compared using a t-test with the results in the final tests. Statistics were discussed as following trying to confirm or not the work hypothesis.

Results

In the initial testing the following results were obtained by groups A (27 students) and B (27 students) - practising only without partner exercises, C (27 students) and D (27 students) – practising all types of exercises.

Self assessment

According to the number of students scoring 1, 2, 3 or 4 p the total points of the group were calculated:

Table 1. Points scored during self assessment

Aspect/ Test	A	B	C	D
Thumbs together	64	64	65	63
Arms straight and flat	69	74	71	70
Ball contacts forearms	75	70	77	72
Shoulders in front of knees	61	67	69	63
Feet shoulder width apart	80	72	70	75
One foot slightly forward	75	66	66	70
Weight balanced	67	77	74	70
Moves to ball	77	68	72	72
Passes the ball to aim	64	65	68	65

Wall assessment

Table 2. Points scored during wall assessment

Aspect/ Test	A	B	C	D
Thumbs together	63	67	61	66
Arms straight and flat	69	74	71	71
Ball contacts forearms	71	71	75	70
Shoulders in front of knees	66	64	69	65
Feet shoulder width apart	80	73	70	73
One foot slightly forward	74	68	66	70
Weight balanced	66	72	74	67
Moves to ball	73	68	71	70
Passes the ball to aim	66	66	69	66

Partner assessment

Table 3. Points scored during partner assessment

Aspect/ Test	A	B	C	D
Thumbs together	61	65	64	66
Arms straight and flat	67	77	72	72
Ball contacts forearms	77	72	72	70
Shoulders in front of knees	64	61	66	67
Feet shoulder width apart	78	72	71	75
One foot slightly forward	77	67	69	70
Weight balanced	66	73	75	66
Moves to ball	71	66	70	70
Passes the ball to aim	65	68	67	66

Game

Table 4. Points scored during game assessment

Aspect/ Test	A	B	C	D
Thumbs together	58	60	59	61
Arms straight and flat	63	70	67	69
Ball contacts forearms	70	68	68	63
Shoulders in front of knees	60	58	62	62
Feet shoulder width apart	72	66	70	69
One foot slightly forward	71	63	63	62
Weight balanced	61	68	71	60
Moves to ball	70	61	64	65
Passes the ball to aim	64	62	62	61

As calculated, the averages of the performance, in the initial testing were the following:

Table 5. Averages calculated after all assessments

	A	B	C	D
Self	70.22	69.22	70.22	68.88
Wall	69.77	69.22	69.55	68.66
Partner	69.55	69	69.55	69.11
Game	65.44	64	65.11	63.55

After the training carried out for 18 weeks, the same tests were taken again, under same protocol. During training in group A and B were practised both exercises with and without partner and in groups C and D only exercises without partner. The results on the final tests were the following:

Self assessment

Table 6. Points scored during self assessment – final testing

Aspect/ Test	A	B	C	D
Thumbs together	66	67	68	67
Arms straight and flat	69	75	71	74
Ball contacts forearms	76	73	79	75
Shoulders in front of knees	63	69	70	69
Feet shoulder width apart	82	74	77	77
One foot slightly forward	77	67	67	72
Weight balanced	69	79	78	74
Moves to ball	77	69	76	76
Passes the ball to aim	68	68	69	67

Wall assessment

Table 7. Points scored during wall assessment – final testing

Aspect/ Test	A	B	C	D
Thumbs together	65	68	66	69
Arms straight and flat	71	75	75	73
Ball contacts forearms	72	72	78	76
Shoulders in front of knees	67	66	72	68
Feet shoulder width apart	83	75	75	75
One foot slightly forward	75	69	67	72
Weight balanced	66	73	77	69
Moves to ball	73	70	74	72
Passes the ball to aim	68	69	70	68

Partner assessment

Table 8. Points scored during partner assessment – final testing

Aspect/ Test	A	B	C	D
Thumbs together	63	66	67	69
Arms straight and flat	68	79	76	76
Ball contacts forearms	77	74	74	76
Shoulders in front of knees	64	62	69	69
Feet shoulder width apart	79	72	73	77
One foot slightly forward	77	67	72	73
Weight balanced	68	74	78	69
Moves to ball	73	67	72	73
Passes the ball to aim	66	69	69	69

Game

Table 9. Points scored during game assessment – final testing

Aspect/ Test	A	B	C	D
Thumbs together	60	63	63	63
Arms straight and flat	65	72	69	72
Ball contacts forearms	72	70	73	66
Shoulders in front of knees	62	60	65	65
Feet shoulder width apart	74	67	72	72
One foot slightly forward	72	64	66	67
Weight balanced	61	69	74	65
Moves to ball	73	63	66	67
Passes the ball to aim	67	65	67	65

As calculated, the averages of the performance, for the final testing were the following:

Table 10. Averages calculated after final testing

	A	B	C	D
Self	71.88	71.22	72.77	72.33
Wall	71.11	70.77	72.66	71.33
Partner	70.55	70	72.22	72.33
Game	67.33	65.88	68.33	66.88

To analyse the results from initial and final testing we chose to group them into a table including both.

Table 11. Compared averages initial and final testing

	A ini	A fin	B ini	B fin	C ini	C fin	D ini	D fin
Self	70.22	71.88	69.22	71.22	70.22	72.77	68.88	72.33
Wall	69.77	71.11	69.22	70.77	69.55	72.66	68.66	71.33
Partner	69.55	70.55	69	70	69.55	72.22	69.11	72.33
Game	65.44	67.33	64	65.88	65.11	68.33	63.55	66.88

The following reports between the initial and final tests were found:

Table 12. Reports between initial and final testing

	A ini/ A fin	B ini/ B fin	C ini/ C fin	D ini/ D fin	Average
Self	1.023	1.028	1.036	1.050	1.034
Wall	1.019	1.022	1.044	1.038	1.030
Partner	1.014	1.014	1.038	1.046	1.028
Game	1.028	1.029	1.049	1.052	1.039
Average	1.021	1.023	1.041	1.046	1.033

Discussion

As previous studies shown, notice that all reports are higher than 1, meaning an overall all progress during volleyball classes practices in the University was recorded during the exercise. Still, the average in the groups C and D, that practised all types of training is higher (1.041 & 1.033 compared to 1.021 & 1.023). We notice also that the higher progress of the forearm pass was recorded during games (increase 3.9%), that shows the exercises were well chosen, aspect that was not relieved by previous studies (a comparation to the results during games). We consider that a final aim of the training is to record a progress during games, not into isolated practise.

As we can see in groups A and B the lowest progress is recorded in exercises with partner (1.4%). In groups C the lowest progress is in exercises with self administration (3.6%) and in group D for wall practice (3.8%). Also, here we notice that is a difference about the lowest progress 1.4% compared to 3.8%, meaning that in the A and B groups the progress that is down, is much under the lowest progress in groups C and D. Regarding the previous studies we had the evidences of the efectivity of the exercises, but not a comparation between them.

Applying the t-test to test if the difference between the averages is statistically relevant, we found the next values:

The mean of A&B minus C&D equals -0.02190;

95% confidence interval of this difference: From -0.02704 to -0.01676;

t = 8.9498;

df = 18 Standard error of difference (one tail P) = 0.002.

This means that the two-tailed P value is less than 0.0001. By conventional criteria, this difference is considered to be extremely statistically significant.

Conclusions

Practising regular volleyball training improves the ability of forearm passing. This could be noticed both in isolated exercises and in regular volleyball game. There are varied categories of volleyball exercise and methods used in training.

The results of the study show that a varied training will improve better the ability of forearm passing. Using only one type of exercises will not have the same effectiveness like a mixed one. Although further research should be done to find out the exact ration between each type of exercise. In the mean time, the results prove that none of the partner or single type exercises have to be excluded. Including exercises – self administrated, against wall and with partner is the best way to improve the passing. This has to be accepted by coaches and included in the management of training process, especially in the university field.

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APENDIX

The model of the data interpretation

Scoring table for volleyball forearm pass

Aspect/ Test	Self assessment	Wall assessment	Partner assessment	Game
Thumbs Together				
Arms Straight and flat				
Ball Contacts Forearms				
Shoulders in front of Knees				
Feet shoulder width apart				
One foot slightly forward				
Weight Balanced				
Moves to ball				
Passes the ball to aim				

The scoring system was a 4 point grade scale as following:

1 point – poor execution, unable to carry on the task;
2 points – poor to average – sometimes playing well the task, but not succeeding in difficult situations;
3 points – average to good – fair execution, playing well more than half of the balls;
4 points – good execution – succeeding the tasks, saving difficult balls, few errors.

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BIOMECHANICAL AND THERAPEUTIC IMPLICATIONS OF THE ANATOMICAL LOCATION OF TRIGGER POINTS

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ABSTRACT. This article establishes the existing correlations between the anatomical location of muscle trigger points and their ability to affect joint mobility. Deeply located muscles, such as the brachialis and piriformis, do not have joint biomechanical consequences when they contain trigger points, but are more difficult to approach therapeutically, in the sense that they require the injection of anesthetics or anti-inflammatories, the maneuver being guided by ultrasound. Theoretically, patients with arthritis are more exposed to being affected by such trigger points. Cervical or temporo-mandibular biomechanical disorders are caused by trigger points in the trapezium, respectively sternocleidomestoid.

Key words*: myofascial pain, joint hypomotility, brachial, piriformis, arthritis*

REZUMAT. Acest articol stabileşte corelaţiile existente între localizarea anatomică a punctelor trigger musculare şi capacitatea acestora de a afecta mobilitatea articulară. Mușchii situaţi profund, ca de exemplu brahialul şi piriformul, nu au consecinţe biomecanice articulare atunci când conţin puncte trigger, dar sunt mai dificil de abordat terapeutic, în sensul că necesită injectarea de anestezice sau antiinflamatorii, manevra fiind ghidată ultrasonic. Teoretic, pacienţii cu artrită sunt mai expuşi de a fi afectaţi de astfel de puncte trigger. Afecţiuni biomecanice cervicale sau temporo-mandibulare sunt provocate de punctele trigger din trapez, respectiv sternocleidomestoidieni.

Cuvinte cheie*: durere miofascială, hipomotilitate articulară, brahial, piriform, artrită*

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Introduction

The correlation between trigger points and joint hypomobility is frequently reported by physicians, however, the order in which these muscle and joint deficiencies should be addressed therapeutically not known and thus further studies are needed (Fernández-de-Las-Peñas, 2009). On the other hand, considering stiffness as a biomechanical property of trigger points of the soleus muscle, only dry acupuncture (dry needling) managed to improve it (Jiménez-Sánchez et al, 2021). It turns out that trigger points biomechanically affect both joints and muscles. As a result, the current work aims to analyze the biomechanical and therapeutic implications of the anatomical location of these trigger points, that is, depending on the affected muscle.

Neck, upper back and shoulders

For trigger points located in the upper trapezius, dry acupuncture (dry needling) has better results for improving pain, neck and shoulder disabilities than compression (Ziaeifar et al., 2019). When the trigger points are located both in the upper trapezius and in the infraspinatus muscle, in athletes with unilateral shoulder impingement syndrome, dry acupuncture for the treatment of shoulder and arm pain and disability has better results when it targets only the infraspinatus in terms of patient comfort (Kamali, Sinaei & Morovati, 2019). When the trigger points are located in the upper trapezius, sternocleidomastoid or levator scapula, there is neck pain and hypomotility at the C3-C4 level, and the analgesic therapies used are ischemic compression and spinal manipulation (Fernández-de-Las-Peñas, 2009). Latent myofascial trigger points located in the sternocleidomastoid muscle can cause a reduction in the amplitude of the temporomandibular joint, one of the therapeutic means being kinesio taping (Bae, 2014). In patients with cervicogenic headache, manual therapy targeted to the active trigger points of the sternocleidomastoid results in the reduction of the headache, the improvement of the motility of the deep cervical flexors and the range of motion of the cervical spine (Bodes-Pardo et al., 2013). For migraines with the same etiology, dry needles applied to the active myofascial trigger points of the sternocleidomastoid can also be used (Rezaeian et al., 2020). Relief of headache with this etiology can also be obtained with ischemic compression, but it seems that the biomechanical properties of the myofascial trigger points are not influenced (Jafari, Bahrpeyma & Togha, 2017). For chronic mechanical neck pain, a condition in which the trigger points of the trapezius and levator scapula are involved, pain and cervical range of motion

are improved more effectively by dry needling combined with manual therapy than by sham dry needling combined with manual therapy (Gallego-Sendarrubias et al., 2020). In the case of the presence of trigger points in the upper trapezius, the activation of the deltoid and serratus anterior during the raising of the arm is delayed (Bohlooli et al., 2016).

Arms

Trigger points located in the brachial biceps can be the basis of shoulder pain (Bron et al., 2007). For the pathological problems of the rotator cuff which are caused by the presence of trigger points located in the brachial muscle, trigger points injection with anti-inflammatory drugs, guided by ultrasound, is used (Suh et al., 2014).

The pelvis and the lower limb

Trigger points in quadratus lumborum, gluteus medius, gluteus minimus and piriformis can result in low back pain and leg pain referral (Holm et al., 2020). It should be mentioned that the latent trigger points in the gluteus medius can limit the movements of the coxofemoral joint (Bagcier et al., 2022). The application of trigger point dry needling is able to improve the biomechanical properties of the gluteus medius (Schneider et al., 2022). Piriformis syndrome can be the cause of low back pain, and the treatment of the trigger points of the piriformis muscle is done by ultrasound-guided injection of anesthetics (Aquino-Jose et al., 2020). The trigger points in the quadratus lumborum can be the cause of low back pain, possibly associated with buttock pain, and their treatment can be done by applying needles to the deep trigger points followed by lidocaine injection (Sirh et al., 2022).

Discussions

Important biomechanical implications are those of the trigger points located in the sternocleidomastoid muscle (for the temporomandibular joint) and of the trigger points located in the upper trapezius (for the shoulder joint). Dry needling is the treatment of choice. Sternocleidomastoid affected by trigger points can be the cause of migraine, and trapezius with myofascial pain can affect the biomechanics of the arm, so other elements of differential diagnosis

are present here. The shoulder can also be affected by the trigger points located in the brachial or biceps brachii. In case of localization of trigger points in the brachial, ultrasound-guided anti-inflammatory injection is used, probably due to the deep anatomical situation. Shoulder pain can also be caused by trigger points located in the trapezius (not only in the biceps brachii or brachii muscle), but in this case disability of the neck, arm, hand, and shoulder is also present (Ziaeifar et al., 2019). It is interesting that the trigger points located in the gluteus medius, which can be treated by dry needling, can cause biomechanical problems of the coxofemoral joint, while the trigger points located in deeper muscles (piriformis or quadratus lumborum), whose therapy is done by ultrasonic guided injection, no. Quadratus lumborum does not have a trochanteric insertion and thus it could be explained that its myofascial damage has no implications on the coxofemoral biomechanics, but the gluteus medius and the piriformis muscle insert on the greater trochanter. The explanation would lie in the muscle volume, smaller for the piriformis. The same considerations apply to the brachialis, a deep muscle that is more difficult to treat therapeutically (the treatment of trigger points requires ultrasound-guided injections). Its myofascial damage does not cause disabilities of the arm like that of the trapezius (whose trigger points can be treated by dry needling). An interesting fact is that arthritis can cause the appearance of muscle trigger points, among the incriminated factors being the reduced mobility due to that disease (Reynolds, 1981). Considering that deep muscles such as the piriformis or the brachialis have a relatively low mobility, we can consider that they are prone to the appearance of trigger points in patients with arthritis. A vicious circle is thus created, myofascial pain biomechanically affecting the muscle and increasing stiffness.

Conclusions

1. The trapezius and sternocleidomastoid muscles can cause, when they contain trigger points, biomechanical dysfunctions, the treatment being represented by dry needling, compressions and kinesio-taping.
2. Deep muscles such as the piriformis or the brachialis, when they contain trigger points, do not affect joint biomechanics, but require treatment by injection.
3. Theoretically, deep muscles are more susceptible to develop trigger points in patients with arthritis.

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