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DOES PLAYING CHESS STRENGTHEN RESILIENCE?

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ABSTRACT. Previous studies show that physical sports strengthen the psychological immunity, namely the resilience. In our research, we sought to answer the question of whether the above statement was also true for chess, one of the most popular mind sports. The aim of our study is to find correlations between resilience and chess, especially in its competitive form. The American Psychological Association (APA) summarizes the behavior and lifestyle requirements to build resilience in ten points. We used a questionnaire to quantify the level of resilience in persons participating in the research. We divided the participants (396 persons) into three groups based on their chess experience: tournament players, hobby players, and non-players as a control group. We compared the results of the groups in each requirement listed by the APA. Chess players had better results in seven cases of the ten guideline points, while no correlation was found in three cases. Chess competitors are more likely able to accept crises and situations that cannot be changed. They are more focused while pursuing their goals and are able to face and work through challenges more efficiently. They seek the reasons of their failures which helps them to improve their skills. Chess players also tend to maintain a healthier lifestyle. We conclude that chess, especially in its competitive form, can build resilience.

Keywords: *chess, resilience, drawing consequences from failure.*

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Introduction

It is well known that physical activity has great importance in maintenance and improvement of health and helps to cope with diseases and their complications. As an example, controlled, regular exercise has a basic role in the therapy of obesity and carbohydrate and lipid metabolic disorders in developed countries. Moreover, sport has favorable psychological effects as well. It contributes to health awareness, youthfulness, makes one feel fit, helps develop regularity and increases the ability to define priorities. Stamina, need for development, aspiration for victory in a fair competition and enjoying success are all parts of sport.

Chess is one of the oldest mind sports and the aforementioned favorable psychological effects of physical activity are true for chess as well. Previous research suggests that chess develops cognitive skills (Fotinica & Petru, 2014), influences persistent attention, concentration, auditory memory function (Fattahi et al., 2015), creativity (Joseph et al., 2016), contrivance 'thinking' in general, mathematical and logical abilities (e.g., Medvegy et al., 2018; Gobet, 2018). Hence, it is worth beginning playing chess as early as possible (Aciego et al., 2013). In recognition of this fact, the European Parliament issued a declaration about supporting the introduction of chess into education (Strasbourg, 2012). It made it possible to include chess in the curriculum in several countries.

But does chess have any further advantages apart from those mentioned above? Besides use of cognitive skills, is there any other difference in personality between those who play chess and those who do not? Does chess affect maintenance and development of – both physical and mental – health? We answer these questions through the examination of resilience.

Resilience is a psychological concept which means coping skills, flexibility, ability of adapting in the face of stress and hardships of life and getting on well in life (Masten & Reed, 2002). Resilience helps us to avoid nervous breakdowns caused by stressful events (Zautra et al., 2010), therefore, it has been studied extensively by scientists. Resilience is the ability to mentally or emotionally cope with a crisis or to return to pre-crisis status quickly (*de Terte* & Stephens, 2014). It is generally a 'positive adaptation' after a stressful or adverse situation (Hopf, 2010). When someone is constantly under stress, it disrupts the internal and external sense of balance, presenting challenges as well as opportunities. The routine stressors of daily life can have positive impacts which promote resilience. Some people can handle greater amounts of stress than others (Oláh, 2004). Stress is experienced in an individual's life course at times of difficult life transitions, involving developmental and social change; traumatic life events, including grief and loss; and environmental pressures, encompassing poverty

and community violence (*Kemp et al., 1997*). The Children's Institute of the University of Rochester explains that 'resilience research is focused on studying those who engage in life with hope and humor despite devastating losses' (Pedro-Carroll, 2005). Resilience allows a person to rebound from adversity as a strengthened and more resourceful person (Richardson, 2002). When an event is appraised as comprehensible (predictable), manageable (controllable), and somehow meaningful (explainable) a resilient response is more likely (Carr, 2004). Resilience has several interrelated components. Improvement of resilience is possible and necessary.

The American Psychological Association (APA) recommends a ten-point list for building and improving resilience (APA, 2016). It suggests that these measures are effective either separately or – especially – together. The essence of these points is the following:

1) Make good connections with family members and friends.
2) Avoid seeing crises as insurmountable problems.
3) Accept situations as they are (even when they are unchangeable).
4) Move toward your realistic goals.
5) Take decisive actions.
6) Look for opportunities for self-discovery.
7) Nurture a positive view of yourself.
8) Keep things in perspective.
9) Maintain a hopeful outlook.
10) Take care of yourself.

Several studies have found that there is a positive correlation between physical sports and resilience (e.g., Hosseini, 2010). Christopher Bryan analyzed the current knowledge of sport and resilience (a total of 64 articles) and bridged the gap between the work and sport psychology to develop a unified understanding of this concept (Bryan, 2017). The relation between sports and resilience is reciprocal: physical sports have beneficial effects on resilience and more resilient athletes perform better in sports (Chacón-Cuberos et al., 2019).

One may ask whether physical activity or other factors from competitive sports tend to strengthen resilience. We can get an answer to this question through the study of the possible correlation between mind sports and resilience. In case of correlation, we could conclude that not only physical activity but also other factors associated with mind sports would be related to resilience.

Correlation between chess and resilience has already been claimed. Mangesh (2015) explained the resilience through a common chess opening, namely the Ruy Lopez. The reigning world champion Magnus Carlsen presents 10 effects of chess in his blog which help develop resilience. He points out that chess helps accept new situations and makes connections even between those who do

not share a common language, teaches how to draw consequences from failures, helps to recognize hardships, teaches how to follow rules, create safe 'state' and accept actual balance of power (Play Magnus, 2018). Hymer (2021) described the role of resilience in chess achievements. For example, the world champion Magnus Carlsen demonstrates his ability of bouncing back: He scored 66% after a win, 60% after a draw, and a staggering 73% after a loss (Hymer, 2021).

Hymer (2021) made the following suggestions in order to become more resilient in chess:

- see resilience not as something you are, but as something you do
- change the self-talk record
- find a role model
- have a laugh about it
- keep good habits
- accept the hurt

It comes into view that these recommendations are in correlation with the suggestions of APA (APA, 2016). A successful chess player needs to take the most of these advices.

Hypotheses

Although the above-mentioned suggest that there is a clear link between resilience and competitive chess, we would like to support this prediction with research. The goal of our study is to find statistical correlations between chess and resilience, driving attention this way to the importance of playing chess. Our main hypothesis is that competitive chess players are more resilient than those who do not play chess. In other words, we predict that the responses of competitive chess players are more in line with the recommendations for strengthening resilience (APA, 2016) than non-chess players. Our sub hypotheses are that chess players are on a higher level of resilience in each particular point of the APA list mentioned above (APA, 2016).

Materials and methods

Sampling

We used stratified sampling method because we assumed that chess players were difficult to reach randomly within the population. We divided the target group into two main groups (chess players and non-players as a control group) and different sampling methods were used in each group. We used

snowball method when selected chess players and random selection when chose the control group. We found that there is a huge difference between chess players in whether they play chess competitively or at a hobby level so we divided the group into two. Finally, we got three groups which were well separable from each other: competitive players (have FIDE Elo-points), hobby players (play chess occasionally but don't have Elo-points) and non-players (cannot play chess or never play at all).

Participants

396 participants (268 men, 128 women; age: M = 39 years, SD = 15) took part in the study. The participants were divided into three groups based on their chess expertise. 197 FIDE-rated individuals (161 men, 36 women; age: M = 36 years, SD = 15) were placed into the group we called competitive players. 92 individuals (56 men, 36 women; age: M = 40 years, SD = 14) were placed into the group called hobby chess players. They were intellectual workers or students playing chess as a hobby but not in competitive form. 107 individuals (51 men, 56 women; age: M = 45 years, SD = 14) were placed into the group called non-players. They were intellectual workers or students who do not play chess.

In the groups of competitive and hobby chess players, the proportion of men and women differed significantly. This is explained by the fact that chess is much more popular among men than among women. The above statement is also supported by the fact that only ca. 40,000 of the ca. 246,000 chess players (that is 16%) on the FIDE Elo rating list are women.

Materials

An anonymous questionnaire was filled in by the participants. The questions were related to the resilience-improving suggestions (APA, 2016): Making connections, tolerating failure, seeking the cause of failure, ability to concentrate, purposefulness, self-knowledge, self-confidence, foresight, and healthy lifestyle.

Data Analyses

We evaluated the points of the questionnaire that showed correlation with improving resilience. We investigated self-evaluating questions on the Likert scale from 1 to 5 points (5 is best). We studied the distribution of points compared to each other at competitive chess players, hobby players and non-players. As the distribution was not balanced neither in gender nor in age (at competitive and hobby players the majority were men), the effects of those were taken into account as well.

Statistical analysis was carried out with logistic regression, comparing probabilities of enrolling into individual groups. We applied cumulative logit model (Agresti, Kateri, 2011; Brant, 1990). Using this technique, the rate of appearance of the individuals (characterized by chess knowledge, age and gender) at the levels of the dependent variables can be obtained by the fitted regression model. If the factor of the chess knowledge is found to be significant for a given question, it means that the distribution of the responses changes with the level of the chess knowledge. For example, the factor of the chess knowledge was found to be significant in the question connected to "foresight": The responses of the competitive chess players tend to be higher than those from the other two groups (Figure 5). This result in the responses of the competitive chess players having larger relative frequencies at higher ratings and smaller relative frequency at smaller ratings. The fitted models also take into account the potential effect of age and gender.

Figures show the connection of values of investigated features (e.g., accepting failure, seeking its cause) relating to the factor of chess knowledge (competitive chess players/hobby-players/non-players) and their distribution. When there was a difference between the two genders we depicted them distinctly.

Results

We accepted the correlation between the listed ten APA recommendations and investigated behavior patterns at $p < .05$ significance.

1. Making connections. No correlations were found.
2. Considering crises as solvable problems and...
3. ...accepting unchangeable situations. The results suggest that competitive chess players are better in tolerating failure ($p < .005$). Figure 1 displays distribution of answers from 1 to 5 referring to acceptance of failure in individuals of each group. It shows that the distribution of non-players is shifted towards to lower numbers (i.e. lower failure tolerance) compared to that of chess-players. Competitive chess players are in greater proportion at higher rates of acceptance of failure (3-4 columns) compared to the non-players.
4. Move toward your goals. We confirmed that chess players rated themselves more purposeful. This is demonstrated on Figure 2/a (men) and figure 2/b (women). It is apparent that both men and women chess players have chosen the better purposefulness categories than the non-players ($p < .001$). Chess players (men) are in greater proportion at

higher rates of the better performing (3-4 columns) compared to the non-players. Women chess players (Figure 3/b) had statistically even better results than men (Figure 3/a). To avoid bias originating from men-women difference we have made separate figures for both genders.

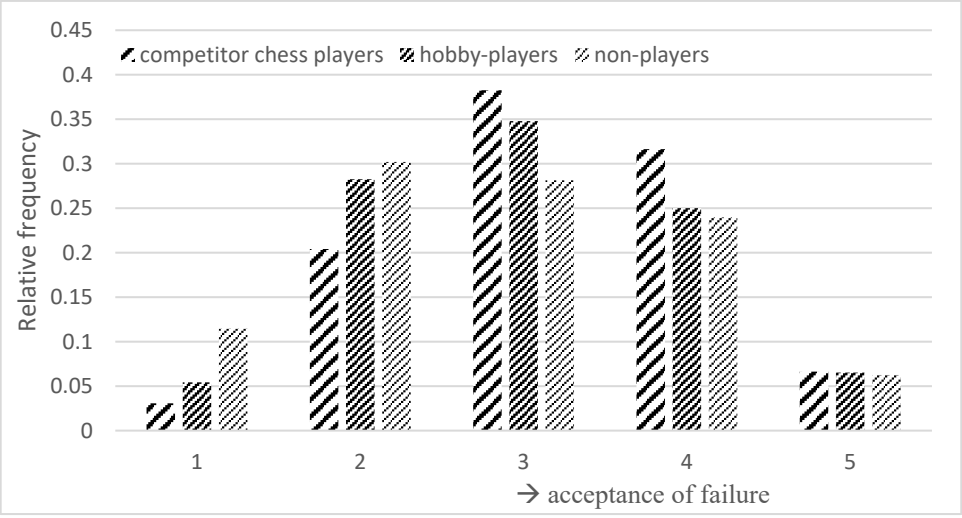

Figure 1. Acceptance of failure

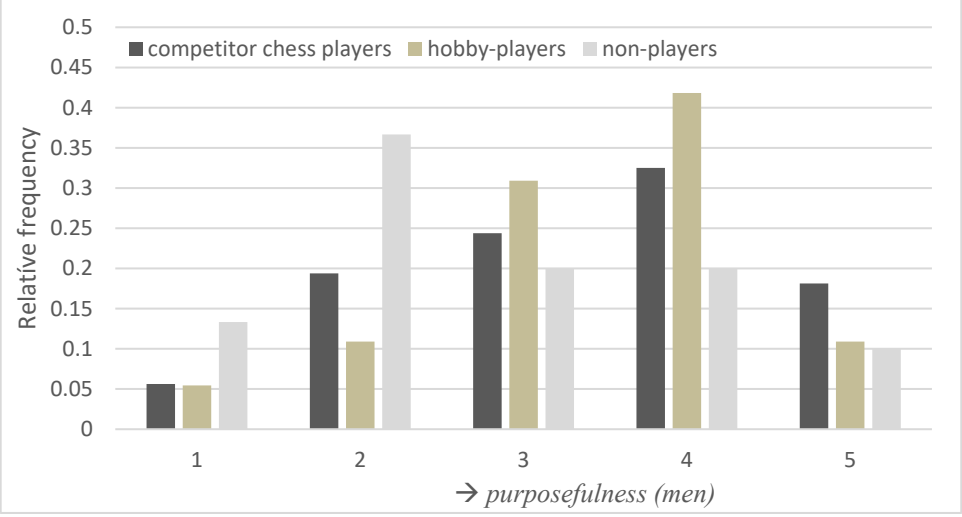

Figure 2/a. Purposefulness (men)

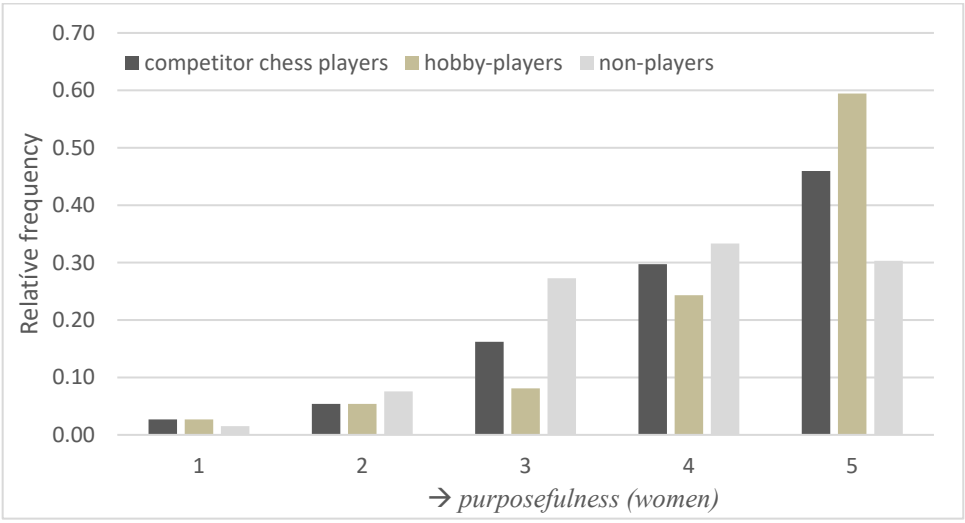

Figure 2/b. Purposefulness (women)

5. Make decisions in difficult situations as well. Chess players were more focused even in disturbing situations. We demonstrated it on figure 3/a (men) and figure 3/b (women).

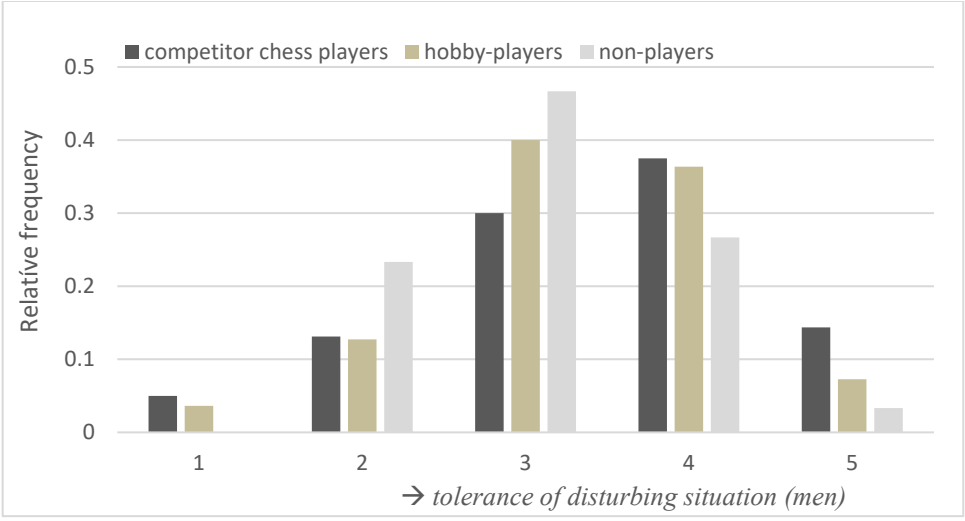

Figure 3/a. Tolerance of disturbing situation (men)

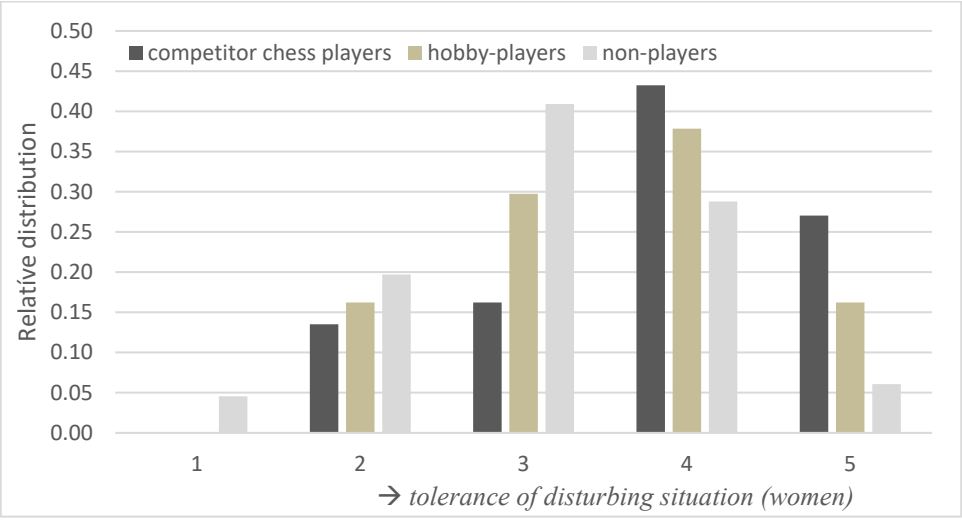

Figure 3/b. Tolerance of disturbing situation (women)

Competitors and hobby chess players were enrolled into more focused groups (4 and 5) in greater proportion than non-players. Women particularly had better results (shifted to higher values compared to men). We did not find statistical difference between competitive players and hobby-players.

6. Looking for solution even in difficult or losing situations. In order to avoid effects of age on the figure we used data of 29-36 years old age group, as shown in Figure 4. Competitive chess players were seeking reasons of failure more intensively and gave higher values than members of the two other groups ($p < .02$) (Figure 4). Young people are seeking reasons of failure more intensively.
7. Maintain a positive attitude against problems. We did not find any differences regarding chess but older people have shown more confidence.
8. Keep things in perspective. According to the results, chess players have better foresight than others, but this difference decreases with age. It is remarkable as Figure 5 shows that competitive chess players are enrolled in greatest proportion into group 5. Figure 5 shows 29-36 age group again to avoid age-related distortion. This age group is balanced within groups so effects of playing chess are apparent.

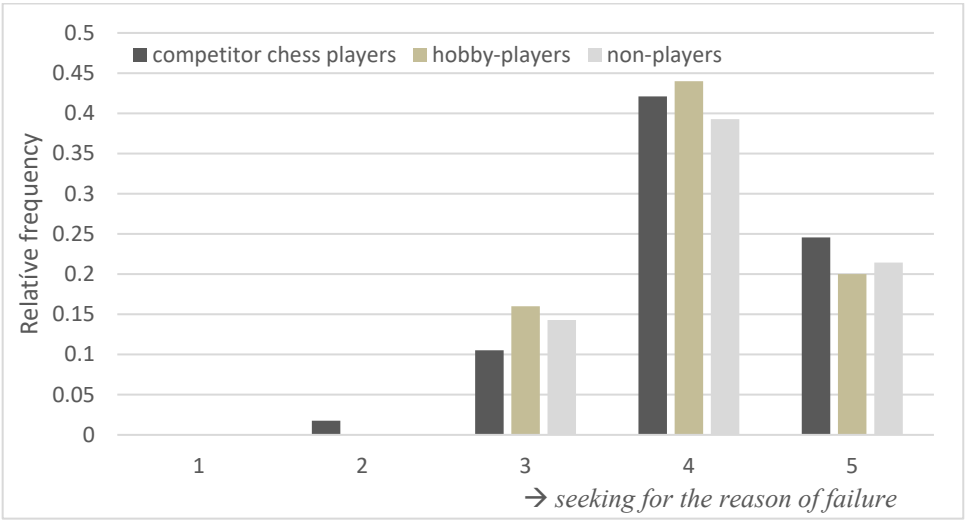

Figure 4. Seeking for the reason of failure

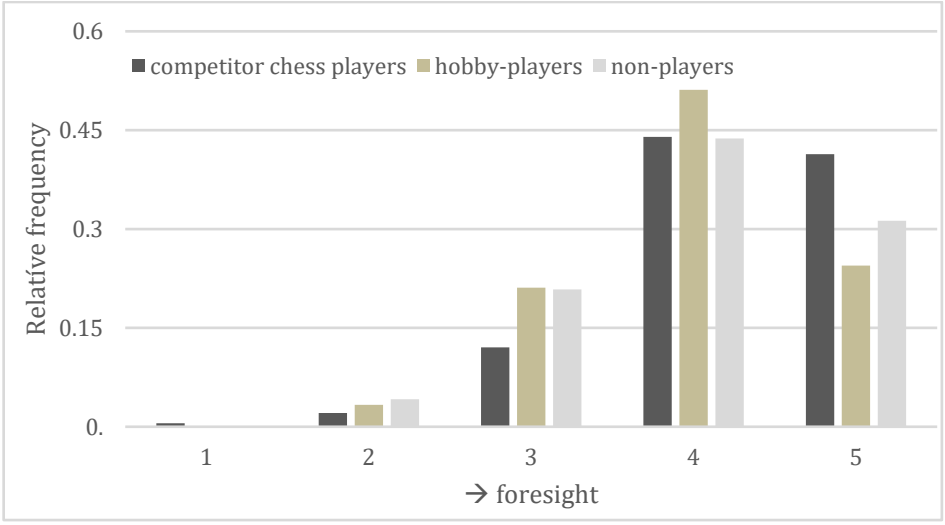

Figure 5. Foresight

9. Keep an optimistic outlook. We did not find any differences between the groups which means that chess players did not consider themselves more optimistic. They have mainly chosen the 'realistic' answer.

10. Take care of your health. Earlier we have evaluated the same questionnaire to assess healthy lifestyle with one-way variance analysis and post hoc (Tukey-style, with different elements) test. We found that chess players smoke less and eat healthier than others and there was a difference in the weekly amount of physical workout of competitive chess players and hobby-players ($p < .01$) and non-players ($p < .005$) (Medvegy et al., 2016).

Discussion

The goal of the current study was to examine whether there is a correlation between chess and resilience. We asked competitive chess players, hobby players and non-players to fill out a survey and then evaluated the responses of the groups regarding the ten points of recommendations to improve resilience (APA, 2016).

A chess player is necessarily in relation with his/her trainer, teammates and opponents, therefore chess helps to create social connections. We predicted that chess players would make better connections. However, the results did not support this hypothesis, we did not find a significant difference between the groups. It turned out that women and elderly hobby-players make relations easier. The results support the hypothesis that chess players tolerate failures more easily than non-players (see Figure 1). It is very important for a chess player because if a competitor became frustrated during a chess game after an unexpected turn or defeat, it would negatively affect his subsequent decisions. Successful chess players need to be able to adapt to new situations quickly.

In line with our hypotheses, the results showed that chess players are more purposeful (Figure 2/a, 2/b) and better able to focus even in disturbing conditions (Figure 3/a, 3/b) than non-chess players.

Our survey found that chess players analyze the reasons of their failures more thoroughly than non-chess players (Figure 4). Successful chess players always analyze their games to learn from them.

Only those become good players who approach their chances positively and consider problems as mere difficulties to cope with. Regarding self-image, we did not find any differences between the groups, so the result did not support the hypothesis in this question.

Successful chess players think in perspective and anticipate the consequences of their decisions on the board. The hypothesis was confirmed, as chess players were found to think more in perspective than non-chess players (Figure 5).

The results did not support the hypothesis that chess players are more optimistic than non-chess players, and we found no significant difference between groups. Chess players consider themselves mostly realistic.

Earlier we have evaluated the same questionnaire to assess healthy lifestyle. We concluded that chess players smoke less, eat healthier and make more activities than others (Medvegy et al., 2016). In three of the ten recommendations (APA, 2016), we found no significant difference between groups, while the answers to the other questions suggest that chess players (especially competitors) are more resilient than non-chess players. This result supports our main hypothesis that chess players have a higher level of resilience than of those who do not play chess. Based on our study, we can state that not only physical sports, but also chess, which is one of the most popular mental sports, has a positive effect on resilience.

Limits of the Study and Recommendations for Further Investigation

Although we reached decent results, our study has a few limitations. The participants in the study evaluated themselves, so the results were subjective. However, the above distortion affected all examined groups equally, so the groups with a large number of participants became comparable. We did not examine what other hobbies non-chess players have that could improve their resilience.

We did not examine a separate group of top chess players (e.g., grandmasters), our strongest group consisted of average tournament players. In future studies it would be worthwhile to compare the level of resilience of top players and tournament players.

Conclusions

Several studies have found that physical sports strengthen psychological immunity or resilience (e.g., Chacón-Cuberos et al., 2019). With our research, we tried to support the hypothesis that chess also strengthens resilience.

The results support the hypothesis since competitive chess players who participated in our study were on a higher level of resilience than the control group. They accept failures and unchangeable situations more easily, they are more purposeful and forward-thinking, they make better decisions even in disturbing situations, and live healthier life than non-chess players.

These results also indicate that in physical sports not only the physical activity but also the psychological factors play an important role in strengthening resilience.

Hence it is worth learning playing chess – preferably from childhood – because it improves resilience and adaptability.

Author statement

We confirm that the manuscript has been read and approved for submission by all the named authors.

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IMPROVING DRAW-A-PERSON TEST RESULTS BY DEVELOPING THE BODY SCHEMA DURING PHYSICAL EDUCATION AND SPORT LESSONS FOR STUDENTS AGED 6-7 YEARS

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ABSTRACT. Introduction: The physical education lesson in primary school can make an essential contribution to the psychomotor development of students. **The purpose** of this study is to highlight the progress made in the development of the Body Schema following the application of a specific intervention plan, progress verifiable in graphic form. **Material and method**: The target group consisted of 10 pupils (5 boys and 5 girls) aged between 6 and 7 years, pupils in the preparatory class who scored low and medium on the initial test. The experiment lasted 10 weeks, with 2 physical education lessons per week. The intervention plan included exercises and motor tracks focused on the development of the body schema. The "draw- a- person" test was applied. The scores were calculated for the Maturity Scale consisting of: Head Scale, Body Schema Scale and Clothing Scale. These scores underwent a qualitative interpretation of the differences between the initial and the final test. **Results**: There are visible differences of the "draw- a - person" drawings in the first and final tests of the students included in the study. The Body Schema was better integrated in the Maturity Scale, which means that the intervention program was efficient. **Conclusions**: Physical education and sports lessons with topics for developing the body schema were effective in recording the progress of this component.

Key words: *psychomotor skills, body schema, maturity scale, exercises, drawing.*

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REZUMAT. ***Îmbunătățirea rezultatelor testului „omulețul" prin dezvoltarea schemei corporale în timpul lecțiilor de educație fizică și sport pentru elevii cu vârste 6-7 ani.*** **Introducere**: Lecția de educației fizică la clasele primare poate avea o contribuție esențială în dezvoltarea psihomotrică a elevilor. **Scopul** acestui studiu este de a evidenția progresul înregistrat în dezvoltarea Schemei Corporale în urma aplicării unui plan de intervenție specific, progres verificabil sub formă grafică. **Material si metoda**: Grupul țintă este format din 10 elevi (5 băieți și 5 fete) cu vârsta cuprinsă între 6-7 ani, elevi în clasa pregătitoare care au înregistrat scoruri mici și medii la testarea inițială. Experimentul s-a desfășurat pe parcursul a 10 săptămâni, cu 2 lecții de educație fizică pe săptămână. Planul de intervenție a cuprins exerciții și parcursuri motrice axate pe dezvoltarea schemei corporale. S-a aplicat testul „omulețul". S-au calculat scoruri pentru Scala Maturității alcătuita din: Scala Capului, Scala Schemei Corporale și Scala Îmbrăcăminte. Aceste scoruri au fost argumentate printr-o interpretare calitativă a diferențelor înregistrate intre testarea inițială și cea finală. **Rezultate**: Intre desenele efectuate la testarea inițială și cea finală se observă diferențe vizibile în cadrul desenului „omulețul" în cazul elevilor cuprinși în studiu. Schema Corporala este mai bine integrată în Scala Maturității, programul de intervenție fiind eficient. **Concluzii**: Lecțiile de educație fizică și sport cu teme de dezvoltare a schemei corporale sunt eficiente în înregistrarea progreselor acestei componente.

Cuvinte cheie: *psihomotricitate, schema corporală, scala maturității, exerciții, desen.*

Introduction

Body schema is a complex phenomenon that manifests itself both kinesthetically and kinetically (Jacob and Jeannerod, 2005). From a kinesthetic point of view, the body schema allows both the awareness of one's own body through which an individual differs from someone else and the awareness of one's own body in motion. From a kinetic point of view, the body schema allows the body to move consciously and unconsciously (Legrand, 2006; Tsakiris & Haggard, 2006) and the feeling of agency and being the subject of one's own actions (Rossetti et al., 2005; Tsakiris &. Haggard, 2006; Tsakiris, SchultzBosbach, & Gallagher, 2007; De Vignemont, 2011). Furthermore, the body schema has a primary role in the child's evolution. It influences both the growth process and the development process of the individual. If the body schema is properly integrated, the individual will develop harmoniously, but if there are disorders of the body schema, they can negatively influence the growth and development of the child. The body schema is "an element that underlies the construction of the individual's personality,

being vital to this process and contributing to the increase of self-esteem" (Abalasei, B., Popescu, L., 2017, 9-10). Body schema also influences the motor development. It is a stage in which body movements and positions become known through contact with various objects in the environment. As a result, the body schema is considered the image that each person has about his own body in the relationship between body segments and the environment (Teixeira et al., 2015).

Physical education classes in primary school are important in the process of psychomotor development of pupils. Thus, the introduction in school curriculum of some elements of psychomotor skills will contribute to the cognitive development of pupils. There are numerous studies that analyze these aspects (Hillmam, Erickson & Kramer, 2008; Mas, Jiménez & Riera, 2018; Piek, Dawson, Smith & Gasson, 2008; Camargos & Maciel, 2016; Mas & Can, 2016). These studies reveal that the specific means of physical education contribute to the development of basic cognitive psychic processes: attention, perception, memory, thinking and imagination, developing maturity.

The body schema is the basic component of psychomotor behaviors, along with laterality and space-temporal orientation (Albu & al., 2006). The poor development of the pupil's body schema will also influence the development of laterality or space-temporal orientation. This process will have effects on the whole learning process. So, the role of physical education at a young age exceeds the limits of the physical field and intertwines in the cognitive one, with direct effects on school learning.

Graphics evolve in children depending on the stages of development at which they are. Drawing, also called "wordless language" (Lefebure, 2006) is one of the first forms of expression of children and appears very early in the process of their development. Drawing provides a way to get to know children in terms of their personality, their level of development, the disorders they may suffer from or their feelings (Luquet, 1927). At the age of 6-7, children are able to synthesize all the elements that characterize an object. They will try in a drawing to express everything they know about the object so that the person to whom they show it will be able to recognize that object (Luquet, 1927). Characters represent over 75% of children's drawings (Baldy, 2010). In the evolution of drawing between the first tests applied to children in the early twentieth century (Luquet, 1927) and today, there are no differences (Baldy, 2010). The drawing of the human body by children allows, among other things, the analysis of the evolution of the development of the body schema or its integration disorders.

The purpose of the research is to analyze the evolution of the integration of the body schema in the maturity scale of the students participating in the study after the application of the intervention plan to the physical education and sports lesson.

Materials and Methods

Participants

The study was part of a larger research, which involved 150 pupils, divided into 2 groups, the experiment group (76 pupils: 32 boys and 34 girls) and the control group (74 pupils: 31 boys and 33 girls), all aged between 6 and 7 years. These were all pupils in the preparatory class of the same school. 10 pupils (5 girls and 5 boys) that had low or average results in the initial testing were chosen from the experiment group.

The pupils in the experiment group followed a special program that lasted 10 weeks. Physical education in primary education is allocated a number of 2 lessons per week. This program consisted of introducing specific themes for the development of the body schema. These exercises were performed either separately or in motor tracks.

Measurement

In order to measure the level of development of the pupils' body schema, they underwent the Draw-a-Person Test (Goodenough, 1957; Royer, 1977) both before and after the application of the intervention plan. This test was applied collectively, in class. Each pupil received a set of 7 colored pencils (blue, green, red, yellow, purple, brown, black), an eraser and a sheet of A4 paper, placed vertically. The pupils were given the following guideline: "On this sheet of paper you will draw a little man, as beautiful as you can, if you want you can also color it." Students were left free to choose the location of the drawing on the page, the size of the drawing, the change of the position of the sheet, the sex of the drawn character, the chosen colors or the refusal to choose the colors. They were not given any help, criticism, appreciations or suggestions. The undecided students were encouraged with the formulas: "Very well, keep going" and those who were asked questions received the answer: "Do as you wish / as you please".

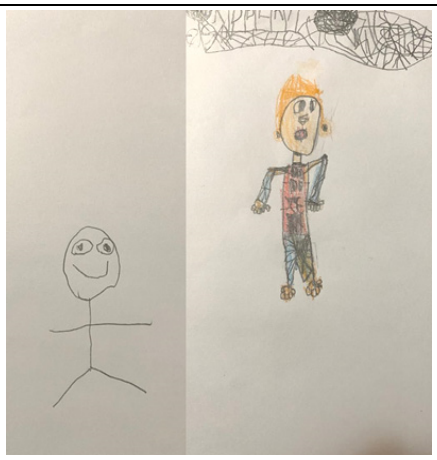
"Draw-a-Person" Test

It contains 51 items according to which the drawing of man was assessed (Goodenough, 1957). The total score obtained served as a basis for the establishment of a Maturity Scale. In order to establish this Maturity Scale, in addition to the 51 items, the evolutionary signs were also considered, bringing the total to 70 items (Royer, 1977). Three scales were analyzed: Body Schema Scale (it includes 33 items: torso, legs, arms, etc.), Head Scale (it includes 23 items: head, eyes, mouth, nose, etc.) and Clothing Scale (it includes 14 items: shoes, belt, etc.). Color were also added. Each item present was rated with 1 point.

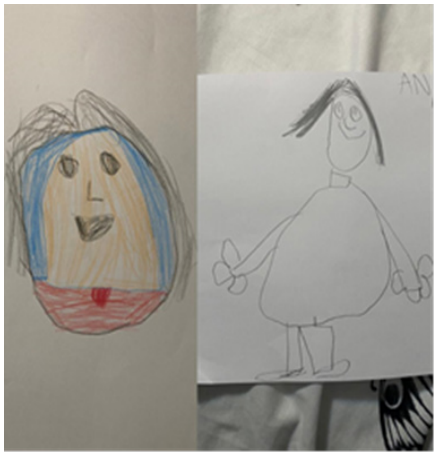
Results

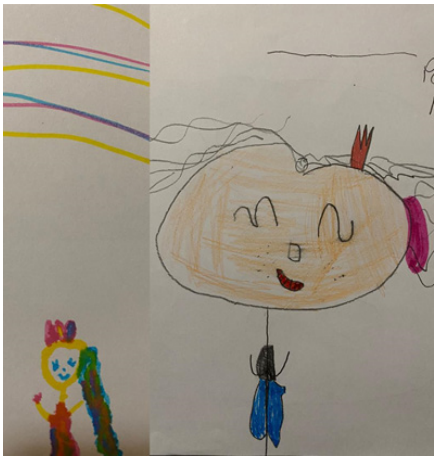
The students' drawings from both the initial and the final tests are presented below, as well as the scores registered at the Maturity Scale and at the 3 scales that compose it (Head Scale, Body Schema Scale, Clothing Scale) and the qualitative analysis of these results.

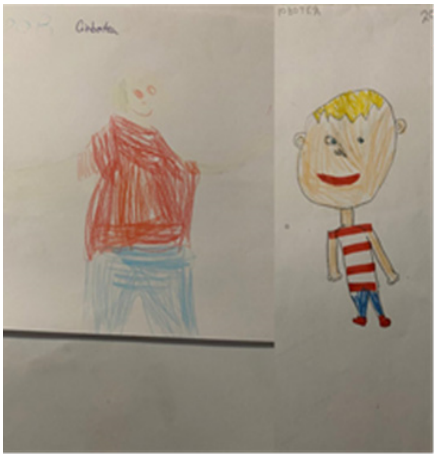
Table 1. "Draw-a-Person" Test' results

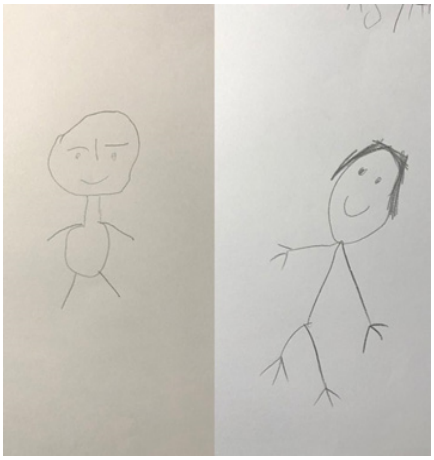
No.	**"Draw-a-Person" Drawing Initial Test/ Final Test**	**Gender/Age Score TI/TF**	**Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details**
1		F/6 T=16/52 SC=3/16 SSC= 13/26 SI=0/10	In the graphic representation there was a better awareness of the body schema, from a visual point of view but also kinesthetically. From the point of view of the 3 scales we noticed a significant improvement through the details added to each scale. Head Scale: the appearance of the hair, the presence of the nose, the realistic color of the face, of the mouth of the nose. Body Schema Scale: we noticed good proportions of the head, the appearance of the shoulders, palms, toes, the presence of the feet and their correct position, the outline of the drawing in black. Clothing Scale: we noticed the presence of clothes. Color Scale: the appearance of colors: yellow, red, blue. Added details: various added elements can be seen on the clothes. At the top of the drawing there is a sun and various elements that can be found on clothes.

No.	"Draw-a-Person" Drawing Initial Test/ Final Test	Gender/Age Score TI/TF	Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details
2		F/6 21/36 SC=10/16 SSC= 11/16 SI=0/5	Comparing the presence of the items of the 3 scales we noticed a significant improvement in the drawing from the final test, with the details added to each scale. Head Scale: showed the appearance of hair, the presence of the nose, the realistic color of the face, the mouth, and the nose. Body Schema Scale: showed good proportions of the head, the appearance of the palms, toes, the presence of the feet and their correct position, the outline of the drawing in black. Clothing Scale: we noticed the presence of clothes. Color Scale: showed the colors red, brown, pink, green and the background of the blue drawing compared to the yellow color from the initial testing. Added details: note the presence of red colored earrings but also a crown on the head.
3		F/6 14/41 SC=6/11 SSC=6/25 SI=2/5	Head Scale: we noticed the appearance of the hair, the presence of the nose, the realistic color of the face, of the mouth of the nose. Body Schema Scale: good proportions of the head, the appearance of the palms, toes, the presence of the feet and their correct position, the outline of the drawing in black. Clothing Scale: we noticed the presence of clothes. Color Scale: the appearance of red, purple, yellow, gray. Added elements: a colored crown and the clothes had some colored elements.

No.	"Draw-a-Person" Drawing Initial Test/ Final Test	Gender/Age Score TI/TF	Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details
4		F/6 15/38 SC=3/9 SSC=12/25 SI=0/5	Head Scale: we noticed the presence of the nose, eyes, hair, mouth, the realistic color of the face, the mouth of the nose. Body Schema Scale: the little man was identifiable, good proportions of the head, the presence of the neck, the presence of the torso, the appearance of the shoulders, arms and legs drawn with two lines, the presence of palms, toes, the presence of oversized feet and their correct position, contour drawing in black. Clothing Scale: we noticed the presence of clothes. Color Scale: showed the appearance of green, brown and black compared to the yellow in the first drawing. The presence of grass can be seen at the top and bottom of the leaf.
5		F/7 24/34 SC= 13/16 SSC= 11/14 SI= 0/4	By analyzing the items of the 3 scales we noticed a significant improvement through the added details. Improvements appeared starting from the Body Schema Scale, the little man being identifiable, good proportions of the head, the presence of the neck, the presence of the torso, the appearance of the shoulders, arms and legs drawn with two lines, palms, toes, the presence of the feet and their correct position. black. At the Clothing Scale and the Head Scale the results were not remarkable. At the Color Scale, at the initial test there were four colors (gray, blue, orange and red) compared to gray as the only color present in the drawing from the final test.

No.	"Draw-a-Person" Drawing Initial Test/ Final Test	Gender/Age Score TI/TF	Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details
6		M/6 9/29 SC=3/10 SSC= 6/16 SI= 0/3	Head Scale: the presence of the nose, the realistic color of the face, the mouth of the nose. Body Schema Scale: the little human was identifiable, good proportions of the head, the presence of the trunk, the appearance of the shoulders, arms and legs drawn with two lines, palms, toes, the presence of the feet and their correct position, the outline of the drawing in black. Clothing Scale: we noticed the presence of clothes. Color Scale: orange and purple were added The details include the addition of a bag and shoes.
7		M/6 27/39 SC=8/11 SSC=13/17 SI= 6/11	The graphic representation highlighted a better awareness of the Body Schema from a visual point of view but also kinesthetically. By analyzing the human perception according to space, we noticed a better layout on the page in drawing 2, but the head is oversized. The presence of clothes could be seen on the Clothing Scale. On the Color Scale, more colors were observed at the initial testing (yellow, green, red, pink, purple) than at the final testing (blue, pink and orange). As details, the presence of a crown was observed, proportioned in the first drawing and disproportionate in relation to the size of the head in the second drawing.

No.	"Draw-a-Person" Drawing Initial Test/ Final Test	Gender/Age Score TI/TF	Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details
8		M/7 26/44 SC=5/12 SSC=19/28 SI=0/3	Body Schema Scale: good proportions of the head, the presence of the neck, the appearance of the shoulders, palms, toes, the presence of the feet and their correct position, the outline of the drawing in black. Clothing Scale: we noticed the presence of shorts and a blouse. Head Scale: we noticed a regression, at the final test the nose, eyebrows and ears are missing, elements that appeared in the initial test. No progress is made on the Color Scale. As added details, the presence of a butterfly on the initial test and of the glasses on the final test was observed.
9		M/7 19/61 SC=6/20 SSC= 10/30 SI=3/11	Head Scale: we noticed the appearance of hair, the presence of the nose, the realistic color of the face, the mouth of the nose, the palms. The head was oversized compared to the rest of the body. Body Schema Scale: good proportions of the head, the appearance of the shoulders, palms, toes, arms and legs drawn with two lines, the presence of the feet and their correct position, the contour of the drawing in black. Clothing Scale: we notice the presence of clothes. Color Scale: it went from 2 colors (red and blue) to four colors (red, yellow, orange and blue). Added details: the shirt in white-red lines.

No.	"Draw-a-Person" Drawing Initial Test/ Final Test	Gender/Age Score TI/TF	Analysis of Head Scale/ Body Schema Scale/ Clothing Scale/ Added Details
10.		M/7 22/26 SC=7/6 SSC=15/20 SI=0/0	Body Schema Scale: good proportions of the head, the appearance of the shoulders, palms, toes, the presence of the feet, the outline of the drawing in black. Head Scale: we noticed an uncertainty, on the final test, the nose and the eyebrows are missing elements that appeared in the initial test, but the hair that is missing at the initial test appears. Head Scale: uncertainty Clothing Scale: no representative items that show an uncertainty about the detailed knowledge of the graphic representation. No progress is observed on the Color Scale.

Discussions

The subjects targeted in this study had a visible progress in the graphic representation, given the fact that the intervention was on the visual and kinesthetic side. This highlighted a better awareness of the body schema. The appearance of new elements (shoulders, neck, fingers, etc.), the proportion of adequate body parts and the central positioning on the sheet showed signs of incorporating the body schema in the self-representation of these pupils.

The type of character drawn by the children also varied. The guideline received at the beginning of the test was to draw a little human. Studies showed that in children's drawings there were characters of the same gender with them (Baldy, 2010). It was found that the boys drew a male character while only 3 girls drew a character that can be interpreted as female. The remaining 2 girls drew a male character.

Regarding the Color Scale, some studies showed that the most colorful detail in the drawing was actually the most important thing for the child (Thoulon-Page, 2002). Regarding the dominant colors, it was statistically found that for girls it was blue and for boys it was red (Royer, 1977). In the case of our study, the colors were diverse and no conclusion could be drawn on a dominant

color or by gender. However, one could see the evolution of the appearance of colors in the drawings, in 7 of the 10 situations analyzed from the initial testing to the final one. In these drawings, the contour of the body is made first with the pencil and the colors are added later. The chosen colors were related to personal choices and not to the realism of the drawing, something specific to the age of 5-7 years. For children who did not color their drawing, this could be a sign of inhibition, the refusal to express their feelings or anxiety (Toulon-Page, 2002). Each drawing was colored with a number of colors that ranged from 3 to 5, which was considered normal for this age. The use of all 7 colors was an element that had to be considered as in the case of non-colored drawings (Royer, 1977).

Conclusions

By analyzing the 10 drawings, a considerable improvement of the human drawing could be observed after the application of the intervention plan. The 10 students (5 girls and 5 boys) chosen for this study were the ones who recorded the lowest scores in the initial test on the Maturity Scale. The present analysis was a qualitative one, in which the 3 component scales of the Maturity Scale were analyzed, namely the Head Scale, the Body Schema Scale and the Clothing Scale. The Color Scale is incorporated in each of the 3 scales mentioned. Even if the scores were calculated for each student, we considered it important to show through this study the evolution of the drawing of the little human in graphical form rather than through a quantitative analysis. Each scale evolved.

Thus, in the initial testing, the Head Scale generally recorded the presence of the eyes, nose and mouth. After applying the intervention plan, there were new added elements, such as: hair, eyelashes, eyebrows, teeth, ears. If in the initial test, the head was just a circle marked with different lines and dots, in the final test the little human's head shows a person with a contoured identity.

The Body Schema Scale was the most integrated in the drawing. Its evolution was observed by the appearance in the drawing of different parts of the body (shoulders, contoured upper and lower limbs, fingers, toes, etc.). In some situations, there was an oversizing of some parts of the body (head, legs).

The greatest progress was observed in the Clothing Scale. If in the initial test the little human was represented by lines that defined the torso or the limbs, in the final test the appearance of the clothes could be observed (with one exception): pants, long-sleeved blouse, skirt, dress. The Color Scale also registered progress, from the gray pencil drawing to the use of colors at both the Clothing Scale and the Head Scale.

In conclusion, the little human test was a simple and useful tool to use even for physical education and sports teachers in primary school. By using it they could understand the stage of development that the pupil was at.

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THE IMPORTANCE OF RECOVERY TREATMENT IN PATIENTS WITH ALGONEURODYSTROPHY

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ABSTRACT. Introduction: AND (Algoneurodystrophy) is a neuropathic pain disease characterized by incapacitating pain, swelling, vasomotor instability, sudomotor abnormality, and impaired motor function. The pain is disproportionate to the severity of the tissue injury and lasts longer than the expected time for tissue repair. **Material and method:** The current study began with the idea that, in the case of algoneurodystrophy, patients in the experiment group would benefit from a considerably faster recovery in terms of mobility and coordination joints in hand and foot if a psychokinetic program, rather than only pharmacological treatment, was implemented. The program applied includes physiotherapy, massage, light range of motion of the affected limb, strengthening exercises, stress loading of the active part, if necessary, and ensuring adequate analgesia. As a result, this type of therapy encourages AND patients to use the affected limb in daily activities. **Results:** The experiment group followed the recovery protocol developed by us and achieved excellent results at the end of the week; the patients felt much better and were satisfied. The control group with drug treatment did not have a high degree of pain, but the joint mobility was affected, and the coordination did not improve much compared to the experiment group. After diagnosing algoneurodystrophy, immediate psychokinetic recovery is of considerable importance on the lost function of the hand and foot. **Conclusion:** The combination of kinetic treatment with physiotherapy next to drug treatment has beneficial effects on the recovery process in relieving pain and inflammation.

Key words: *recovery treatment, kinesiotherapy, algoneurodystrophy.*

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REZUMAT. ***Importanța tratamentului de recuperare la bolnavii cu algoneurodistrofie.*** **Introducere:** AND (Algoneurodistrofia) este o boală de durere neuropatică caracterizată prin durere, incapacitante, umflare, instabilitate vasomotorie, anomalie sudomotorie şi afectare a funcţiei motorii. Durerea este disproporţionată cu severitatea leziunii tisulare şi durează mai mult decât timpul estimat pentru repararea ţesuturilor. **Material şi metodă:** Actualul studiu a pornit de la ideea că, în cazul algoneurodistrofiei, pacienţii din grupul experiment ar beneficia de o recuperare considerabil mai rapidă în ceea ce priveşte mobilitatea şi coordonarea articulaţiilor la mâini şi picior dacă ar fi urmat un program fiziokinetic, mai degrabă decât doar un tratament farmacologic. Programul aplicat include kinetoterapie, masaj, amplitudine uşoară de mişcare a membrului afectat, exerciţii de întărire, încărcare la stres a părţii active, dacă este necesar, şi asigurarea analgeziei adecvate. Drept urmare, acest tip de terapie încurajează pacienţii AND să folosească membrul afectat în activităţile zilnice. **Rezultate:** Grupul experiment a urmat protocolul de recuperare elaborat de noi şi a obţinut rezultate excelente la sfârşitul săptămânii; pacienţii s-au simţit mult mai bine şi au fost mulţumiţi. Grupul control cu tratament medicamentos nu a avut un grad ridicat de durere, dar mobilitatea articulară a fost afectată, iar coordonarea nu s-a îmbunătăţit mult în comparaţie cu grupul experiment. După diagnosticarea algoneurodistrofiei, recuperarea fiziokinetică imediată are o importanţă considerabilă asupra funcţiei pierdute a mâinii şi piciorului. **Concluzii:** Combinaţia tratamentului kinetic cu kinetoterapie alături de tratamentul medicamentos are efecte benefice asupra procesului de recuperare în ameliorarea durerii şi a inflamaţiei.

Cuvinte cheie: *tratament de recuperare, kinetoterapie, algoneurodistrofie.*

Introduction

Algoneurodystrophy (AND) is a life-changing condition that usually affects the extremities after trauma or nerve damage (Shim et al., 2019).

Algoneurodystrophy (AND) may be a neuropathic torment clutter characterized by the nearness of particular clinical highlights, counting hyperalgesia, sudomotor and vasomotor variations from the norm, and trophic changes. The torment experienced is unbalanced depending on the degree of tissue harm and endures past the expected time anticipated for tissue mending (Guthmiller & Varacallo, 2020).

This syndrome is known by several different names, including reflex sympathetic dystrophy, causalgia, algodystrophy, Sudeck's atrophy, neurodystrophy, and post-traumatic dystrophy.

Algoneurodystrophy (AND) is caused by different degrees or types of tissue damage, but it has also been observed in the absence of injury or during periods of protracted immobility. The most typical lesion associated with AND

development is a fracture that occurs in> 40%. Other frequently inciting injuries include sprains, contusions, crushing injuries, and surgery (Guthmiller & Varacallo, 2020).

The pathogenesis of this disorder is nary still conclusive. Then, we accept Leriche's hypothesis, which considers that, in some cases, trauma will cause vegetative reflex, accompanied by the escape of local vasomotor control, followed by the installation of vasoconstriction, passive hyperemia, which is the basic process for subsequent changes in the area. Congestion may explain osteoporosis and soft-tissue edema but may not explain enough pain or atrophy (Marinus et al., 2011).

AND affects about 26 out of 100,000 people. It is more prevalent in women than in males, with a ratio of 3.5: 1. DNA can affect people of all ages, including children up to three years old and adults up to 75 years old, but it is usually the most common in the mid-thirties. Type I AND occurs in 5% of all traumatic injuries and 91% of all DNA cases after surgery (Turner-Stokes & Goebel, 2011), (Goebel, 2011).

The IASP (International Association for the Study of Pain) has classified CRPS into two types based on nerve damage sustained due to the injury.

• Type I: sympathetic reflex dystrophy (SRD), Sudeck's atrophy, RND (reflex neurovascular dystrophy), or algoneurodystrophy, sees no demonstrable nerve damage.

• Type II: also known as causal, has apparent nerve damage (Bruehl, 2015).

The medical evolution of the condition can usually be divided into three clinical phases: a warm early intense phase, with tendentious symptoms, occasionally proceeded by a dystrophic period distinguished by an enlightened decrease in edema. Then there is an atrophic phase, in which atrophy and skin contractions become predominant.

1. Stage: Usually, the initial symptoms appear within a few weeks of injury. The affected limb is extremely painful, erythematous, swollen, and warm in the painful period. Allodynia and hyperalgesia are common side effects, skin and nail growth changes, and muscle weakness. The affected area is limited and has no specific nerve distribution (Giannotti et al., 2016).

2. Stage: This stage usually lasts between 3 and 6 months, during which the symptoms progress. The skin continues to change, and it becomes thin, pale, shiny, and transparent; as a result, the nails become brittle and damaged. The intensity of the discomfort rises, and hair growth slows. The muscles weaken, and the joints tighten.

3. Stage: If the DNA remains untreated until this point, it becomes difficult or too painful for the patient to move the affected limb. This causes the muscles and tendons to dissipate (atrophy) and contract, which can eventually cause contractions of the affected hand or foot. These changes can become permanent (Goh et al., 2017).

Moreover, it can be installed in patients with associated risk factors, such as diabetes, dyslipidemia, neurovegetative dystonia, and alcoholism.

The conditions that a complex clinical analysis must eliminate in each case are deep vein thrombosis and thrombophlebitis; incorrect plaster casts and splints; carpal tunnel syndrome; the actual injuries; Gillian Barre Syndrome; peripheral atherosclerotic disease (Guthmiller & Varacallo, 2020).

The paraclinical investigation required is radiography, osteoden-sitometry (DEXA); electromyography; bone scintigraphy; contrast-enhanced MRI examination.

NSAIDs (non-steroidal anti-inflammatory drugs) have been used to treat pain and inflammation. The comprehensive treatment uses a multidisciplinary approach, the most important of which is the rehabilitation program. It is prudent to establish aggressive management as soon as possible, as a delay can led to an unfavorable outcome. Treatment should begin as soon as the diagnosis is confirmed. This involves the participation of an interdisciplinary team related to the evolutionary stage (Uritis et al., 2018).

Patients need to be educated to maintain a normal lifestyle without paying attention to recent trauma or surgical events. On the other hand, patients must follow an adequate nutritional plan. Avoid excessive intake of calories, alcohol, and excessive consumption of spices. Pain relief through medication, psychological counselling, and effort therapy is the primary goal of the first stage of evolution (Harden et al., 2013).

Conservative treatment is preferred through adequate initial mobilization (even assisted) and exercise programs to facilitate movement. Physical therapy applies low-frequency and medium-frequency currents (anti-inflammatory effects) for analgesic purposes. High-frequency currents, such as ultrasound with anti-edematous and fibrinolytic effects, skin desensitization by tactile stimulation, and thermal and hydrothermal therapy (Bruehl, 2015).

Recovery objectives: pain reduction; reduction of inflammatory phenomena; reduction of vasomotor and trophic disorders; functional re-education regarding the deficit of mobility of the different joints, the lack of coordination, and the global deficits regarding the grip or gait.

Electrotherapy procedures are beneficial for the direct influence of some symptoms in the clinical picture of AND and for shortening the period in which functional re-education can begin (Berger, 1999).

It includes a series of movement techniques, including analytical aspects and complex integration exercises that are indicated in the recovery of the grip or the re-education of gait. Movement exercises are prescribed after an analytical muscle and joint evaluation. Mobilization exercises are of different types: passive, passive-active, active-assisted, active, and active with resistance (Gutiérrez-Espinoza et al., 2019).

Material and method

The hypothesis of the research

In the present research, we started from the hypothesis that, in the case of algoneurodystrophy, if a psychokinetic program is applied, not only drug treatment itself, patients in the experiment group will benefit from a much faster recovery in terms of mobility, coordination joints in hand and foot.

The present research included 12 patients diagnosed with AND. A total of 6 patients underwent drug treatment, and six patients followed a psychokinetic recovery protocol.

The inclusion criteria were the following: medical diagnosis being algoneurodystrophy at the level of the hand or the level of the foot; proposed by the doctor to follow kinetic recovery sessions / drug; the age of patients between 30 and 75 years; patient agreed to participate in this study; symptoms: pain; swelling of the limb; colour change in the skin; vasomotor disorders; decreased mobility.

The exclusion criteria were the following: medical diagnosis being algoneurodystrophy in the shoulder or knee; the age of patients under 18 years; without the consent of patients to participate in this study.

Subjects of the research

The research subjects were 12 patients diagnosed with AND (Table 1); the control group was six patients that followed the traditional drug treatment, and the experiment group was six patients that followed the physio-kinetic program.

Table 1. Subjects of the research

No. Crt.	Subject	Age	Gender	Diagnosis	Control / Experiment group
1	Subject 1	48	Male	Right hand—AND post-traumatic	EG
2	Subject 2	59	Female	Right-hand post-traumatic—operator AND	CG
3	Subject 3	40	Male	Right hand—postoperative AND	CG
4	Subject 4	39	Male	Right leg—post-traumatic AND	CG
5	Subject 5	53	Female	Right hand—Post-traumatic AND—Tenosynovitis	EG
6	Subject 6	72	Male	Left leg—post-traumatic AND—after fracture	CG
7	Subject 7	50	Female	Left hand—post-traumatic AND—after fracture	EG
8	Subject 8	32	Male	Right leg—post-traumatic AND—after fracture	EG
9	Subject 9	69	Female	Right hand—post-traumatic AND	EG
10	Subject 10	62	Female	Left hand—post-traumatic AND—after fracture	CG
11	Subject 11	51	Male	Left leg—post-traumatic AND—after fracture	EG
12	Subject 12	63	Female	Right leg—post-traumatic AND—after fracture	CG

Methods of research used

• Joint balance. In the strict sense, the articular balance represents the measurement of the amplitudes of movement in the joints in all directions of movement. Goniometers are regarded as valid and dependable clinical tools for determining the range of motion of limb joints (Tavares et al., 2017).

However, the correct execution of the measurements requires experience after repeated tests. It refers to the appreciation of the actual maximum limit of a movement, especially in people who do not cooperate or have pain when mobilizing when approaching the angle. Depending on their function and purpose, the measurements shall be specified. In the case of measurements used in studies and research, errors above 3° are not permitted (Sbenghe, 2019).

Goniometers are commonly used in clinical practice, and goniometric measurement can be regarded as a gold standard. Goniometry appears to be the foremost objective, a solid strategy accessible to clinicians for assessing a standard ROM (Ellis & Bruton, 1998).

• VAS scale. The visual analogue scale (VAS) comprises a successive route through endpoints that characterize extraordinary limits, such as "no torment at all" and "pain as awful because it might be" (Haefeli & Elfering, 2006). The quiet

is inquired to check his torment level on the route among the two destinations. The removal between "painless" and the sign at that point characterizes the subject's pain. This instrument was, to begin with, utilized in Freyd's brain research in 1923 (Freyd, 1923). On the off chance that clear terms such as "mild", "moderate", "severe," or a numerical scale are included in the VAS, it is called a Realistic Appraisal Scale. (GRS). A-line length of 10 or 15 cm appeared to be the scarcest estimation mistake compared to the 5 and 20 cm adaptations and appeared to be the foremost helpful for respondents (Seymour et al., 1985).

The advantages and disadvantages of measuring the effect of pain by VAS are similar to assessing pain intensity. The terms that define the objectives of the scale could be, for example, "not bad at all" and "the most unpleasant feeling possible". In several investigations, the VAS for evaluating torment impedance has appeared to be substantial and delicate to treatment impacts and the qualities of the reporting scale (Von Korff et al., 2000).

Score:

0— No pain; **3**— Irritation enough to distract; **5**— Pain should not be ignored for longer than 30 minutes; **7**— Very intense pain; **10**— Unbearable pain.

The International Association for the Study of Pain defines pain as "... an unsavoury tactile and enthusiastic encounter that's related with genuine or potential tissue harm or portrayed in such terms." This definition proceeds: "Pain is continuously subjective. Every person learns how to use the word in different contexts through experiences of injury in early life." (Cohen et al., 2018).

Place of the Research

The research took place between November 2020 and April 2021, at Fizio—Kineto Centrum in Odorheiu Secuiesc. Each subject engaging in the investigation was followed for two weeks.

Recovery Program Developed and Implemented

The program includes physiotherapy, massage, light range of motion of the affected limb, strengthening exercises, and stress loading of the active part, if necessary, together with ensuring adequate analgesia. As a result, this therapy encourages AND patients to use the damaged limb in daily activities.

The recovery program included physiotherapy (ultrasonic, galvanic bath, laser therapy), therapeutic massage, and kinesitherapy.

Results

The research used the VAS examination scale (Table 2, Table 3) and Goniometry—Carpal / tarsal flexion—Dorsiflexion assessment scale (Table 4, Table 5, Table 6, and Table 7). The test was taken in the first week at the beginning of the study and in the second week at the finalization of the second week of treatment.

Table 2. The experiment group at the VAS examination scale

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II
1.	Subject 1	Male	Right hand	8	2
2.	Subject 2	Female	Right hand	10	4
3.	Subject 3	Male	Right foot	7	3
4.	Subject 4	Female	Left hand	9	2
5.	Subject 5	Female	Right hand	9	4
6.	Subject 6	Male	Left foot	7	3

Table 3. The control group at the VAS examination scale

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II
1.	Subject 1	Female	Left hand	8	6
2.	Subject 2	Female	Right hand	7	4
3.	Subject 3	Male	Right hand	9	6
4.	Subject 4	Male	Left foot	8	5
5.	Subject 5	Male	Right foot	7	5
6.	Subject 6	Female	Right foot	6	5

Table 4. The experiment group at the Goniometry—Carpal/tarsal flexion—Dorsiflexion examination scale

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II	Normal value
1.	Subject 1	Male	Right hand	40°	66°	70°
2.	Subject 2	Female	Right hand	10°	63°	70°
3.	Subject 3	Male	Right foot	8°	20°	20°
4.	Subject 4	Female	Left hand	45°	70°	70°
5.	Subject 5	Female	Right hand	25°	65°	70°
6.	Subject 6	Male	Left foot	7°	18°	20°

Table 5. The control group at the Goniometry—Carpal/tarsal flexion—Dorsiflexion examination scale

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II	Normal value
1.	Subject 1	Female	Left hand	20°	40°	70°
2.	Subject 2	Female	Right hand	34°	52°	70°
3.	Subject 3	Male	Right hand	17°	45°	70°
4.	Subject 4	Male	Left foot	5°	12°	20°
5.	Subject 5	Male	Right foot	8°	14°	20°
6.	Subject 6	Female	Right foot	7°	13°	20°

Table 6. The experiment group at the Goniometry—Metacarpophalangeal flexion/ metatarsophalangeal

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II	Normal value
1.	Subject 1	Male	Right hand	20°	77°	90°
2.	Subject 2	Female	Right hand	30°	86°	90°
3.	Subject 3	Male	Right foot	22°	35°	35°
4.	Subject 4	Female	Left hand	28°	90°	90°
5.	Subject 5	Female	Right hand	55°	70°	90°
6.	Subject 6	Male	Left foot	30°	35°	35°

Table 7. The control group at the Goniometry—Metacarpophalangeal flexion/ metatarsophalangeal

No.	Subject	Gender	Member diagnosed with AND	Week I	Week II	Normal value
1.	Subject 1	Female	Left hand	30°	53°	90°
2.	Subject 2	Female	Right hand	40°	60°	90°
3.	Subject 3	Male	Right hand	20°	70°	90°
4.	Subject 4	Male	Left foot	14°	30°	35°
5.	Subject 5	Male	Right foot	20°	33°	35°
6.	Subject 6	Female	Right foot	30°	35°	35°

Statistical interpretation

Statistical analysis (Table 8) included descriptive statistics (frequency, mean, median, standard deviation) and inferential statistics. The Kolmogorov Smirnov test was applied to determine the distribution of the analyzed data series. For comparison of means, the t-Student test was applied, respectively

the Mann-Whitney test for comparison of medians. The significance threshold chosen for p was 0.05. Statistical analysis was performed using the GraphPad Prism utility trial version.

Table 8. The statistical interpretation of data

Statistical interpretation regarding age comparison	Experiment group vs. Control group Unpaired t-test P-value	0.4809
Statistical interpretation regarding VAS results in Week I	Experiment group vs. Control group. Unpaired t-test P-value	0.2314
Statistical interpretation regarding VAS results in Week II	Experiment group vs. Control group Unpaired t-test P-value	**0.0011**
Goniometry—Carpal tarsal flexion—Week I	Experiment group vs. Control group Unpaired t-test P-value	0.3934
Goniometry—Carpal tarsal flexion—Week II	Experiment group vs. Control group Unpaired t-test P-value	0.0649
Goniometry—Metacarpophalangeal flexion/ metatarsophalangeal—Week I	Experiment group vs. Control group Unpaired t-test P-value	0.5655
Goniometry—Metacarpophalangeal flexion/ metatarsophalangeal—Week II	Experiment group vs. Control group	0.1541

The t-Student test, p> 0.05, was used to discover any statistical differences between the median of the two groups regarding age parameters; there was no statistically significant difference between the mean age values in the two groups (p = 0.4809).

We used the t-Student test, p> 0.05, to discover the statistical differences between the median of the two groups regarding the results of the VAS scale first week; there was no statistically significant difference between the mean values of the VAS Scale—Week I in the two groups (p = 0.2314).

Also, it was used the t-Student test, p <0.05, to discover the statistical differences between the median of the two groups regarding the results of the VAS scale second week, there was found a statistically significant difference between the mean values of the VAS Scale—Week II in the two groups (p = 0.0011).

The t-Student test, p> 0.05, was used to discover any statistical differences between the median of the two groups regarding the results of the Goniometry; there is no statistically significant difference between the mean values Goniometry—Carpal/tarsal flexion—Week I in the two groups (0.3934).

We used the t-Student test, p> 0.05, to discover the statistical differences between the median of the two groups regarding the results of the Goniometry; there was no statistically significant difference between the mean values of the Goniometry—Carpal tarsal flexion—Week II in the two groups (p = 0.0649).

Also, it was used the t-Student test, p <0.05, was for discover the statistical differences between the median of the two groups regarding the results of the Goniometry, there was found no statistically significant difference between the mean values of the Goniometry—Metacarpophalangeal flexion / metatarsophalangeal—Week I (p = 0.5655).

The t-Student test, p> 0.05, was used to discover any statistical differences between the median of the two groups regarding the results of the Goniometry; there is no statistically significant difference between the mean values of Goniometry—Metacarpophalangeal flexion / metatarsophalangeal—Week II in the two groups (0.1541).

Discussions

In order to diagnose AND as soon as possible and treat it more effectively and precisely, it is essential to apply effective physical therapy, following the recovery protocol based on therapeutic exercises and appropriate physiotherapy. This leads to regaining early degrees of flexion, relieving pain, reducing edema, and achieving positive functional results.

Similar to our study, Gutiérrez-Espinoza et al. analyzed that an intense treatment strategy founded on hydrotherapy, manual therapy, and short-term exercise improves function and reduces pain in patients over 60 years of age with CRPS I after conservatively treated DRF. All patients performed a 15-minute active wrist exercise in a jacuzzi using a thermoneutral immersion in water (34.5 °C), which decreases sympathetic nervous system activity and the effects of hydrostatic pressure, which helps reduce edema and pain perception (Gutiérrez-Espinoza et al., 2019).

Wasner G. et al. recently presented a shift to functional skills reinstated rather than pain management as the primary objective of therapy. One of the essential components of this method is therapeutic exercise, despite some debate about whether a strenuous activity can be harmful early (Wasner et al., 2003).

In the other article, Barnhoorn K. J. et al. (Barnhoorn et al., 2015), treatment means working on joint developments, and inactive power developments are habitually unfortunate and agonizing and should be kept away from during the intense stage. The article indicates that inactive treatment, trailed by isometric and isotonic physiotherapy, should be possible when the aggravation level reductions (Birklein, 2018). In this manner, a multidisciplinary approach to the treatment of DNA patients ought to be considered, and the fundamental reason for pharmacological intercessions is to dispose of torment. Misidou, C., & Papagoras, C. believe that Physical Therapy is more effective in decreasing discomfort and enhancing proactive mobility (Misidou & Papagoras, 2019).

Birklein F et al., in the article Neurological findings in complex regional pain syndromes—analysis of 145 cases (Birklein et al., 2000) similar to ours, concluded that in the case of DNA is the existence of distal edema, which happens in 80% of all cases.

We would also like to emphasize the importance of the interdisciplinary part, namely the physical development (Szabo & Sopa, 2020), stress management (Popa et al., 2020), as well as everything related to the motor control part in the general physical recovery (Szabo et al., 2021).

Conclusions

The hypothesis of our study was confirmed, namely, in the case of algoneurodystrophy, if a psychokinetic program will be applied, not only drug treatment itself, patients in the experiment group benefited from a much faster recovery in terms of mobility and coordination joints in hand and foot.

The experiment group followed the recovery protocol developed by us and achieved outstanding results at the end of the week; the patients felt much better and were satisfied.

The control group with drug treatment did not have a high degree of pain, but the joint mobility was affected, and the coordination did not improve much compared to the experiment group.

Patients could not regain their hand function or resume walking through drug treatment, and physical therapy and physiotherapy are much more effective.

After diagnosing algoneurodystrophy, immediate psychokinetic recovery is of considerable importance to the lost function of the hand and foot.

The combination of kinetic treatment with physiotherapy next to drug treatment has beneficial effects on the recovery process in relieving pain and inflammation.

The treatment in algoneurodystrophy should include physiokinetotherapy over time because it has significant importance in the complete recovery next to the drug treatment. Also, the continuation of physiotherapy and occupational therapy after two weeks of recovery strengthens the recovery process and contributes to therapeutic exercises for the complete recovery of the damaged limb (hand or foot).

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ASPECTS REGARDING THE RECOVERY OF THE ANKLE SPRAIN BY MYOFASCIAL TECHNIQUES

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ABSTRACT. Introduction: A sprained ankle is an injury that occurs when you roll, twist or turn your ankle in an awkward way. This can stretch or tear the tough bands of tissue (ligaments) that help hold your ankle bones together. The incidence of training injuries is almost constant for players between the ages of 13 and 19, with the majority of injuries ranging from 1 to 5 injuries per 1,000 hours of training, while younger players have lower incidences. The incidence of injuries during the match tends to increase with age, in all age groups, with an average incidence of about 15 to 20 injuries per 1,000 hours of play in players over 15 years of age. **Objective**: The aim of this study is to verify the efectiveness of an individualized kinetic program in association with myofascial techniques. **Methods:** The myofascial techniques used are IASTM (Ergon therapy), dry needling, cupping and kinesiotaping. In this study a 18 years old football player was included. The evaluation was performed by the Biodex (for the muscle strength) and lunge test (for the range of motion). **Results:** After a month o treatment, our patient improved his strength and range of motion. **Conclusion:** Studies have shown that these techniques of myofascial release provide a huge effectiveness on the flexibility of the muscles, having even much more efficacy than stretching. Using myofascial techniques, has a much quicker result on the recuperation of the ankle sprain offering a great efficacy on the total recuperation of the pacient.

Key words*: manual therapy, rehabilitation, ankle sprain.*

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REZUMAT. ***Aspecte privind recuperarea entorsei de gleznă prin tehnici miofasciale.*** **Introducere:** O entorsă a gleznei este o leziune care apare atunci când vă rostogoliţi, răsuciţi sau întoarceţi glezna într-un mod neobişnuit. Acest lucru poate întinde sau rupe benzile dure de ţesut (ligamente) care ajută la menţinerea oaselor gleznei împreună. Incidenţa accidentărilor la antrenament este aproape constantă pentru jucătorii cu vârste cuprinse între 13 şi 19 ani, majoritatea accidentărilor variind de la 1 la 5 accidentări la 1.000 de ore de antrenament, în timp ce la jucătorii mai tineri incidenţa este mai scăzută. Incidenţa accidentărilor în timpul meciului tinde să crească odată cu vârsta, la toate grupele de vârstă, cu o incidenţă medie de aproximativ 15 până la 20 de accidentări la 1.000 de ore de joc la jucătorii de peste 15 ani. **Obiective**: Scopul acestui studiu este de a verifica eficacitatea unui program kinetic individualizat în asociere cu tehnici miofasciale. **Metode**: Tehnicile miofasciale utilizate sunt IASTM (Ergon therapy), dry needling, cupping şi kinesiotaping. În acest studiu a fost inclus un jucător de fotbal în vârstă de 18 ani. Evaluarea a fost efectuată cu Biodex (pentru forţa musculară) şi testul fandare (pentru amplitudinea de mişcare). **Rezultate:** După o lună de tratament, pacientul şi-a îmbunătăţit forţa şi amplitudine de mişcare. **Concluzii**: Studiile au arătat că aceste tehnici de eliberare miofascială oferă o eficienţă uriaşă asupra flexibilităţii muşchilor, având chiar mai multă eficacitate decât stretching-ul. Utilizarea tehnicilor miofasciale are un rezultat mult mai rapid la recuperarea entorsei gleznei oferind o mare eficacitate asupra recuperării totale a pacientului.

Cuvinte cheie: *terapie manuală, recuperare, entorsă de gleznă.*

Introduction

The ankle sprain is one of the most common joint injuries. It represents a traumatic injury caused by the abnormal stress of the capsulo-ligamentary area, a movement that exceeds the limit of normal amplitude, without it losing contact permanently between the articular surfaces. It occurs when a ligament is forced to get stretched beyond its normal limits.

A severe sprain can lead to the rupture of the elastic fibers that make up the ligaments. Ankle sprain appears when the foot twists beyond normal motor limits, walking on an uneven surface, or following a wrong step.

The ankle sprains can be systematized, depending on their severity and of the structures they are involved in: grade 1, grade 2 and grade 3.

Grade 1 ankle sprain is characterized by a stretch of the capsulo-ligamentary area but without the appearance of lesions. This is manifested by moderate pain, apparition of bruising, an edema and difficulty on walking.

On this grade of ankle sprain the joint does not get imobilized. A compressive bandage or an ankle brace is used, of elastic material or an orthosis. The limb is placed in a prone position, cryotherapy is applied and muscle relaxant and analgesic medication is administered. In the case of grade 1 sprain, the compressive bandage is maintained until the disappearance of pain.

Grade 2 ankle sprain it is characterized by the appearance of partial lesions in the capsulo-ligamentary area, in this case the symptomatology is more accentuated, compared to a sprain of grade I.

In the case of this type of ankle sprain, a foot immobilization is required or orthosis, for a period of 7-10 days. If the edema is severe, in the ankle and foot, in the first phase use a splint plastered until the resorption of the local edema (washer skin) and then continued with immobilization, putting a plaster boot with walking heel or an ankle orthosis. In addition to the joint immobilization, the limb is placed in a prone position and the medications that will be administered will be muscle relaxants and painkillers.

Grade 3 ankle sprain is the most serious form, this being characterized by the appearance of a complete ligament injury. The pain felt by the individual is strong, making walking being impossible. In some cases, a paradoxical phenomenon occurs, the pain felt by the patient decreases suddenly on intensity.

In the case of a grade 3 sprain, the ankle is immobilized for a period of 14-21 days, the affected limb is placed in a prone position, cryotherapy is applied topically and medications such as muscle relaxants and painkillers are administered. In the case of high-performance athletes or serious sprains caused by accidents or work, surgery may be needed, which consists of suturing torn ligaments and suturing the joint capsule.

In the case of performance athletes it is very important for the functional recovery treatment to start while the segment is immobilized, to reduce the time required for the recovery and it must have two stages after the removal of the plaster cast: general functional recuperation of the ankle joint and at the same time a specific treatment related to the sport that is being practiced (Doherty, 2014).

Risk factors (Gaber &Knupp, 2022):

- Excessive demand during sports activities – The ankle sprain is the most frequent trauma encountered in the practice of sports that require jumping, changes of directions in a fast mode, running or twisting the foot, in sports such as basketball, volleyball, tennis, football;
- Previous ankle injuries - If the patient has suffered another ankle sprain or other types of ankle injury, the risk of the patient suffering another ankle sprain is high;

- Poor physical condition - low strength or flexibility of the ankles can increase the risk of ankle sprains when practicing sports by the patient;
- Improper footwear – Chosen shoes that are not suitable for physical activity increase the vulnerability of the ankle;
- Obezity;
- Weak muscle tone;
- Accidents that can cause mechanical stress on the ligaments;
- Inactivity (Takumi Kobayashi, 2016).

Etiology

In the case of athletes, ankle sprains are determined by the unequal ratio between the capacity of the capsulo-ligamentary area to manage these demands and the present demands at this level. Mainly, recurrent ankle sprains reappear due to improper treatment. This results on a non fully recovery of the ligaments and the strength being lower than normal. There are mainly three types of traumatic agents that take part on the talo-crural joint and these are:

- Falling;
- Sudden twisting movements;
- Direct hit on the joint level.

The ankle sprain is the most common trauma that the orthopedic doctors are facing at present, having as main causes:

- falls that cause torsion of the joint;
- foot landings after jumping or pivoting;
- walking, running or exercising on uneven surfaces;
- the action of the opponent on the joint in the activity of different sports (Valderrabano, Horisberger, Russell, Dougall, & Hintermann, July 2019).

Myofascial techniques

Manual therapies can treat the fascial distortion and swelling that occurs in ankle sprain. Gemmel H., Hayes B. & Conway M. (2005), highlight that including manual treatment in the classic rehabilitation program of the ankle sprain, contributes to a faster improvement of the range of motion of the dorsiflexion movement. This way, athletes can compete again at a maximum capacity.

According to Kamari N., Poojari S. & Prabu R. (2021), myofascial techniques are effective for chronic ankle sprains too, not just for the acute ones. Compressive myofascial release produces immediate changes in the dorsiflexion movement of the ankle (Stanek J., Sullivan T., & Davis S., 2018).

IASTM (Instrument Assisted Soft Tissue Mobilization) is a manual therapy that consists on the assisted mobilization of soft tissues with the help of a specialized tool.

ERGON represents an innovative therapy for static and dynamic mobilization of soft tissues with the help of a medical instrument (Park et al., 2016).

Studies show that ERGON treats the body's biomechanical deficiencies by improving musculoskeletal endurance and imbalances of the entire kinematic chain. it has immediate effects, being an effective, non-invasive procedure. A meeting lasts between 5-10 minutes depending on the area and the condition being treated. It is recommended to avoid sensitive structures, bone protrusions, rich areas vascularized and superficially innervated regions (Park et al., 2016).

Dry Needling is a modern treatment performed with dry needles and was designed to relieve muscle pain. Its popularity is growing. During the dry needle, a practitioner inserts several threaded needles into the skin. Threaded needles are fine, short, stainless steel needles, which do not inject fluid into the body. That is why the term "dry" is used.

Practitioners place needles in "trigger points", in muscle or tissue. The dry needle is sometimes called an intramuscular stimulation.

Practitioners with dry needles say that the needle helps on releasing the knot and improves any muscle pain or spasms. The needles will remain in the skin for a short time. The time duration depends from practitioner to practitioner. Some health professionals, such as physiotherapists and massage therapists get some training on the dry needle as far as that goes (López-González, et al., 2021).

Kinesio taping

A form of therapy which consists applying elastic bandages in key areas of the body, muscle, joint and/or ligament injuries. It directly stimulates the peripheral and lymphatic circulatory systems, and indirectly, the muscular and neurological system (Byeong-Jo Kim, 2015).

Cupping

Cupping is a form of therapy that is applied with the help of devices in the form of a cup and was a method used to treat skin lesions. It is assumed that this method removes toxins from the body. The application of suction cups over the years has evolved since the use of the animal horns, then to the bamboo cup and then to the glass cup, as it is used today. Cupping can also be made of clay and silicone materials that can withstand exposure to high temperatures during the heating process (Cao H, 2012).

Massage

The massage is a very important component in recovery. It can be performed in several ways, depending on the intended purpose. Its main benefits are: stimulation of blood circulation and automatically a richer flow of high levels of nutrients, muscle relaxation, general relaxation, lowering the pain threshold, etc (Cordun M., 2005).

Objective

The aim of this study is to verify the efectiveness of an individualized kinetic program in association with myofascial techniques.

Materials and methods

We included a subject – male, 18 years old, football player, with ankle sprain grade 2. The treatment was applied for 4 weeks. The evaluation was performed with biodex and lunge test

The kinetic program consists of the following exercises:

1. The patient in supine position performs active flexion and extension at the ankle level (isometrics) 12 repetition/2 series (figure 1).

Figure 1. Exercise 1

2. The patient in supine position or seated, performs active abduction at the toe level – 12 repetitions/2 series.

3. The patient, seated, performs extensions at the level of the knee of the affected limb – 12 repetitions/ 2 series.

4. The patient, standing, will perform movements in all planes at the level of the hip, corresponding to the affected limb. 10 repetitions/2 series.

5. The patient in the supine position will perform abdominal breathing – 30 seconds/3 series.

6. The patient in supine position – flexion and extension of the fingers with a resistive band (this exercise can be performed with the lower affected limb positioned on a stand) – 10 repetitions/3 series (fig. 2).

Figure 2. Exercise 6

7. The patient, in a seated position, performs the extension of the knee corresponding to the affected limb, in resistive mode – 10 repetitions/2 series.

8. The patient, in prone position, flexes the knees in resistive mode – 10 repetitions/2 series.

9. The patient, standing, seated or quadruped position, performs mobilizations of the affected limb in resistive mode – 10 repetitions/2 series.

10. The patient, seated, standing supported on a chair or in supine position, stretches the thigh – 1 minute/2 series.

11. The patient, standing on a balance ball, maintains the position on each lower limb – 30 seconds/3 series (figure 3).

Figure 3. Exercise 11

12. The patients, standing, lifts on the toes – 15 repetitions/3 series (figure 4).

Figure 4. Exercise 12

13. Easy runs with change of direction – 2 min/4 series.

14. Standing on one leg on the balance board – 30 seconds/3 series each leg (figure 5).

Figure 5. Exercise 14

The myofascial techniques applied are:

- ✓ Ergon therapy – performed 15 minutes 3 times a week, treated muscles: hamstrings, gastrocnemius, tibialis anterior and ankle flexor
- ✓ Massage – 15 minutes, 3 times a week, on the front and back of the foot
- ✓ Kinesio tape – in the first 2 weeks we applied kinesio tape for posture, after that we used tape to stabilize the ankle
- ✓ Cupping – twice a week for 5 minutes in combination with tissue massage or ergon therapy
- ✓ Dry needling – 2 minutes on each muscle separately, treating in a different way the tibialis anterior, peroneis, ankle extensors.

Results

At the lunge test we can observe an increasing of the value obtained from the final assessment by 14° at the level of the sprained ankle, from 28° at the initial evaluation to 42° at the final evaluation (table 1).

Table 1. Results of the lunge test

Ankle / Assessment	Initial assessment	Final assessment
Sprained ankle	28°	42°
Healthy ankle	41°	42°

At the level of the sprained ankle, the patient improved the strength for the extension movement by 40 Joulles, from 20.9 J to 66.9 J, and for the flexion movement by 149.7 J, from 121 J to 270.7 J. At the level of the healthy ankle, we can also observe an improvement of the strength: for the extension movement the strength increased by 5 J and for the flexion movement by 30 J.

Table 2. Biodex results

Ankle / Assessment	Initial assessment		Final assessment	
	Extension (J)	**Flexion (J)**	**Extension (J)**	**Flexion (J)**
Sprained ankle	20.9	121	66.9	270.7
Healthy ankle	60.3	238.2	65.3	268.2

Discussions

Currently, ankle sprains are the most common trauma to the osteo-articular system. In the case of athletes, they are more common during training or playing and are caused by abnormal joint stress. (Fong, 2007)

Injuries to the lateral collateral ligaments are present in a proportion of 85% of total cases. Following a meta-analysis conducted in 2016, it was concluded that football presents the highest risk of ankle sprains, with an incidence of 7 per 1000 individuals. In the United States, in 2010 the incidence was 2.15 per 1,000 people per year.

Age 10- 19 years old were associated with higher rates of ankle sprain. Men between the ages of 15 and 24 have a higher incidence than women, while women over 30 have a higher incidence than men. Most ankle sprains are produced during sport activities. Ankle sprains take part, particularly to active people, especially adults and adolescents, after work, traffic or sports accidents. (Doherty, 2014)

Conclusions

The ankle sprain has recently become a very serious problem in sports and non-sports life Researchers have tried to find new therapies to treat this type of pathology. Several studies have shown that myofascial therapies are effective in treating the ankle sprain.

Also, after using the IASTM technique and dry needling, I observed a significant improvement of the patients who received this specific protocol of recuperation than those who did not.

After some years of me being non-sputum, I tried to use myofascial therapies to treat this type of trauma. Being a physiotherapist at one of the oldest Romanian football teams, I tried to introduce myofascial therapies to treat ankle sprains and after some successes that i had, I am confident that ankle sprains can be treated in optimal time through myofascial therapies.

Using the myofascial techniques in association with a kinetic program, the range of motion and muscles strength improved, which highlights the effectiveness of the therapeutic protocol.

In conclusion, a protocol that is based on the myofascial techniques as said previously, help the patients by providing towards them a quicker recovery after an ankle sprain.

Authors contribution

All authors have equally contributed to this study.

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STUDY REGARDING THE UPPER LIMB RANGE OF MOTION AFTER BREAST CANCER SURGERY

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ABSTRACT. Introduction: Mastectomy surgery in association with local radiotherapy and chemotherapy generates side effects such as: lymphedema, decreased range of motion, chronic pain, cardiotoxicity, neuropathy, premature menopause, infertility, anxiety, depression, fatigue. Decreased range of motion is the most disabling side effect of the treatment. Aerobic and resistive exercises can prevent lymphedema and improve the range of motion of the upper limb on the side of mastectomy. **Objective:** The purpose of the present study is to verify the effectiveness of an individualized kinetic program, applied to improve the upper limb range of motion after breast cancer surgery. **Methods:** In this study, 5 subjects (females, aged between 49 and 67) with right radical mastectomy and axillary lympho-dissection were included. They performed a kinetic program twice a week for 6 months and we evaluated the range motion at the level of the upper limb. **Results:** All the movements performed in upper limb (flexion, extension, abduction, adduction, internal and external rotation) improved, suggesting that the kinetic program is efficient. The average of the flexion movement increased by 35°, from 126° to 161°. The values obtained for the extension movement show an increase of the average by 14.6°. The abduction movement improved from 120° to 170°. At the elbow level, the flexion increased by 24.4° and the extension decreased by 6°. At the wrist level, the flexion increased by 37.4° and the extension increased from 41.8° to 78°. **Conclusions:** After applying the therapeutic program, the final physical assessments highlights that the range of motion increased in the upper limb.

Key words: *breast cancer, range of motion, mastectomy.*

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REZUMAT. ***Studiu privind amplitudinea de mişcare a membrului superior după intervenţia chirurgicală în cancerul de sân.*** **Introducere:** Intervenţia de mastectomie asociată cu radioterapia locală şi chimioterapia generează efecte secundare cum ar fi: limfedem, amplitudine de mişcare scăzută, durere cronică, cardiotoxicitate, neuropatie, menopauză prematură, infertilitate, anxietate, depresie, oboseală. Amplitudinea de mişcare diminuată este cel mai dăunător efect secundar al tratamentului. **Obiective:** Scopul prezentului studiu este de a verifica eficienţa unui program kinetic individualizat, aplicat pentru a îmbunătăţi amplitudinea mişcărilor membrului superior după intervenţia chirurgicală în cancerul de sân. **Metode:** În acest studiu au fost incluşi 5 subiecţi (de gen feminin, cu vârsta cuprinsă între 49 şi 67 de ani) cu mastectomie radicală dreaptă şi limfodisecţie axilară. **Rezultate:** Toate mişcările efectuate la nivelul membrului superior (flexie, extensie, abducţie, adducţie, rotaţie internă şi externă) s-au îmbunătăţit, sugerând că programul kinetic este eficient. Media mişcării de flexie a crescut cu 35°, de la 126° la 161°. Valorile obţinute pentru mişcarea de extensie arată o creştere a mediei cu 14.6°. Mişcarea de adducţie s-a îmbunătăţit de la 120° la 170°. La nivelul cotului, flexia a crescut cu 24.4° şi extensia a scăzut cu 6°. La nivelul mâinii, flexia a crescut cu 24.4° şi extensia s-a îmbunătăţit de la 41.8° la 78°. **Concluzii:** După aplicarea programului terapeutic, evaluare finală evidenţiază că amplitudinea mişcărilor membrului superior s-a îmbunătăţit.

Cuvinte cheie: *cancer de sân, amplitudine de mişcare, mastectomie.*

Introduction

Mastectomy surgery in association with chemotherapy and radiation therapy have negative effects on the human body (Shapiro & Recht 2001). These side effects can be systematized as follows:

- diseases secondary to the application of local radiotherapy: cardiotoxicity, pneumonia, rib fractures, pain, lymphedema;
- systemic conditions following the administration of chemotherapy: myelosuppression, peripheral neuropathy, premature menopause, infertility, weight gain, cardiovascular disease, nausea and vomiting, anxiety, depression, insomnia, fatigue, fear of recurrence;
- side effects of the surgical intervention: decreased range of motion, keloid scars, chronic pain.

According to Jung et al., (2003) the pain felt after surgery is transitory and occurs as a consequence of muscle and ligament injuries. Chemotherapy and radiotherapy may increase the intensity of the pain. Chronic pain can be a disabling factor and there are two types: neuropathic pain and phantom pain felt in the removed breast.

Courneya K. et al. (2007) analyzed the effects of aerobic exercise and resistive exercise on patients receiving chemotherapy. The authors observed that if patients practice aerobic and resistive exercises, they can complete chemotherapy without developing lymphedema, improving their self-esteem and physical state.

Fong et al. (2012), emphasizes the effects of physical activity on oncologic patients. The types of physical exercises that can be used in the treatment of patients consist of aerobic exercises, low-intensity exercises and resistive exercises. Physical activity has beneficial effects on the quality of life, promotes weight loss of overweight patients, improves cardiovascular fitness and the functional level of the upper limb on the side of the surgery.

Decreased mobility in the upper limb and, therefore a decrease in the functional level, is the most annoying complication of the treatment applied to the breast cancer and has a major impact on the quality of life of patients (Kaya et al., 2010).

According to Ewertz M. and Jensen A. B. (2011), the decreased range of motion of the joints of the upper limb on the side of the mastectomy is part of the long-term side effects of the surgical and oncological treatment. The authors point out that the recovery has the role of enabling patients to reach and maintain the optimal level of functionality from a physical, intellectual, psycho-social and spiritual point of view.

The decrease in the shoulder joint mobility is considered by the authors Lauridsen et al. (2007), as a consequence of axillary lymphodissection in association with local radiotherapy. These authors applied *the Constant Shoulder Score (CSS)* questionnaire, performed a joint balance at the shoulder level and perimetry on both upper limbs and found that the abduction movement is the most affected movement, the amplitude being reduced by 30° to 60°. Patients who received local postoperative radiotherapy also experienced a more pronounced decrease in joint mobility compared to those who underwent only a mastectomy.

We consider it important to assess the quality of life through the questionnaire proposed by the World Health Organization as well as to establish the coefficient of disability of the upper limb on the side of the surgery by applying the questionnaire Disabilities of the Arm, Hand and Shoulder (Guzin et al., 2022).

Including hirokinetotherapy in the therapeutic protocol through partial or total immersions, has beneficial effects on lymphedema and muscle strength due to the mechanical factors of water (Tidhar D. and Katz-Leurer M., 2009). The biomechanics of movement are facilitated by the ascending force and exercises and mobilizations can be performed even with patients who cannot exercise on land or have a contraindication in this regard.

Objective

The aim of this research is to verify the effectiveness of the application of an individualized kinetic program to improve the upper limb range of motion after breast cancer surgery.

Materials and methods

5 subjects, aged between 49 and 67 years, with right radical mastectomy and axillary lymphodissection were included in this study.

The hypotheses that formed the basis of this research is: the application of an individualized kinetic program increases the range of motion of the upper on the side of the surgery.

We evaluated the possible movements at the level of the upper limb. The test was performed with the goniometer, on both upper limbs, in order to make a comparison between the affected upper limb and the unaffected one.

The kinetic means used are classified in:

- ✓ specific means: physical exercises and massage;
- ✓ non-specific means: multilayer compressive bandage and kinesio taping.

Each subject benefited from a recovery program focused on the objectives of the therapeutic approach. In order to respect the principle of progressivity, the number of repetitions varied between 6 and 10 for each exercise.

The exercise program was performed with a frequency of 2 sessions per week and consists of exercises aimed at increasing the range of motion of the upper limb.

Results

Flexion in the scapulohumeral joint

Measurements made for flexion show an increase in the average value by 35°, from 126° at the initial assessment to 161° at the final assessment. The minimum value increased from 90° to 155° while the maximum value increased from 145° to 165°. The results of the measurements performed are relatively homogeneously dispersed at the initial evaluation and homogeneous at the final evaluation (table 1.).

Table 1. Results regarding the amplitude of the flexion movement

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	126.0	35.0	135.0	22.2	90	145	55	17.6%
Final	161.0		160.0	4.2	155	165	10	2.6%

Extension in the scapulohumeral joint

In the case of the extension, the measurements performed show an increase of the average by 14.6°, from 28.4° at the initial assessment to 43° at the final assessment. The minimum value increased from 20° to 35° and the maximum value increased from 35° to 50°. The measured values are dispersed relatively homogeneously at the initial evaluation and homogeneously at the final evaluation (table 2.).

Table 2. Results regarding the amplitude of the extension movement

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	28.4	14.6	30.0	5.5	20	35	15	19.4%
Final	43.0		45.0	5.7	35	50	15	13.3%

Abduction in the scapulo-humeral joint

The values obtained in the joint balance for the abduction movement show an increase of the average by 50°, from 118° at the initial assessment to 168° at the final assessment. The minimum value increased from 100° at the initial assessment to 165° at the final one, and the maximum value increased from 140° to 170°, data found in table 3.

Table 3. Results regarding the amplitude of the abduction movement

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	118.0	50.0	120.0	17.9	100	140	40	15.2%
Final	168.0		170.0	2.7	165	170	5	1.6%

Internal rotation in the scapulohumeral joint

In the case of the internal rotation, the recorded values showed an increase of the average by 45°, from 39° at the initial evaluation to 84° at the final evaluation. The minimum value increased from 30° to 80° and the maximum value from 50° to 90°. Regarding the homogeneity of the values obtained in the evaluations, they are dispersed relatively homogeneously at the initial evaluation and homogeneous at the final evaluation (table 4.).

Table 4. Results regarding the amplitude of the internal rotational movement

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	39.0	45.0	40.0	7.4	30	50	20	19.0%
Final	84.0		85.0	4.2	80	90	10	5.0%

External rotation at the scapulohumeral joint

In the case of the external rotation, the values obtained showed an increase of the average by 42.4°, from 33.6° at the initial evaluation to 76.0° at the final evaluation. The minimum value increased from 25° initially to 65° at the final assessment, while the maximum value increased from 40° to 90°. The dispersion of values is relatively homogeneous at the initial evaluation and homogeneous at the final evaluation (table 5.).

Table 5. Results regarding the amplitude of the external rotational movement

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	33.6	42.4	33.0	6.5	25	40	15	19.4%
Final	76.0		75.0	11.4	65	90	25	15.0%

Flexion in the elbow

In the case of the flexion at the level of the elbow, the measurements made show an increase of the average by 24.4°, from 113.6° at the initial evaluation to 138° at the final evaluation. At both evaluations the values obtained are dispersed homogeneously. The results are presented in table 6.

Table 6. Results regarding the amplitude of the flexion movement in the elbow

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	113.6	24.4	115.0	10.9	100	125	25	9.6%
Final	138.0		138.0	2.1	135	140	5	1.5%

Extension in the elbow

Measurements made for extension at the elbow emphasis a decrease of the average by 6°, from 7.6° at initial evaluation to 1.6° at final evaluation. The minimum value is 5° at the initial assessment and 0° at the final assessment, while the maximum value decreased from 10° to 3°. The recorded values are dispersed relatively homogeneously at the initial evaluation and homogeneously at the final evaluation. The datas are presented in table 7.

Table 7. Results regarding the extension movement in the elbow

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	7.6	-6.0	7.0	1.9	5	10	5	25.6%
Final	1.6		2.0	1.5	0	3	3	94.8%

Flexion at the wrist level

The evaluation at the wrist for the flexion movement point an increase of the average by 30.6°, from 37.4° at the initial evaluation to 68° at the final evaluation. The minimum value increased from 33° to 65°, while the maximum value increased from 42° to 70°. The values obtained during the evaluation are homogeneously dispersed (table 8).

Table 8. Results regarding the flexion in the wrist

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	37.4	30.6	37.0	3.6	33	42	9	9.8%
Final	68.0		68.0	2.1	65	70	5	3.1%

Extension at the wrist level

In the case of extension at the wrist level, the initial and final evaluation emphasize an increase of the average by 36.2°. The minimum value is 38° and the initial evaluation an 75° at the final evaluation. The maximum value increased from 45° to 80°. At both evaluations the values are homogeneously dispersed (table 9).

Table 9. Average values regarding the extension in the wrist

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	41.8	36.2	42.0	2.9	38	45	7	6.9%
Final	78.0		79.0	2.0	75	80	5	2.6%

Abduction at the wrist level

The measurements made for the abduction movement in the wrist, highlight an increase of the average of 4.6°, from 8.4° to 13°. The standard deviation increased from 1.1 to 2.2 and the amplitude changed from 3 to 6. The values are dispersed homogeneously at both assessments (table 10).

Table 10. Average values regarding abduction movement in the wrist

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	8.4	4.6	8.0	1.1	7	10	3	13.6%
Final	13.0		13.0	2.2	10	16	6	17.2%

Adduction in the wrist

In the case of wrist adduction, the assessments performed shows an increase of the average of, 6.4°, from 34.2° at the initial evaluation to 40.6° at the final evaluation. Standard deviation has modified from 2.8 to 1.1, and the amplitude decreased from 7 to 3. The values are dispersed homogeneusly at both assessments (table 11).

Table 11. Average values regarding adduction movement in the wrist

EVALUA-TION	Average	Average difference	Median	Standard Deviation	Min.	Max.	Amplitude	Variation Coef.
Initial	34.2	6.4	35.0	2.8	30	37	7	8.1%
Final	40.6		41.0	1.1	39	42	3	2.8%

Discussions

The disability that occurs in the upper limb following the application of the treatment for breast cancer is defined by Harrington et al. (2013) as a result of the decrease in strength, endurance and range of motion in the joints that make up the upper limb. Early physical activity stops the side effects of the treatment and contributes to regaining the functionality of the upper limb (Falcetta et al., 2018).

Early application of an individualized therapeutic program improves the amplitude of upper limb movements and contributes to the decrease of lymphedema secondary to the treatment applied to the breast neoplasm.

Moderate intensity aerobic exercise, performed with a frequency of 2 sessions per week during chemotherapy, has much more beneficial effects on muscle strength, fatigue and cardiovascular system activity compared to low intensity exercise performed daily (Hamma van Waart et al., 2015).

Conclusions

Surgical treatment used in the neoplasm contributes to decreased range of motion of the upper limb on the side of mastectomy, which negatively influences the quality of life of patients.

Following the statistical processing of the results obtained in the initial and final assessment, we found the aspects presented below.

The initial and final evaluation of the flexion movement shows an increase in amplitude, in terms of the average value, by 35°, from 126° to 161°. The median changed from 135 to 160. The standard deviation decreased from 22.2 to 4.2, which shows that the final values are more strongly grouped around the average value.

The values obtained for the extension movement show an increase of the average by 14.6°, from 28.4° to 43°. The minimum value increased from 20° to 35°, and the maximum value changed from 35° to 50°.

For the median abduction movement, the value increased from 120 to 170. The standard deviation changed from 17.9 to 2.7, and the amplitude decreased from 40 to 5, which indicates a relatively homogeneous dispersion of the values obtained.

In the case of the internal rotational movement, the average increased by 45°. The homogeneity of the values, they are relatively homogeneously dispersed at both the initial and the final evaluation.

The initial and final assessment of the external rotation show an increase of the average by 42.5°and the amplitude also increased from 15 to 25.

At the elbow level, the flexion increased by 24.4° and the extension decreased by 6°.

At the wrist level, the flexion increased by 37.4° and the extension increased from 41.8° at the initial assessment to 78° at the final assessment. The standard deviation, in the case of abduction, increased from 1.1 to 2.2 and the average increased by 4.6°. The amplitude of the adduction movement increased by 6.4° and the standard deviation decreased from 2.8 to 1.1.

After applying the therapeutic program, the final physical assessments highlights that the range of motion increased in the upper limb.

Authors contribution

All authors have equally contributed to this study

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APPLICATION OF KINETIC RECOVERY PROGRAMS IN PERFORMANCE SPORTS DANCE PATHOLOGIES

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ABSTRACT. For the detection of the flat foot and ligament laxity, the method of visual observation of the anatomical landmarks, the planogram on paper and the test of bearing body weight were used. At the same time, to test the stability of the ankle joint, we used the unipodal test on Bosu ball, where it was measured in seconds how much the subjects managed to maintain the unipodal position on Bosu ball. For the detection of low back pain, the method of individual interviewing of each athlete, the VAS scale of pain, the DLLT test (Double Leg Lowering Test) and the visual evaluation of any malalignments present in the bone structures was used. Applying the protocol for flat foot pathology, we obtained an improvement of the plantar arch in all subjects, as evidenced by the improvement of paper planograms where the decrease of the plantar footprint on the medial part of the foot was observed in all subjects of the experiment group. Compared to the standard protocol applied to the control group, we obtained by applying our protocol an improvement of the Achilles tendon line in orthostatic in 9 out of 10 subjects, while when applying the standard protocol, only 7 out of 10 subjects were observed. In conclusion, applying the kinetic protocol to recover post-training low back pain has improved low back pain, proving to be more beneficial than the standardized protocol for dancers, especially for female subjects.

Keywords: *kinetic recovery, sport performance, dancers pathologies, sport traumatology.*

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REZUMAT. ***Aplicarea protocolului kinetic de recuperare în patologiile dansului sportiv de performanță.*** Pentru depistarea laxității piciorului plat și a ligamentelor s-au folosit metoda de observare vizuală a reperelor anatomice, plantograma pe hârtie și testul de susținere a greutății corporale. Totodată, pentru a testa stabilitatea articulației gleznei, am folosit testul unipodal pe mingea Bosu, unde s-a măsurat în secunde cât de mult au reușit subiecții să mențină poziția unipodală aceasta. Pentru a detecta durerile de spate au fost utilizate metoda de intervievare individuală a fiecărui atlet, scala de durere VAS, testul DLLT (Testul dublu de coborâre a picioarelor) și evaluarea vizuală a oricăror malalinieri prezente în structurile osoase. Aplicând protocolul pe care l-am creat pentru patologia piciorului plat, am obținut o îmbunătățire a arcului plantar la toți subiecții, dovadă fiind îmbunătățirea plantogramelor de hârtie unde s-a observat o scădere a impresiei plantare pe partea medială a piciorului la toți subiecții grupului experimental. În comparație cu protocolul standard aplicat grupului de control, am obținut prin aplicarea protocolului nostru o îmbunătățire a liniei tendonului lui Ahile în ortostatism la 9 din 10 subiecți, în timp ce aplicarea protocolului standard a fost observată la doar 7 din 10 subiecți. În concluzie, aplicarea protocolului kinetic de recuperare a lombalgiei post-exercițiu a adus un rezultat pozitiv în ceea ce privește ameliorarea lombalgiei, dovedindu-se a fi mai benefică decât protocolul standardizat pentru dansatori, în special pentru subiecții de sex feminin.

Cuvinte cheie: *recuperarea kinetică, sportul de performanță, patologiile dansatorilor, traumatologia sportivă.*

Introduction

The sports field has seen a significant expansion in the last two decades, refining itself physically and mentally and developing the quality of human motor skills to a higher level. Like any sport, performance sports dance also includes athletes' injuries resulting from some favourable factors such as incorrect warm-up, repeated poor execution of dance figures, lack of theoretical and motor knowledge of the dancers, and overstrain and over-training of the body. The position represents the two partners' external attitudes towards each other before and during the dance.

In standard dances, the primary position contains the following distinct elements: the partners stand face to face, with a slight lateral movement of the dancer to her left, to very quickly reach the right of the partner, and the knees of both partners are slightly bent, and the partner's knees will be positioned so that her right leg can move freely between the partner's legs, both partners must keep their shoulder blades down and their shoulders relaxed, the muscles of the arms, abdomen, back and lower limbs are in tension (we have a muscle tone above the usual standard limit); the line of the shoulders and hips is

horizontal, parallel to the floor and the two lines (of the hip and shoulders) of the partnership between the body of the partner and the partner there is contact in the pelvis area only up to the level of the pelvic girdle (the right side of the partner is in contact with the left side of the boy) (Năstase, 2002).

Looking at the anatomy of the foot, we note that it is made up of 26 bones arranged in 3 groups as follows (Andron & Reveica, 2003): the tarsus—contains seven bones: the talus, the calcaneus, the navicular, the cuboid and the three cuneiforms; metatarsus—contains the five metatarsals; phalanges - 14 in number. From an antero-external view, the astragalus articulates with numerous bones: tibia, fibula, calcaneus, and scaphoid. However, no muscle attaches to this bone. He mobilizes indirectly through his neighbours. It consists of a body, a head and a neck. On the superior and lateral faces, the elongated trochlea of the talus with the medial and lateral malleolar facet is found. The body forms with the neck at an angle of declination, open downwards and at an angle of inclination open medially (Avrămescu, 2003). The metatarsus contains five metatarsal bones, numbered I to V from medial to lateral, and are long, paired bones containing a head, a body, and a base (Papilian, 2003).

The spine has three main functions (Drake et al., 2020):

- the support function—supports the weight of the body, transmits various forces through the pelvis to the lower limbs, supports and moves the head and helps to manoeuvre the upper limbs;
- movement function (dynamic)—through the attached muscles;
- the protective function of the central nervous system.

The back muscles consist of the outside muscle group and the intrinsic muscle group (Drake et al., 2020): the extrinsic back muscles move the upper limbs and ribs; the intrinsic muscles of the back maintain the posture and contribute to the movement of the spine; these movements include flexion (anterior bending), extension, lateral flexion, and rotation (circumduction).

Pes planus - general aspects

Pes planus ("flat foot") as the lack in the medial longitudinal arch of the foot, heel valgus deformity, and medial talar prominence is all symptoms of this condition. The deformity is ordinarily asymptomatic and disappears within the first decade of life, evolving into a painful, rigid form that causes significant disability (Troiano et al., 2017). This pathology is common in children and adults (Michaudet et al., 2018). Thus, the arch of the plantar arch is erased, touching the ground and creating significant biomechanical changes in the body. There are two types of pes planus: the rigid type and the flexible type. In pes planus of the rigid type, there is a flattening of the plantar arch both when bearing body weight and without it.

In contrast, with a flexible or functional pes planus, the plantar arch is present when the foot is not weight-bearing or on a half-sole, but when the dancer is standing, the medial longitudinal arch flattens. This condition is widespread among dancers (Clippinger, 2007). From a practical point of view, flat feet appear in sports dance due to the foot technique used in Latin dances. The foot position in Latin dances is similar to the third position in ballet. Thus, the dancers' soles will form a "V" by opening the tips to the side, simultaneously changing the biomechanics of the steps.

Biomechanics of the Occurrence of Lumbago in Dance

Performance dancers spend much time in the ballroom using their most complex tool—the body. Sports dance is a sport practised through the total involvement of the dancers, both mentally and physically. So, on a physical level, all the body's parts are involved in the act of dancing, especially the spine. Because of its remarkable flexibility, the spine has become essential for dancers for two reasons. Firstly, biomechanically, it must fulfil the function of supporting the body through its strength, mobility and suppleness; secondly, it is essential to the aesthetics of motoring. The figures in performance sports dance require a sophisticated aesthetic, and the spine is subject to great demands to support the desired individual position of the trunk and the weight of the other partner in the more complicated figures (Clippinger, 2007).

Knowing the elements of posture used in standard dances, we thus identify the occurrence of lumbago through analysis. A study in Current Sports Medicine entitled "Spine Injuries in Dancers" reports that the spine is the second most affected area of the body due to problems arising from poor knowledge of the execution technique or weakness of the abdominal muscles (Gottschlich et al., 2011). The incorrect execution of the posture in standard dances foresees the occurrence of the following mistakes that favour the occurrence of lumbar hyperlordosis: inactivating the necessary muscle tone at the abdominal level, performing exaggerated extension in the girls towards the floor or projecting the body weight on the heels.

Research hypothesis

In the present research, we started from the hypothesis that, following the implementation of the kinetic protocols developed by us, we will obtain significantly better results among the experimental group, respectively a greater efficiency of our protocols in order to improve post-exercise lumbago and a verticalization external axis of the Achilles tendon.

Material and method

For the implementation of the two elaborated protocols, the following materials were used: a mattress; a small elastic ball; an elastic band; a stepper; a kettlebell; the trellis; a cylindrical foam roller of reduced diameter; a pencil; standard size medicine ball; a chair.

The visual observation method of anatomical landmarks, the planogram on paper and the body weight bearing test was used to detect flat feet and ligamentous laxity. At the same time, to test the stability of the ankle joint, we used the unipod test on the Bosu ball, where it was measured in seconds how long the subjects could maintain the unipodal position on the Bosu ball.

The method of individual interviewing of each athlete, the VAS pain scale, the DLLT test (Double Leg Lowering Test) and the visual evaluation of any malalignments present in the bone structures was used to detect lumbago.

As a comparison term for the kinetic protocols we developed, we chose two standardized exercise protocols that we applied to the control group. The standardized kinetic protocol for the recovery of the lower back includes the ten exercises created by Marius Militaru at the National University of Physical Education and Sport, and the standard kinetic protocol followed for the recovery of lumbago is the one created by Dr. Dan Valentin Anghelescu.

In the present work, 20 subjects aged between 10 and 16 years were included, divided into two groups of 10 subjects each (experimental and control groups). All subjects gave their consent for active participation in this study.

The method of carrying out the application of the two protocols is based on their practical application by the performance group of the dance club Dance Art from Târgu Mureş on its premises during the period 03.06.2022-03.07.2022. The management of the Dance Art sports dance club in Târgu Mureş agreed to conduct the research within the club premises.

Data Analyses

The results of the research were analyezed using the statistical program GraphPad and the Student T test (with $p>0.05$) was used for identifying the significance of the results.

It was compared the initial results of the VAS test with the final results in the control group and the experimental group, also the results of the Bosu ball unipodal test results in the control group and the experimental group and the difference between groups.

Table 1. Subjects from the control group

Subjects	Age	Sex
M.C.	12 years	M
C.T.	11 years	F
R.B.	13 years	F
A.C.	10 years	F
P.M.	16 years	M
D.D.	12 years	M
A.B.	13 years	M
I.H.	15 years	F
R.B.	11 years	M
S.D.	16 years	F

Table 2. Subjects from the experiment group

Subjects	Age	Sex
C.D.	15 years	F
R.P.	16 years	M
D.F.	15 years	F
C.F.	12 years	F
D.B.	12 years	F
D.S.	15 years	M
K.C.	11 years	F
D.H.	13 years	M
E.T.	10 years	M
A.S.	13 years	F

Table 3. The kinetic protocol was performed in order to recover the pathology of the flat feet

Exercise 1	*Exercise 2*
I.P.: seated on the chair with the soles parallel, and the cylindrical foam roller will be placed under the soles; T1: rolling the soles forward on the surface of the foam roller; T2: rolling the soles backwards on the surface of the foam roller; Dosage: 4 series of 12 repetitions.	I.P.: seated on the chair with the soles parallel to the ground, and a towel is placed under the fingers; T1: by pinching the toes, the towel will gradually gather under the sole; Dosage: perform this exercise 7 times with each lower limb.

Exercise 3 I.P.: sitting on a chair with the feet parallel to the ground; T1: dorsiflexion of the hallux (lifting the hallux off the ground); T2: slow and controlled return of the hallux to the ground, keeping the arch of the plantar arch in tone; Dosage: 4 series of 10 repetitions (the exercise is performed with both lower limbs simultaneously or with each lower limb individually).	*Exercise 4* I.P.: sitting on a chair with the feet parallel to the ground; T1: dorsiflexion of the phalanges (lifting the phalanges off the ground); T2: their return to the ground, slow and controlled by activating muscle tone, maintaining the arch of the plantar arch; Dosage: 4 series of 12 repetitions.
Exercise 5 I.P.: sitting on a chair with the feet parallel to the ground; T1: dorsiflexion of the hallux; T2: slow and controlled return of the hallux to the ground, keeping the arch of the plantar arch in tone; T3: dorsiflexion of fingers 2–5; T4: the slow and controlled return of fingers 2–5 on the ground, keeping the arch of the plantar arch in tone; Dosage: 4 series of 10 repetitions.	*Exercise 6* I.P.: sitting on the chair with the ankle of the right lower limb positioned on the left knee and around the leg of the right lower limb, an elastic band is attached with one of the ends, the other end being positioned under the sole of the left lower limb; T1: inversion of the right leg against the resistance of the elastic band, after which it relaxes to the initial position; Dosage: 3 series of 8 repetitions (same as with the other lower limb).
Exercise 7 I.P.: sitting on the mattress with an elastic pasted behind the soles, and its ends are caught in the hands; T1: active-passive dorsiflexion is performed by pulling the elastic band, resulting in the stretching of the calf muscles and the Achilles tendon with a 20-second hold; Dosage: 3 times every 20 seconds of maintenance.	*Exercise 8* I.P.: sitting on the mattress with an elastic band passed over the tips, and its ends are caught in the hands; T1: plantar flexion with stretching of the tips against the resistance of the elastic band; T2: plantar dorsiflexion; Dosage: 4 series of 10 repetitions.
Exercise 9 I.P.: orthostatic with feet apart below shoulder level, feet parallel;	*Exercise 10* I.P.: orthostatic with parallel feet positioned on the half-sole at the edge of the stepper;

T1: lift the plantar vault off the ground by inversion, then return to the initial position; Dosage: 4 series of 10 repetitions.	T1: lifting on top of the ankle joint; T2: lowering to the initial position; Dosage: 4 series of 10 repetitions.
Exercise 11	*Exercise 12*
I.P.: orthostatic on the right lower limb, the left lower limb is raised from the ground with the knee bent; T1: through eversion, the plantar vault is raised from the ground, maintaining unipodal balance, after which it relaxes; Dosage: 4 series of 8 repetitions (similarly, it is also performed with the other lower limb).	I.P.: orthostatic on the right lower limb, the left lower limb is raised from the ground with the knee bent; T1: maintaining the plantar arch in the correct anatomical position by activating the musculo-ligament tone of the foot (the weight is concentrated on the outer part of the sole); Dosage: 4 times for 30 seconds (similarly, it is also performed with the other lower limb).
Exercise 13	*Exercise 14*
I.P.: standing with the legs slightly apart below the level of the shoulders, and a pencil is placed horizontally on the ground between the two legs, with the ends positioned under the areas of the plantar arches; T1: rolling the sole from the heel to the toe without touching the pencil with the plantar arch; T2: rolling the sole from the tip to the heel without touching the pencil with the plantar arch; Dosage: 4 series of 10 repetitions.	I.P.: standing with legs slightly apart below shoulder level with or without a kettlebell; T1: slow squat, concentrating the weight on the outside of the soles, and the plantar arch is activated and does not touch the ground as much as possible; Dosage: 4 series of 8 repetitions.
Exercise 15	*Exercise 16*
I.P.: orthostatic with the legs slightly apart with an elastic ball positioned between the two ankles at the medial sub malleolar level; T1: rise on the toes, keeping the ball between the medial sub-malleolar parts of the foot; T2: catching the ball with the feet; T3: lowering to the ground with the heels, reaching the initial position; Dosage: 4 series of 8 repetitions.	I.P.: orthostatic with a pencil positioned on the ground; T1: the pencil is lifted from the ground using only the fingers and leg muscles, after which the pencil is placed back on the ground; Dosage: 5 times with each lower limb.

Exercise 17	*Exercise 18*
I.P.: orthostatic with the left lower limb positioned in front and the other behind with the soles on the ground, parallel to each other; T1: by bending the trunk forward and bending the left knee, the calf muscles and the Achilles tendon are stretched for 15 seconds; Dosage: this exercise is performed 3 times for 15 seconds/hold with both lower limbs.	I.P.: orthostatic with the legs slightly apart, the soles parallel, the plantar arch is activated, raised from the ground; T1: dorsiflexion of the hallux, with a return to the initial position; Dosage: 4 series of 10 repetitions.
Exercise 19	*Exercise 20*
I.P.: sitting on a mattress with an elastic band attached with one end to the foot of the right foot and the other end to a trellis; T1: inward circumduction of the right leg against the resistance of the elastic band; Dosage: 4 series of 8 repetitions.	I.P.: orthostatic; T1: slow walking with awareness of plantar arch activation; Dosage: 3 times for 3 minutes.

Table 4. The kinetic protocol performed in order to recover low back pain

Exercise 1	*Exercise 2*
I.P.: sitting on a mat with the lower limbs attached, with a medicine ball on the tibial area, and the hands are positioned on the ball; T1: flexion of the trunk on the thighs, rolling the arms on the ball, holding for 5 seconds, then returning to the initial position; Dosage: 4 series of 8 repetitions.	I.P.: sitting on a mat with the lower limbs spread out to the sides, with a medicine ball in front of the body, hands on the ball; T1: bending the trunk towards the ground, rolling the ball forward, after which it returns to the initial position; Dosage: 4 series of 8 repetitions.
Exercise 3	*Exercise 4*
I.P.: sitting on the mat with the thighs on the calves, the trunk fully flexed on the thighs, the upper limbs stretched forward on the ground; T1: placing the hands slightly to the left, without lifting the trunk from the thighs, the trunk is transferred to the left side,	I.P.: sitting on the mat with the left lower limb flexed and positioned slightly to the side of the body, and the right lower limb extended forward; T1: flexion of the trunk on the thigh of the right lower limb, without rotation of

generating a more intense stretch on the right side of the back, after which it returns to the IP T2: placing the hands slightly to the right, without lifting the trunk from the thighs, the trunk is transferred to the left side, generating a more intense stretch on the left side of the back, after which it returns to the IP Dosage: 3 series of 6 repetitions.	the trunk, with a 15-second hold, after which it returns to the initial position; Dosage: 3 series of 5 15-second holds (this exercise is performed analogously with the other lower limb).
Exercise 5	*Exercise 6*
I.P.: sitting on the mat with the left lower limb flexed and positioned slightly to the side of the body and the right lower limb extended forward; T1: trunk flexion on the thigh of the right lower limb with rotation so that the trunk is parallel to the wall, holding for 15 seconds, after which it returns to the initial position; Dosage: 3 series of 5 15-second holds (this exercise is performed analogously with the other lower limb).	I.P.: from orthostatic, we will perform a semi-squat, staying on the ground, the knees will be directed outwards, and the upper limbs will press the knees outwards with the elbows; T1: this position is maintained for 40 seconds; Dosage: 3 times for 40 seconds.
Exercise 7	*Exercise 8*
I.P.: quadrupedal; T1: extension of the right lower limb with that of the left upper limb, then returns to the initial position; T2: extension of the left lower limb with that of the right upper limb, then returns to the IP; Dosage: 4 series of 10 repetitions.	I.P.: quadrupedal; T1: flexion of the spine, resulting in its bending; T2: extension of the spine, resulting in its arching; Dosage: 4 series of 10 repetitions.
Exercise 9	*Exercise 10*
I.P.: supine position; T1: flexion of the right lower limb on the trunk, bringing the knee to the chest and holding for 10 seconds, after which it returns to the initial position;	I.P.: supine position; T1: bring the right knee to the chest; T2: the right knee is brought over the left lower limb and positioned on the ground, creating a twist of the trunk and maintaining this position;

T2: flexion of the left lower limb on the trunk, bringing the knee to the chest and holding for 10 seconds, after which it returns to the initial position; Dosage: 3 series of 8 repetitions.	Dosage: 3 series of 7 repetitions (analogously, it is also performed with the other lower limb).
Exercise 11	*Exercise 12*
I.P.: supine position; T1: by rolling the body backwards, pass the lower limbs over the trunk, above the head and maintain this position for 15 seconds; Dosage: 3 times.	I.P.: supine with the sole of the right lower limb on the ground, the other lower limb is positioned with the ankle on the right knee, grasp the hands behind the thigh of the right lower limb and pull it towards the body; T1: pull the right lower limb towards the body, then return to the initial position; Dosage: 3 series of 5 repetitions (similarly, it is also performed with the other lower limb)
Exercise 13	*Exercise 14*
I.P.: ventral decubitus with palms placed sub axillary, on the ground; T1: push the trunk off the ground without lifting the pelvis, resulting in an upward extension of the trunk with a 15-second hold, then return to the starting position; Dosage: 3 times.	I.P.: ventral decubitus with palms placed sub axillary, on the ground; T1: pushing the trunk off the ground, lifting the pelvis and sitting back on the calves with the thighs, holding for 15 seconds, then returning to the starting position Dosage: 5 times.
Exercise 15	*Exercise 16*
I.P.: orthostatic with the trunk bent at 90 degrees to the ground, hands on the trellis for support; T1: holding this position for 30 seconds (or more if possible), then relax; Dosage: 3 times.	I.P.: orthostatic; T1: total flexion of the trunk on the thighs, touching the ground with the hands, holding for 20 seconds; Dosage: 3 times.

Results

This research included 20 male and female subjects between the ages of 10 and 16. They were divided into two groups (the control and experimental groups, each comprising ten subjects).

The experimental group followed the two protocols proposed by us in order to recover the flat foot and post-exercise lumbago. The control group followed the protocol developed by Marius Militaru for the recovery of the flat foot and the protocol demonstrated by the therapist Josh Withney at the Palmetto Health-USC Medical Group institution for the recovery of post-exercise low back pain.

After performing the protocols for one month, the VAS score of the control group improved substantially, and there were even cases in which the post-exercise lumbar pain entirely improved in 3 of the ten subjects of the experimental group. In the case of the recovery of the flat foot, an improvement in the stability of the foot was observed, but the ligamentous laxity remained the same due to the continued practice of Latin dances with the specific technique.

Table 5. Results of the VAS score in the control group for low back pain

Subjects	Initial VAS score	Final VAS score
M.C.	7	3
C.T.	6	2
R.B.	6	3
A.C.	6	2
P.M.	5	3
D.D.	7	3
A.B.	6	2
I.H.	7	3
R.B.	7	3
S.D.	7	3

The significance T test was applied to discover if the results of the VAS score in the control group were significant. It was discovered that the difference between the initial and the final VAS score for the control group were statistically significant with a P value of 0.0001.

Table 6. VAS score results in the experimental group for low back pain

Subjects	Initial VAS score	Final VAS score
C.D.	6	2
R.P.	6	0
D.F.	7	1
C.F.	5	2
D.B.	6	1
D.S.	6	1
K.C.	6	0
D.H.	7	2
E.T.	5	0
A.S.	6	2

Applying the kinetic protocol for low back pain created by us shows a decrease in the final VAS score significantly better than the final VAS score of the control group, indicating a greater efficiency of our protocols to improve post-exercise low back pain in performance dancers.

The results of the initial VAS score and final VAS score in the experimental group was calculated with the T test. The results show that there are statistical significant improvements with a p value of 0.0001 between the VAS score of the experimental group at the initial and final test.

The final results of the VAS test between the experimental group and the control group were compared and was found a statistically significant difference with a p value of 0.0002.

Table 7. Results of Achilles tendon axis improvement in the control group in flatfoot pathology

Subjects	Deformation of the trend axis. Achillean, on initial visual inspection	Improvement in the final phase after performing the kinetic protocol
M.C.	YES	YES
C.T.	YES	NO
R.B.	YES	NO
A.C.	YES	YES
P.M.	YES	NO
D.D.	YES	NO
A.B.	YES	YES
I.H.	YES	NO
R.B.	YES	YES
S.D.	YES	NO

Table 8. The results of improvement of the axis of the Achilles tendon in the experimental group in the pathology of the flatfoot

Subjects	Deformation of the trend axis. Achillean on initial visual inspection	Improvement in the final phase after performing the kinetic procedure
C.D.	YES	YES
R.P.	YES	YES
D.F.	YES	YES
C.F.	YES	NO
D.B.	YES	NO
D.S.	YES	YES
K.C.	YES	YES
D.H.	YES	NO
E.T.	YES	NO
A.S.	YES	YES

Applying our protocol for the recovery of the flat foot on the experimental group, a 60% improvement in the axis of the Achilles tendon was observed compared to the control group where only 40% of the subjects had an improvement. At the same time, compared to the control group, the experimental group achieved a significant improvement in the stability of the ankle joint, an aspect highlighted by the final results of the single-foot Bosu test.

Table 9. Bosu ball unipodal test results in the control group

Subjects	Initial test on Bosu ball (sec)		The final test on Bosu ball (sec)	
	Left leg	Right leg	Left leg	Right leg
M.C.	8	12	11	14
C.T.	6	9	11	13
R.B.	5	7	9	11
A.C.	5	9	13	12
P.M.	7	11	10	13
D.D.	9	7	10	10
A.B.	10	9	14	12
I.H.	8	10	13	14
R.B.	6	7	11	13
S.D.	7	10	8	13

The significance T test was applied to discover if the results of the Bosu ball unipodal test in the control group for the initial and final test in the left leg was significant or not. It was discovered that the difference between the initial and the final results for the bosu ball unipodal test for the left leg was statistically significant with a p value of 0.0002.

Same test was performed for the right leg and also was found a statistically significant result with a p value of 0.0001.

The next comparison at the results of the bosu ball unipodal test at the control group was between the left leg and the right leg at the initial test. It was discovered that the difference between the initial testing results of the left leg and the right were statistically significant with a p value of 0.008384.

Last comparison at the bosu ball unipodal test at the control group was between the left leg and the right leg at the final test. The Student T-test showed that was statistically significant difference between the left leg and the right leg at the final testing, with a p value of 0.025699.

Table 8. Bosu ball unipodal test results in the experiment group

Subjects	Initial test on Bosu ball (sec)		The final test on Bosu ball (sec)	
	Left leg	Right leg	Left Leg	Right leg
C.D.	9	10	13	16
R.P.	7	8	12	15
D.F.	10	8	15	16
C.F.	5	6	11	10
D.B.	6	9	9	14
D.S.	6	7	10	10
K.C.	7	7	9	11
D.H.	6	8	10	13
E.T.	5	9	10	14
A.S.	6	8	8	11

The significance T test was applied to discover if the results of the Bosu ball unipodal test in the experimental group for the initial and final test in the left leg was significant or not. It was discovered that the difference between the initial and the final results for the bosu ball unipodal test for the left leg at the experimental group was statistically significant with a p value of 0.000082. Same test was performed for the right leg and also was found a statistically significant result with a p value of 0.0001.

The next comparison at the results of the bosu ball unipodal test at the experimental group was between the left leg and the right leg at the initial test. It was discovered that the difference between the initial testing results of the left leg and the right were statistically significant with a p value of 0.02747.

Last comparison at the bosu ball unipodal test at the experimental group was between the left leg and the right leg at the final test. The Student T-test showed that was statistically significant difference between the left leg and the right leg at the final testing, with a p value of 0.016858.

Discussions

One study indicates that medial foot collapse during gait is more prevalent in athletes with high generalized joint laxity than in athletes with low generalized joint laxity (Foss et al., 2009). Ferrari and Watkinson also chronicled related discoveries, mentioning that the centre of strain path was more median in ladies than in men, who show beyond doubt a centrally positioned centre of

pressure trajectory. They found that thanks to this median path, the leading metatarsal head was packed more in ladies than in men (Ferrari & Watkinson, 2005). Relating these aspects to our research, we discover the similarity between these studies and the current research that highlights an increased ligamentous laxity in female subjects due to the execution technique of the steps in Latin dances like Samba, Cha Cha, Rumba, Paso Doble and Jive.

Ballet is very similar to ballroom dancing in terms of foot technique, except that ballerinas dance on tiptoe or half-sole, and ballroom dancers use the entire sole through progressive toe-half-sole-heel contact in Latin dances like Samba, Cha Cha, Rumba, Paso Doble and Jive and the natural toe-to-heel roll in standard dances like Lent Waltz, Tango, Viennese Waltz, Slow Fox and Quick Step.

Li et al. state that external rotation, especially at the ankle joint, is essential for dancers to reach an extreme position in ballet. Limiting the ankle's range of motion can cause the foot to pronate (tilt inward) and cause the foot to lose medial arch support. If the stability provided by the midfoot begins to give or decrease, the dancer will compensate to maintain the centre of mass (Li et al., 2022). This element is also valid in sports dance, where the aesthetics of the foot technique is essential.

Applying the protocol created by us for the pathology of the flatfoot, we obtained an improvement of the plantar arch in the case of all subjects, an aspect proven by the improvement of the planograms on paper, where the reduction of the plantar impression on the medial side of the foot was observed in all subjects of the experimental group. Compared to the standard protocol applied to the control group, we obtained by applying our protocol an improvement of the Achilles tendon line in orthostatic in 9 out of 10 subjects, while applying the standard protocol only in 7 out of 10 subjects was observed. Laxity of ligaments and joint capsules can lead to disruption of joint stability and put dancers at risk of injury (Drezewska et al., 2012; Drezewska & Sliwinski, 2013).

LBP (low back pain) in CB dancers is overdue to the cumulative effects over years of suboptimal motor control, such as impoverished positional straightness, absence of coordination or inaccurate technique implementations (Gamboa et al., 2008; Roussel et al., 2009; Roussel et al., 2012), together with muscle imbalances (Gamboa et al., 2008; Steinberg et al., 2011), hypermobility or muscle tension (Gamboa et al., 2008; Roussel et al., 2009; Steinberg et al., 2011), maximal use of the lower limbs (Neguş et al., 2005) and excessive repetitive movements in non-physiological positions (Capel et al., 2009; Nilson et al., 1993; Gottschlich & Young, 2011).

Our study similarly highlights these aspects, demonstrating the importance of knowing the optimal technique for executing positions and movements during the dance, correct coordination and achieving a balance in the intensity of muscle tone.

Another study argues that the intrinsic plantar foot muscles within the active and neural subsystems play a critical role in the central foot system as local stabilizers and direct sensors of foot deformation (McKeon et al., 2015). Therefore, it is imperative to strengthen the muscular-ligamentous structures of the foot, especially the plantar ones, which are essential in maintaining the natural plantar arch of the foot and its stability together with the ankle joint. Relating the idea of this study to our research, we reach the same conclusion: the importance of developing the plantar muscular-ligament force through specific kinetic exercises that increase plantar stability and improve the flat foot, reconstructing its plantar arch.

These protocols can also be applied as prophylaxis, not only for recovery but to ensure effective prevention; it is necessary to train athletes about these two conditions and apply a separate protocol of exercises aimed at strengthening the abdominal muscles (to prevent low back pain) and the joint ankle (to prevent flatfoot). It is also essential that the athletes know the correct execution of the exercises and that the two protocols are applied under a specialist's supervision.

Conclusions

In conclusion, applying the kinetic protocol to recover low back pain after training brought a positive result in relieving low back pain, proving to be more beneficial than the standardized protocol for dancers, especially for female subjects.

Regarding the application of the kinetic protocol was found statistically significant differences between the initial and final evaluation of pain with the VAS scale at both control group and experimental group.

At the Bosu ball unipodal test results were discovered statistically significant improvments also in the control group and the experimental group at both left leg and right leg.

The kinetic protocol was efficient in reducing back pain and also some good results were observed in reducing the flat foot deficiency.

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THE PHYSIOLOGICAL EFFECTS PLAYING BEACH HANDBALL HAS ON JUNIOR HANDBALL INDOOR PLAYERS

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ABSTRACT. Beach handball is a branch of sports that was born on the beaches of Italy in the early 1990s and it was designed to help players under go their physical training in a more dynamic training during the summer. Objectives. The main goal of this study is to describe the physiological state of the athletes that underwent a series of beach handball training sessions and to determine the effects of such training sessions on junior level beach handball athletes. Materials and methods. We have suggested that the evaluation of the athletes' condition be determined via invasive methods, such as the analysis of their urinary value. Results. The numerical data obtained from our analysis were computed using Student's t-test for unpaired samples associated with Welch's unequal variance t-test. The statistical significance was determined for an associated $P < 0.05$ (probability > 95%). The comparison was made between the mean of the initial values and the mean of the final value for all the dosed biochemical markers. The data are expressed as mean ± SD (standard deviation). The statistical processing was done using the GraphPad Prism software. Conclusions. Including beach handball practice sessions in the training program of indoor handball players has no significant effect on their physiological state.

Keywords: *beach handball, juniors, physiological status.*

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REZUMAT. ***Efectele practicării jocului de Beach Handball la nivel fiziologic asupra jucătorilor de handbal junior.*** Jocul de Beach Handball este o ramură sportivă nouă care a luat naștere pe plajele din Italia la începutul anilor 1990 cu intenția de a face pregătirea fizică a jucătorilor de handbal mult mai dinamică pe perioada verii. **Obiective.** Obiectivul principal al studiului a fost conturarea statusului fiziologic al sportivilor supuși unor serii de antrenamente organizate de Beach Handball și determinarea efectelor fiziologice în urma aplicării jocului de Beach Handball în pregătirea jucătorilor de handbal la nivel de juniori. **Materiale și metode.** Am propus evaluare stării sportivilor prin metode invazive, cum ar fi determinarea valorii unitare a acestora. **Rezultate.** Datele numerice obținute în urma determinărilor efectuate au fost prelucrate cu testul t Student pentru valori neperechi asociat cu corecția lui Welch. Semnificația statistică a fost stabilită la un *P* asociat < 0.05 (probabilitate > 95%). Comparația s-a efectuat între media valorilor inițiale și media valorilor finale, pentru toți markerii biochimici dozați. Datele sunt exprimate ca medie ± ES (eroarea standard a mediei). Prelucrarea statistică a datelor s-a efectuat folosind softul GraphPad Prism 5. **Concluzii**. Introducerea antrenamentelor de Beach Handball în programul de pregătire al jucătoarelor de handbal (indoor) nu influențează statusul fiziologic a acestora.

Cuvinte cheie: *handbal pe plajă, juniori, stare fiziologică.*

Introduction

Beach handball is a relatively new sport that emerged on the beaches of Italy during the early 1990s. Its aim was to be a more dynamic strategy for physical training during the summer (Morillo-Baro et al. 2015). Ever since its emergence, numerous studies have been conducted regarding the psychological profile (Reigal et al., 2019; Vasquez-Diz et al., 2019), and the anthropometric profile, but also regarding the body composition of athletes that play beach handball. Such studies have seldom focused on the physiological implications of this sport, most notably focusing on the dehydration of the athletes during matches (Puebo et al., 2017; Lemos et al., 2020). Beach handball, just like its classical version, is characterized by mixed effort, with high intensity actions that may quickly cause muscle fatigue during games (Povoas et al., 2012). In contrast to classic handball (indoor handball), beach handball players must cover a smaller running distance (indoor handball (Michalsik & Aagaard,2015): males=3267±568m, females 4002±551m; beach handball: males = 1235±222m, females = 1118±222m) and a lower number of accelerations due to the sand surface that imposes greater physiological effort on the players (Puebo et al., 2017).

Considering the similarities between beach and indoor handball, be they on a technical/tactical level or physical/ anthropometrical level, both being factors that have deep impact on performance (Lemos et al., 2020), we believe that physiological phenomena can be observed/measured for beach handball as well. By looking at all the relevant literature, one may notice that no studies have been done effort endurance markers and their effect in the training of handball players when beach handball is played by junior level players.

Catecholamines are a third indicator of effort endurance and of modulating competitional stress (the first and second being cortisol and testosterone). They have an essential physiological role, encompassing dopamine, noradrenaline and adrenaline, and their release is distributed unevenly throughout the central and peripheral nervous system and through the endocrine system (Pan et al., 2018). The release of catecholamines in the blood flow is a fast, momentary, process that leads to the quick enhancement of motrical performane (especially by increasing oxygen levels in the muscles), of the breathing rate, of the employment of the body's energy resources, and it generates an ample integration of the stress factors within the central nervous system (McMorris et al., 2016). Catecholamines are also present in urine, their presence being an accurate indicator of their blood concentration (Takagi et al., 2020).

Objectives

The main goal of this study has been observing the physiological state of athletes that underwent a series of beach handball training sessions and determining what effect does including beach handball have in the training of junior level handball players.

Materials and methods

Subjects, duration of study

The study group was composed of 26 female athletes, aging from 16-18 years old, with no chronic illnesses and based on their signed consent. The study group has been divided in two, one group being formed of 13 female athletes (control group), and the second group being formed of 13 female athletes that employed the training methods associated with beach handball (experimental group), all part of CSS Viitorul Cluj, both groups from CSS Viitorul Cluj-Napoca.

The duration of the experiment was 6 months, between the 15th of February and the 15th of July 2020. The frequency with the subjects took part in the training sessions was 3 times a week.

Biochemical analysis of urine

The biochemical analysis of the urine was performed using the 2000 Evolution analyzer calibrated by Biomaxima Poland. The reactants used during this process originated from Biomaxima Poland and have been specially selected for determining the relevant markers within our study. The determining of the total urinary catecholamines was done by nitration of the Aromatic Nucleus in an acid environment and the coupling of that reaction with ammonium molybdate (Madrakin et al., 2006). The amount of urinary phosphates was determined using the Tusky method. The urea level in the urine was quantified based on the reaction with picric acid in a high alkaline environment. Urobilinogen was evaluated qualitatively, by looking for its presence/absence. The presence of urobilinogen was established using Erlich's reagent, with p-dimethylaminobenzaldehyde. Urinary pH was established using the colorimetric method with urine test strips.

Data processing and statistical analysis

The numerical data obtained from our analysis were computed using Student's t-test for unpaired samples associated with Welch's unequal variance t-test. The statistical significance was determined for an associated $P < 0.05$ (probability > 95%). The comparison was made between the mean of the initial values and the mean of the final value for all the dosed biochemical markers. The data are expressed as mean ± SD (standard deviation). The statistical processing was done using the GraphPad Prism software.

Results

The quantifying of catecholamines (fig. 1), phosphates (fig. 2), creatinine (fig.3) and urea in urine samples from the two groups in the initial phase and the final phase, after the training sessions of the experimental group. The data are expressed as the mean ±SD. Statistical significance is for $P<0.05$(), $P<0.01$(), $P<0.001$(**).

The results of the biochemical urinary sampling revealed on the one hand the healthy metabolic state of the subjects, and on the other hand their constantly balanced lifestyle. As shown in Fig.1, the level of total urinary catecholamines, including here adrenaline, dopamine and noradrenaline, presented no statistically

significant variations, which implies the lack of activation of the neuroendocrine adrenergic system throughout the intervention period. This same aspect is suggested by the absence of any statistically significant variation of the phosphate concentration (fig.2) urea respectively (fig. 3) which implies the absence of any overloading of the glomerular filtration function associated with urine production.

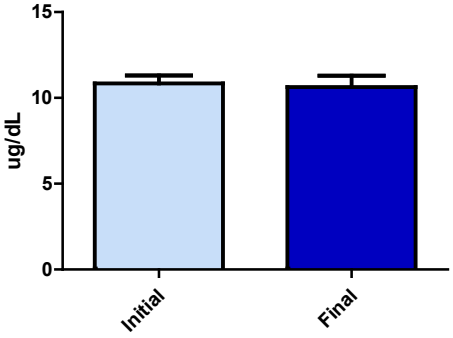

Fig. 1. Urinary cathecolamines concentration

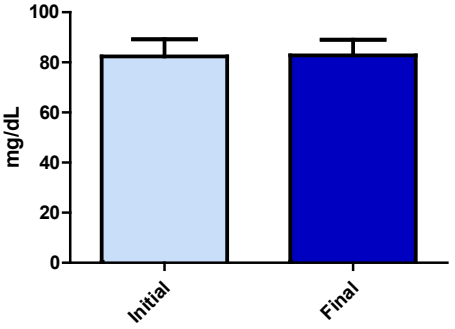

Fig. 2. Urinary phosphates concentration

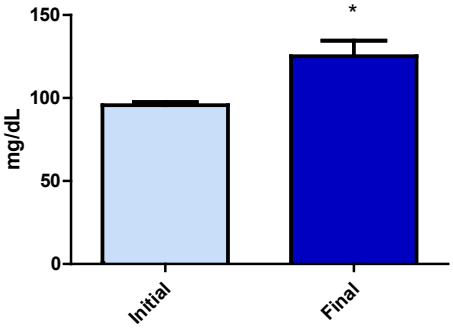

Fig. 3. Urinary creatine concentration

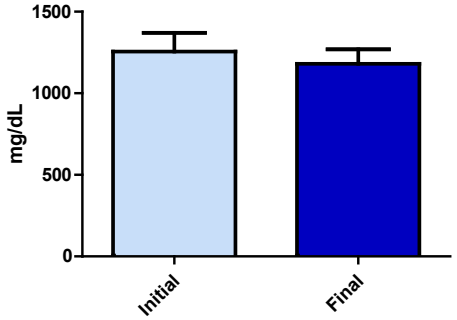

Fig. 4. Urea concentration

The sustained intense physical effort may cause an increase in the renal perfusion rate with an increased level of excretion of urea and phosphates respectively, phenomena absent in both groups. Unlike these parameters, the creatinine urinary level (fig. 4) increased after the intervention period ended, but this increase may be accounted by other environmental factors such as temperature-moisture (outdoor training) that would lead to an increased flow of fluids and an increased excretion of creatinine.

Discussion

The biochemical testing of the subjects in this study had the role of determining whether there are any physiological changes on a handball team (indoor) that also plays beach handball. The urine samples of the athletes (16-18 years old) showed the neuroendocrine reactance and the fact that specific beach handball training sessions have no effect on the physiological measurements of (indoor) handball players.

Within all branches of sports, knowing the blood and urine markers is seen as an important control and planning element for practice and matches (Lopez-Sanchez et al., 2018).

We are unaware of any existing study done to analyze urinary measurements of (indoor) handball that also play beach handball - junior level. The (indoor) handball athletes showed reduced levels of blood and urine pH after practice as a consequence of acid products of the metabolism, such as hydrogen ions, lactate, pyruvate etc. In our study, the end results showed reduced statistical significance. Most papers, in agreement with their own research results, confirm a reduction of urine pH after anaerobic (Hanon et al., 2012), aerobic (Wiacek et al., 2011) or mixed exercise (Wiecek et al., 2015).

The core strengths of this study include the monitoring of the athletes based on the markers identified in the urine. Unfortunately, we have not included the monitoring of ions present in urine and perspiration, nor have we analyzed the athletes' diet. Both could have been valuable resources for coaches who want to study these influences on the electrolytes level and on the acid-base levels during practice. The following studies should also take into account a greater number of athletes, and the experimental period should be longer.

Conclusion

Through our biochemical analysis of athletes' urine we showed that they have a healthy metabolic state, indicating a healthy lifestyle.

Constant beach handball training of (indoor) handball female players, following a certain protocol, with ages ranging from 16 to 18 years old, did not influence their physiological state, the values resulting from urine analysis being statistically insignificant.

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A COMPARATIVE STUDY ON THE INTERESTS AND VALUES OF INSTITUTIONALIZED CHILDREN AND OF DANCING CHILDREN WHO COME FROM FAMILIES

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ABSTRACT. Introduction: Institutionalized children are at risk in terms of their integration into society, as the lack of educational and financial resources hinders the development of their cognitive and non-cognitive skills. Sports activities contribute to the development of interests and influence the general education of the children, which can be stimulated through music and dance - the most representative artistic field that allows the psychomotor development of children. **Objective:** The aim of this study is to ascertain the differences between the institutionalized children and the dancers who come from families in terms of their interests and values. **Materials and Methods**: Fifty-five children aged 11-12 participated in the study, including 30 children in foster care who do not participate in organized extracurricular physical activities and 25 performance dancers who come from organized families. **Results**: The interest in the various activities in which children are asked to participate is more obvious in dancers, particularly from an artistic and social point of view, and children in foster care are preoccupied with free time and social relations, with authority being the least valued. **Conclusions**: The influence of dance on children's development can be noticed in the results of the psychological tests assessing their interests and values, which suggest that dancers are more interested in *extracurricular activities* compared to children in foster care centers and they are more concerned about their future employment situation.

Keywords*. Dance, interests, values, institutionalized children.*

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REZUMAT. ***Studiu comparativ privind interesele şi valorile copiilor instituţionalizaţi şi ale copiilor dansatori care provin din familii.*** **Introducere:** Copiii instituţionalizaţi reprezintă o categorie cu factor de risc din punct de vedere al integrării în societate, lipsa resurselor educaţionale şi financiare împiedicând dezvoltarea abilităţilor cognitive şi noncognitive ale acestora. Activităţile sportive contribuie la formarea intereselor şi influenţează educaţia generală a copiilor, care poate fi stimulată prin intermediul muzicii şi dansului - acesta fiind cel mai reprezentativ domeniu artistic ce permite dezvoltarea psihomotrică a copiilor. **Obiectiv:** Scopul acestui studiu este de a stabili diferenţele dintre copiii instituţionalizaţi şi dansatorii proveniţi din familii, din punct de vedere al intereselor şi valorilor acestora. **Materiale şi Metode:** La studiu au participat 55 de copii cu vârsta cuprinsă între 11-12 ani, incluzând 30 de copii din centre de plasament care nu participă la activităţi fizice extraşcolare organizate şi 25 de dansatori de performanţă, proveniţi din familii organizate. **Rezultate:** Interesul pentru diversele activităţi la care sunt solicitaţi copiii este mai bine evidenţiat la dansatori, în special din punct de vedere artistic şi social, iar copiii din centrele de plasament sunt preocupaţi de timp liber şi de relaţiile sociale, cel mai puţin apreciind autoritatea. **Concluzii:** Influenţa dansului asupra dezvoltării copiilor poate fi observată în urma rezultatelor testelor psihologice de evaluare a intereselor şi valorilor, care sugerează faptul că dansatorii sunt mai interesaţi de alte activităţi desfăşurate în afara orelor de şcoală comparativ cu copiii din centre, şi sunt mai preocupaţi de viitoarea situaţie profesională.

Cuvinte cheie: *Dans, interese, valori, copii instituţionalizaţi.*

Introduction

Through their specific content, sports activities influence the path of the general education from a motor, intellectual, aesthetic, and emotional perspective (Gevat et al., 2012), contributing to the development of interests and motivation in order to achieve good results in other disciplines and areas, as well as to the biopsychic development of the child (Popa et al., 2013). Extracurricular physical activities improve the quality of life and positively influence the physical development and integration into society of children (Tomescu, Stănescu & Aivaz, 2022). The values each person is guided by in life are correlated with his/her state of well-being, a very important role pertaining to the psychological processes (mental health), needs (relationships, autonomy, and skills) and ways of acting in order to achieve results according to his/her personal values and interests (Raymond I. J. & Raymond C. M., 2019). According to a study involving 85 physical education teachers, aesthetic movements are appreciated

by students, among their favorite subjects being gymnastics, an artistic sport included in the school curriculum (Stănescu, 2013). The activities related to music and art are important milestones for children's education, as they stimulate cognitive, emotional, psychomotor, and social development. Only the children who feel free and secure develop their creativity and the necessary skills to satisfy their needs and interests effectively (Benic et al., 2017). There is a connection between the personality type and the personal, social, and economic interests (Funder, 2001), and the relationships between these are reflected in children's school situation and their motivation to study.

A study carried out by Jodl et al. (2001) with the participation of 444 7th grade children from parent families shows that parents' values in the academic or sports field are directly or indirectly transmitted to their children, who end up having the same interests and professional vision as their parents. Young people's behavior towards curricular or leisure activities often reflects the adults' aspirations. According to this study, the inclination for sports appears to come from the father, whereas the academic motivation is maintained by the mother. Children may also inherit their parents' occupational desires, as well as their parents' non-cognitive skills and dominant types of intelligence.

Institutionalized children are at risk in terms of their integration into society. Educational and social exclusion is of interest to specialists, as it is a phenomenon that occurs in adolescence, a period of change that affects the behavior, psychological orientation, values and interests, as well as social interaction (Tudor et al., 2020). Frequently, institutionalized children want to be involved in various activities, but they give up after a very short time. Self-determination depends on every individual's level of motivation, and it can be intrinsic (it is interest-based), or autonomous extrinsic (it presumes the importance of a thing or of an activity for the individual), both of which contributing to achieving school performance or performance in the workplace, as well as to the well-being and the satisfaction that a person feels as a result of performing tasks or achieving good results (Gagne & Deci, 2005). Limited educational and financial resources hinder the development of disadvantaged children's cognitive and non-cognitive skills. Thus, programs for the educational and social integration of children who are at risk have started to be implemented at national level in Romania. Extracurricular activities, such as sports games, music, dance, painting, etc. have a positive influence on the educational, social, and emotional development of young people (Martin & Dowson, 2009). The subjects' interest in undergoing training can be maintained through activities, carried out on a musical background, which are an outlet for their energy and a provider of energy, and which offer satisfaction and a good mood (Teodorescu & Bota, 2008).

Specialists in the field consider necessary the instruction on the expressive aspects of motricity, dance being one of the sports and artistic activities through which body expression and musicality are stimulated (Manos, 2016). It is the most representative artistic field that allows the development of creativity, originality, sociability, and aesthetic posture through movement, therefore the inclusion of dance in the school curriculum could bring benefits in terms of children's personality development (Macovei et al., 2013).

Professional dancers have highly developed emotional intelligence, especially those who have been dancing from an early age, and the stimulation of this type of intelligence through dance implies the development of multiple interests in other activities and the achievement of professional goals (De Las Heras-Fernandez et al., 2020). The dance stimulates the noncognitive skills, and those who are practicing this sport have better developed artistic and social skills than those who do not carry out physical activities during their free time (Tomescu et al., 2021).

This comparative study aims to establish the differences between the institutionalized children and the dancers who come from families, in terms of their interests and values, the test results showing the efficiency of dance in terms of children's motivation and interest in school and extracurricular activities.

Materials and Methods

Fifty-five children aged 11-12 participated in the study, including 30 children in foster care who do not participate in organized extracurricular physical activities and 25 performance dancers who come from organized families. The inclusion of the institutionalized children in the target group was done after consultations with the specialized staff of the foster care centers from which they came, who helped by administering the assessment tests.

For this study we have accessed the *PEDb Platform*, a software app for assessing developmental and mental health and career counselling, through which children's interests and values can be assessed.

The *Interest Assessment Questionnaire* consisted of six scales which set out the preferences for specific areas of activity or knowledge. Children were able to respond to the statements in the questionnaire by circling an option from 0 to 2 (0 - if they disliked the activity, 1 – they were indifferent, 2 - they liked the activity). The maximum score for each dimension was 20, meaning a 100% level of influence (4=20% - 20=100%).

Table 1. Description of the Interest Assessment Questionnaire's scales

SCALE	DESCRIPTION
Social interests (S)	Activities which involve interpersonal relations, focus on teamwork and less on independent activities
Entrepreneurial interests (E)	Initiative, prefers to influence other persons, to make decisions, manage, and take risks
Artistic interests (A)	Creativity, expressiveness; prefers to change things and apply new ideas, and less to follow rules
Investigative interests (I)	Attraction to research, investigation, exploration, understanding things and situations in depth, thoroughness
Realistic interests (R)	Tendency to manipulate objects and tools, physical activities; attraction to working with plants, animals, or objects, and less with people
Conventional interests (C)	Inclination towards well-organized activities with precise rules, carried out according to procedures, requiring systematic knowledge of data or objects

The *Value Assessment Questionnaire* consisted of nine scales and it highlighted the child's core beliefs with regard to the activities and relationships within the society. The statements in the questionnaire were descriptions of certain people, and the subjects were asked to rate how much this model resembles themselves by choosing from the following options: 5 - very much like me, 4 - much like me, 3 - somewhat like me, 2 - less like me, 1 - very little like me. The maximum score obtained for each dimension was 20, meaning a 100% level of influence (4=20% - 20=100%).

Table 2. Description of the Value Assessment Questionnaire's scales

SCALE	DESCRIPTION
Skills Development (SD)	The importance of developing and harnessing interests, skills, and competences
Authority (A)	Ability to lead, make decisions, take responsibility; desire to have influence and to dominate other people
Challenge (CH)	Involves risky and complex activities
Safety (S)	Important to know the risks, the factors involved, the steps to follow in an activity
Autonomy (AUT)	Freedom and diversity
Rule Following (RF)	Organizing and carrying out activities according to the rules set by others

SCALE	DESCRIPTION
Free Time (FT)	Systematic pursuit of recreational activities and passions
Professional Recognition (PR)	Entails competence in the workplace or in one's field of activity, through which one earns respect and admiration from those around them
Social Relations (SR)	Desire to build and develop harmonious relationships with those around them, without competitiveness

The comparative study of the two groups (children in foster care and dancers) aimed at interpreting the average score of the tests' variables so as to assess children's interests and values in terms of the differences and correlations between them, as well as analyzing the statistical connections between the variables using the principal component analysis (PCA) method. This descriptive method highlights the connections and associations between the numerical variables.

Results and discussions

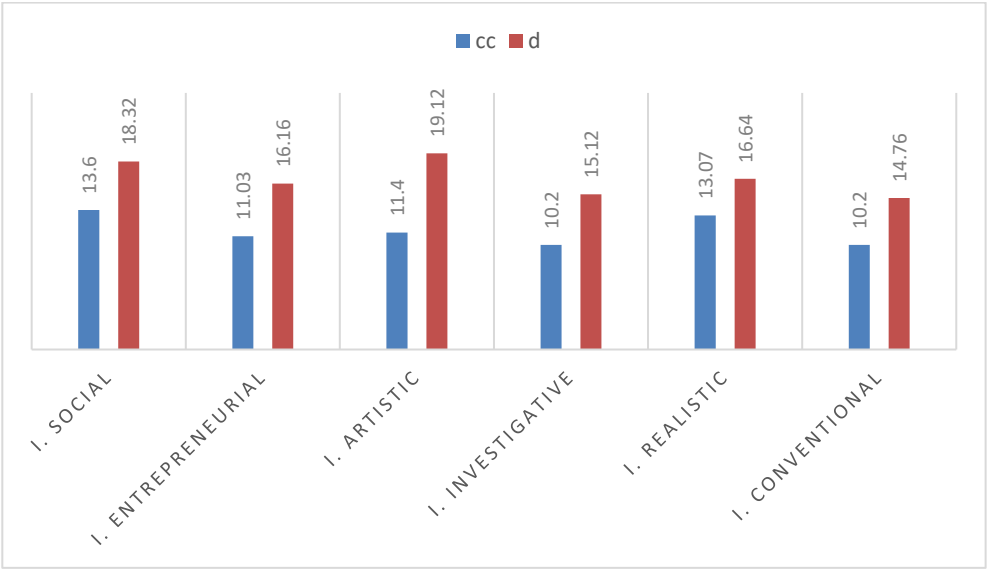
Interests. The statistical analysis for this test was performed in relation to all the stipulated variables: social, entrepreneurial, artistic, investigative, realistic, and conventional interests. The following table describes the average/ mean score of the two assessed categories and the standard deviation for each type of interest.

Table 3. Average/mean score of the interest assessment test's variables

Category		S	E	A	I	R	C
cc	Mean	13.60	11.03	11.40	10.20	13.07	10.20
	N	30	30	30	30	30	30
	Std. Dev.	3.909	5.014	5.399	4.582	4.705	5.027
d	Mean	18.32	16.16	19.12	15.12	16.64	14.76
	N	25	25	25	25	25	25
	Std. Dev.	1.773	2.779	1.130	3.046	2.737	3.479
Total	Mean	15.75	13.36	14.91	12.44	14.69	12.27
	N	55	55	55	55	55	55
	Std. Dev.	3.903	4.855	5.592	4.638	4.294	4.920

Note: *S* - Social; *E* - Entrepreneurial; *A* – Artistic; *I* – Investigative; *R* – Realistic; *C* – Conventional; *cc* – children in foster care; *d* – dancers; *N* – Number; *Std. Dev.* – Standard Deviation

Dancers (d) scored higher on all variables, meaning that they were more preoccupied with the activities carried out for the benefit of their professional development. From an artistic point of view, they scored an average of 19.12, and the children in the foster care (cc) only 11.40. The closest values were for realistic interests, where the mean value for dancers and institutionalized children was 16.64 and 13.07 respectively.



Graph 1. Graphical representation of the results - Interests

The interest in the various activities in which children are asked to participate is more obvious in dancers, particularly from an artistic and social point of view, and the investigative and conventional interests are the areas for which the children in both categories are least inclined.

Table 4. Pearson's Coefficients - Interests

Variables	Chi-Square	p	Phi
Social	30.521	**.004**	.745
Entrepreneurial	28.870	**.011**	.725
Artistic	32.108	**.001**	.764
Investigative	29.360	**.031**	.731
Realistic	21.062	.100	.619
Conventional	23.271	.226	.650

According to Table 4, the differences are significant for most variables, as $p < 0.05$. The largest differences were recorded with regard to artistic interests, where χ^2 (3) = 32.108, $p < 0.001$ and social, χ^2 (3) = 30.521, $p < 0.004$. Dancers also performed significantly better with regard to entrepreneurial and investigative interests, with a value of $p < 0.011$, respectively 0.031. The average scores for realistic and conventional interests were also higher for the dancers, however, the differences were not as significant as the ones mentioned.

Table 5. Correlation matrix - Interests

Variables	S	E	A	I	R	C
Social	1.000	**.556**	**.716**	.464	.486	.340
Entrepreneurial	**.556**	1.000	**.569**	**.530**	.493	**.556**
Artistic	**.716**	**.569**	1.000	.493	.446	.363
Investigative	.464	**.530**	.493	1.000	**.647**	**.577**
Realistic	.486	.493	.446	**.647**	1.000	**.718**
Conventional	.340	**.556**	.363	**.577**	**.718**	1.000

Note: *S* - Social; *E* - Entrepreneurial; *A* – Artistic; *I* – Investigative; *R* – Realistic; *C* – Conventional

The *Correlation Matrix* describes the correlations between the variables. There were no very strong correlations, as no values above the 0.8 limit were recorded. There were, however, correlations between 0.6 - 0.8, representing strong correlations. Some experts also consider correlations that exceed the value of 0.5 to be strong correlations. Table 5 illustrates the fact that social interests were strongly correlated with entrepreneurial (0.556) and, especially, artistic (0.716) interests, and that realistic interests had the most significant correlations with conventional (0.718) and investigative (0.647) interests. The weakest correlations were between conventional and social (0.340) and artistic (0.363) interests. The variable with the most correlations was the entrepreneurial interests. A person who has initiative, is decisive and risk-taking also has social, artistic, investigative and conventional skills, which means that he/she enjoys working with people, has vision and imagination, likes to investigate and find out as much information as possible, and can organize his/her work so as to get what he/she wants.

According to Diagram 1, the dancers scored better mean values, their results showing very strong connections. This aspect is indicated by their presence on the right side of the vertical axis. The children in foster care (cc) were predominantly positioned to the left of the axis, with remarkable differences between their results taking into account their disordered arrangement around the axes.

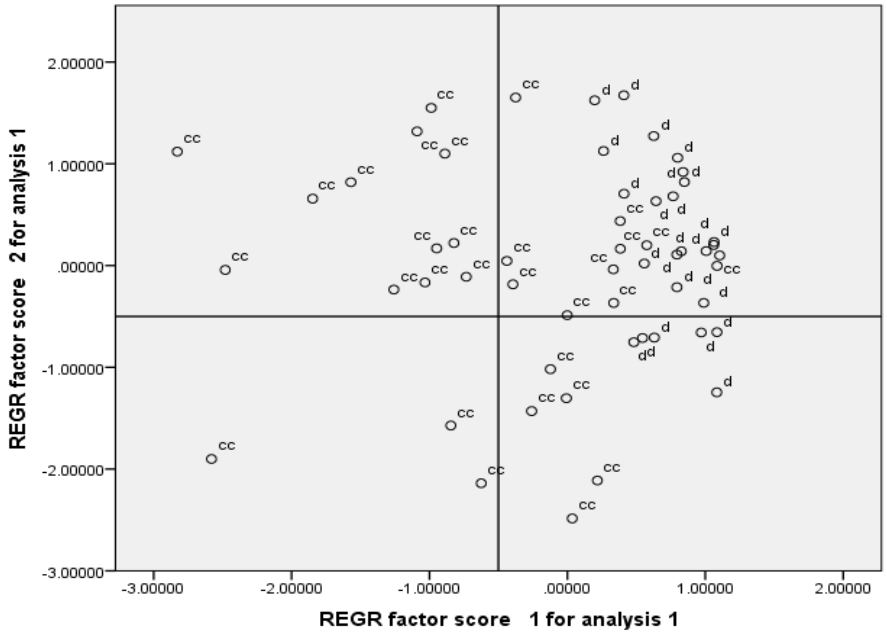


Diagram 1. Distribution of the children from the two groups, by interests

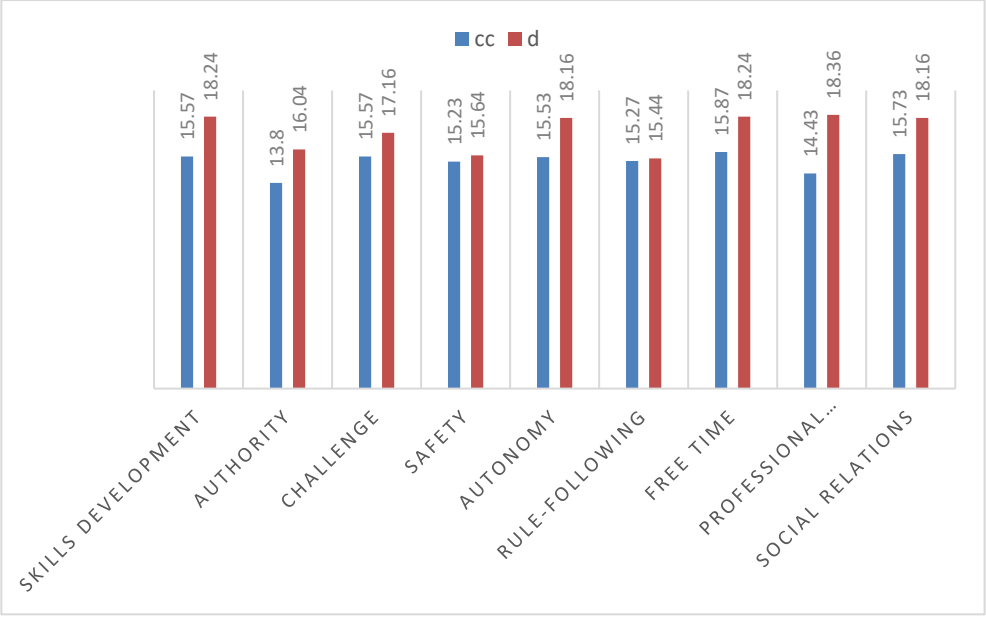
Values. The statistical analysis of the value assessment test was carried out based on several variables: skills development, authority, challenge, safety, autonomy, rule-following, free time, professional recognition, social relations. Table 6 suggests higher mean scores on all variables for the dancers, with the closest values being recorded for safety (15.23 for the institutionalized children and 15.64 for the dancers) and rule-following (15.27, respectively 15.44). In terms of social relations, the mean value for the dancers (d) is much higher than the one for children in foster care (cc), with values of 18.16, respectively 15.73, and the preoccupation for skills development is higher for those who were raised in families.

Table 6. The mean score of the value assessment test's variables

Category		SD	A	CH	S	AUT	RF	FT	PR	SR
cc	Mean	15.57	13.80	15.57	15.23	15.53	15.27	15.87	14.43	15.73
	N	30	30	30	30	30	30	30	30	30
	Std. Dev.	3.298	3.336	2.473	2.897	2.991	2.363	2.763	3.626	3.732
d	Mean	18.24	16.04	17.16	15.64	18.16	15.44	18.24	18.36	18.16
	N	25	25	25	25	25	25	25	25	25
	Std. Dev.	1.964	2.475	2.154	3.569	1.434	3.216	1.451	1.680	2.173
Total	Mean	16.78	14.82	16.29	15.42	16.73	15.35	16.95	16.22	16.84
	N	55	55	55	55	55	55	55	55	55
	Std. Dev.	3.059	3.157	2.447	3.195	2.732	2.757	2.542	3.494	3.326

Note: *SD* – Skills Development; *A* – Authority; *CH* – Challenge; *S* – Safety; *AUT* – Autonomy; *RF* – Rule Following; *FT* – Free Time; *PR* – Professional Recognition; *SR* – Social Relations; *cc* – children in foster care; *d* – dancers; *N* – Number; *Std. Dev.* – Standard Deviation

According to Table 6, compared to the dancers (d), the children in foster care (cc) do not have such well-established values. The differences are visible in graph 2, which highlights the better results obtained by the dancers on all variables.



Graph 2. Graphical representation of the results - Values

The differences between the two categories of children were not as obvious as in the case of interests. However, the dancers scored higher, the most important issues for them being professional recognition, free time, skills development, autonomy, and social relations. Children in foster care were also preoccupied with free time and social relations, with authority being the least valued.

Table 7. Pearson's Coefficients - Values

Variables	Chi-Square	p	Phi
Skills development	16.264	.092	.544
Authority	13.994	.301	.504
Challenge	7.387	.597	.366
Safety	18.375	.144	.578
Autonomy	16.827	.113	.553
Rule-following	11.373	.413	.455
Free time	13.969	.174	.504
Professional recognition	26.239	**.010**	.691
Social relations	19.033	**.040**	.588

The most significant differences were noticed for professional recognition (χ^2 (3) = 26.239, p < 0.010) and social relations (χ^2 (3) = 19.033, p < 0.040). This aspect highlighted the low interest of children in foster care in education and professional development, whereas dancers were preoccupied with school results and were aware of the need for a stable job in the future. The social nature of dance was also emphasized in this test, with interpersonal relations and communication with those around them being of greater importance to the dancers.

Table 8. Correlation matrix - Values

Variables	SD	A	CH	S	AUT	RF	FT	PR	SR
Skills development	1.000	.295	**.523**	.057	**.618**	.255	.377	**.543**	**.595**
Authority	.295	1.000	.381	.206	.379	-.010	.220	.356	.322
Challenge	**.523**	.381	1.000	-.042	**.527**	.001	**.574**	.350	**.545**
Safety	.057	.206	-.042	1.000	.109	.425	.308	.285	.106
Autonomy	**.618**	.379	**.527**	.109	1.000	.136	.491	**.619**	**.684**
Rule-following	.255	-.010	.001	.425	.136	1.000	.198	.107	.241

Variables	SD	A	CH	S	AUT	RF	FT	PR	SR
Free time	.377	.220	**.574**	.308	.491	.198	1.000	.404	.481
Professional recognition	**.543**	.356	.350	.285	**.619**	.107	.404	1.000	.456
Social relations	**.595**	.322	**.545**	.106	**.684**	.241	.481	.456	1.00

Note: *SD* – Skills Development; *A* – Authority; *CH* – Challenge; *S* – Safety; *AUT* – Autonomy; *RF* – Rule Following; *FT* – Free Time; *PR* – Professional Recognition; *SR* – Social Relations

Table 8 describes the correlations between the variables, with the values between 0.5 - 0.8 representing strong connections. The connection between autonomy and skills development (0.618), professional recognition (0.619) and social relations (0.684) is highlighted. These aspects are influencing each other. Professional recognition implies the desire to progress, to develop and to be independent, as the relations with those around them depend on this. Safety and rule-following do not correlate with any other variable, which means that the lack of self-confidence limits other values or activities, and rule-breaking slows down the development of other characteristics stipulated in the test.

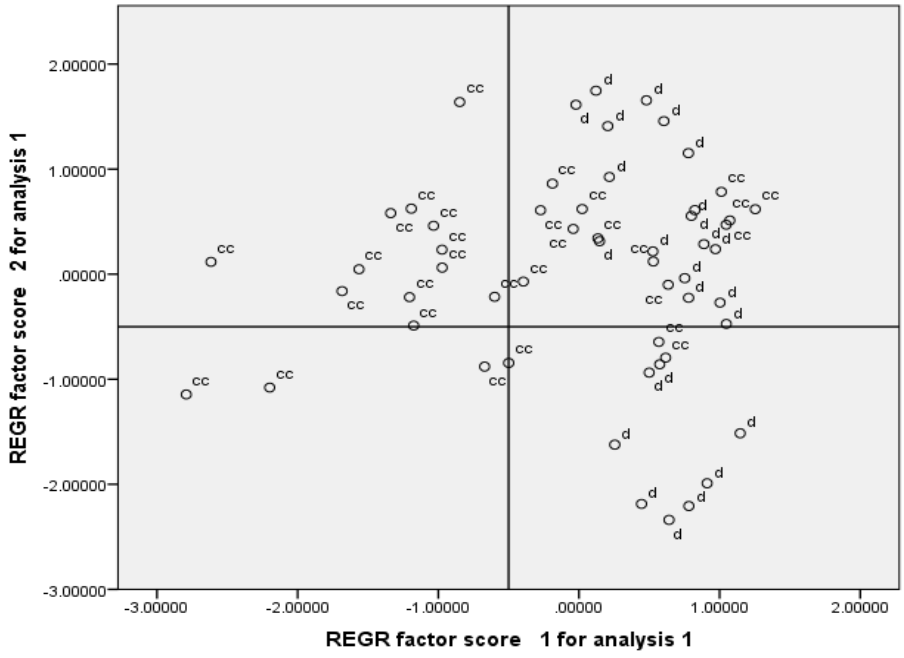


Diagram 2. Distribution of children in the two groups by set of values

Diagram 2 suggests the creation of the two clusters - the dancers (d) are grouped on the right of the vertical axis, and children in foster care (cc) are predominantly positioned on the left. There are, however, fluctuations in terms of the correlation of the dancer children's responses to the value assessment test, therefore their distribution is not homogeneous.

Conclusions

The influence of dance on children's development can be seen in the results of the interest assessment test, where dancers obtained the highest scores for artistic and social interests. They are also more interested in other extracurricular activities compared to the children in foster care and have better established values and principles. This may be due to the environment they come from, as well as to the extracurricular activities carried out during their free time. Whereas dancers are preoccupied with their future career prospects and social relations, institutionalized children place the most emphasis on their free time, and the least on authority.

We believe that these differences are due to both their living environment and the emotional state. Extracurricular activities are important for improving children's psychological and emotional state, and art is a method recommended by specialists for reducing stress and integrating into society. Dance is a varied and complex artistic sport, which enables children's psychomotor development. We believe that the implementation of a dance program for the development of cognitive and non-cognitive skills can improve children's school situation by improving their moral values and increasing their interest in curricular and social, free time activities.

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PAGES FROM NAGYVÁRAD CITY'S FOOTBALL HISTORY (1901 – 1919)

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ABSTRACT. In the first part, the paper refers to the events which led to the establishment of the first sports associations of Nagyvárad city, followed by the presentation of the school sports associations and clubs that had football departments, the football fields, the very first round-ball game in the city's history, and the attendance of the teams to regional football championships. Within the documentation phase, I consulted specialized books, monographs, encyclopedias and sports sections of newspapers published in Oradea referring to the studied topic.

Keywords: *football, sports association, Nagyvárad, Oradea*

REZUMAT. ***File din istoria fotbalului oraşului Nagyvárad (1901 – 1919).*** În prima parte, lucrarea se referă la evenimentele care au condus la constituirea primelor asociaţii sportive din oraşul Nagyvárad după care sunt prezentate asociaţiile şi cluburile sportive şcolare cu secţii de fotbal, terenurile de fotbal, primul meci cu balonul rotund din istoria oraşului şi participarea echipelor în campionatele regionale de fotbal. În cadrul activităţii de documentare am consultat cărţi de specialitate, lucrări monografice, enciclopedii şi rubricile de sport din presa orădeană care se referă la tema studiată.

Cuvinte cheie: *fotbal, asociaţie sportivă, Nagyvárad, Oradea*

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Introduction

The beginning of the 20th century captures the society of Nagyvárad city (in Romanian called Oradea) in a profound transformation process. The momentum of the industrial development made possible an architectural remodeling, and at the same time, a remodeling of the society.

In 1900, 91.3% of the population of Nagyvárad was of Hungarian nationality, 5.1% of Romanian nationality, 2.4% German nationality and 1.2% of other nationalities (Magyar Királyi Központi Statisztikai Hivatal, 1902). Between 1901-1919, the mayor of Nagyvárad was Rimler Károly.

The cosmopolitan aspect of Oradea, reflected by the architectural language sometimes sober, sometimes full of life, was going to transform the city of Sebes Körös (nowadays called Crişul Repede River) into a genuinely rising city. It was the favorite place of the poet Ady Endre, who called Nagyvárad the little Paris from the banks of Peţa.

In this context, the appearance of sports associations meant to manage and promote the game, within the limits imposed by the regulations, was not surprising.

At the end of the 19th century, the most active sports associations of the city were Polgári Lövészegylet (in Romanian, Asociaţia Civică de Tir (The Civic Shooting Sports Association)), established in 1835, having 220 members, Tornaegylet (in Romanian, Asociaţia de Gimnastică (The Gymnastics Association)) established in 1871, and Nagyváradi Torna Kör (in Romanian, Cercul de Gimnastică din Oradea (The Gymnastics Club of Oradea)), established in 1889, having 40 members (Fehér, 1897), (Rácz, 1871) & (Hügel, 1889). None of these three associations had a football department.

The round-ball game became known in Nagyvárad at the beginning of the 20th century. At first, it didn't take any organizational form (sports associations or teams), people were simply playing football. Until then, it was regarded as a hobby of the aristocrats, but after several sports associations had been established, football became more and more popular.

Beyond the Carpathians, in the Kingdom of Romania, "football was played randomly by ad-hoc teams for recreational purposes; later, the first teams organized in clubs or societies were established, who were playing friendly matches amongst themselves; followed by the organization of competitions taking the form of cups" (Ghibu & Todan, 1970, p. 290).

School sports associations and clubs with football departments between 1901-1919

The establishment of sports associations and football departments in Nagyvárad contributed to the development of the round-ball game. Until the end of 1919, in Nagyvárad, there were 29 school sports associations or sports clubs with football departments (Table 1).

Table 1. Containing school sports associations and sports clubs with football departments between 1901-1919 (Török, 1937), (Ujhelyi, 1925), (Sas, 1901 – 1918) & (Hegedüs, 1918 – 1919)

School sports clubs and sports associations	The year when the football department was established	The first departments in chronological order
Nagyváradi Torna Kör	1901 (1889*)	Gymnastics, Fencing, Tourism, Football
Nagyváradi Atlétikai Club	1910	Football, fencing, gymnastics, boxing, athletics, skating, boxing, free wrestling, swimming and tennis
Nagyváradi Sport Egylet	1911 (1906*)	Gymnastics, athletics, free wrestling, tennis, kayaking, skating, fencing, football, water polo, hockey, table tennis, motorcycling, clay pigeon shooting
Bihari Vivó Club	1912 (1910*)	Fencing, football
Törekvés Munkás Testedző Egyesület	1912	Football, athletics, free wrestling, gymnastics, swimming, boxing, tennis, table tennis, cycling and fencing
Nagyváradi Egyetértés Sport Kör	1912	Football, athletics, swimming, fencing, tennis, tourism
Nagyváradi Sport Club	1912	Football, Tourism
Várad-velencei Athletikai Club	1912	Football
Nagyváradi Premontrei Főgimnázium Testgyakorló Kör	1912	Football
Nagyváradi Felső Kereskedelmi Torna Kör	1912	Football
Nagyváradi Magántisztviselők Egyesülete	1912	Football
Nagyváradi Állami Főreáliskolai Torna Club	1912	Football

School sports clubs and sports associations	The year when the football department was established	The first departments in chronological order
Nagyváradi Magánalkalmazottak Sport Egyesülete	1913	Football
Velencei Törekvés	1913	Football
Nagyvárad Város Villamos Müvének Alkalmazottjai	1914	Football
Orthodox Izraelita Polgári Fiúiskola***	1914	Football
Felső Kereskedelmi Iskola Torna Egylet	1914	Football
Nagyváradi Községi Polgári Fiúiskola***	1914	Football
Nagyváradi Testvériség	1916	Football
NFC**	1918	Football
Nagyváradi Kereskedelmi Alkalmazottak Sport Egylet	1919	Football
Magyar Államvasutak Testgyakorlók Köre	1919	Football, gymnastics, athletics
Nagyváradi Pénzintézeti Tisztviselők	1919	Football
Fa és Fémipar***	1919	Football
Vasutas Sport Kör***	1919	Football
Nagyváradi Önkéntes Tűzoltóegylet Football Csapata	1919	Football
Nyomdászok***	1919	Football
Csillagváros***	1919	Football
OSK**	1919	Football

Note: * = The year when the sports association was established (in case it was established before the establishment of the football department), ** = The full name did not appear in the local newspapers, *** = the team was active on that year, we don't know the year when it was established

In 1901, next to gymnastics and athletics, Nagyváradi Torna Kör introduces football among its activities (Ionescu & Tudoran, 1984).

In 1906, Nagyváradi Sport Egylet was established (in Romanian, Asociaţia Sportivă din Oradea (The Sports Associtions of Oradea)) (Illustration 1), which was the second sports association in Oradea to have a football department.

a) b)

Illustration 1. a-b The Nagyváradi Sport Egylet Medal
(from the collection of the National Museum of Banat)

Round shaped medal, made out of metal: bronze, undated, diameter 30x30 mm, weight 10.40 grams (Illustration 1). The front side (Illustration 1a) presents the coat of arms of Nagyvárad city, with an inscription in capital letters under the heraldic composition saying "NAGYVÁRADI SPORT EGYLET", delimited by a dot on each of its sides. The back side (Illustration 1b) presents a thick edge, inside of which there is a discus thrower (a work which resembles the Discobolus of Myron), and a four-line inscription saying "ÉP TESTBEN ÉP LÉLEK".

In that same year, Nagyváradi Sport Egylet takes over the football activity from Nagyváradi Torna Kör and attends a series of games, some of which were international, in the company of clubs from Austria-Hungary (Chirilă & Ionescu, 1999).

In the center of Nagyvárad, in a booth of Emke Café (currently, Astoria Restaurant) on May the 26th, 1910, the founding meeting of the Nagyváradi Atlétikai Club took place (in Romanian, Clubul Atletic Oradea (Oradea Athletics Club)). In the following years, other sports associations appeared as well which placed their focus on the round-ball game: Törekvés Munkás Testedző Egyesület (in Romanian, Asociaţia de Cultură Fizică a Muncitorilor Stăruinţa Oradea (Stăruinţa Association for Workmen's Physical Training)) (1912), Nagyváradi Egyetértés Sport Kör (in Romanian, Înţelegerea Oradea (Înţelegerea Oradea Sports Club)) (1912), Nagyváradi Sport Club (in Romanian, Clubul Sportiv din Oradea (Oradea Sports Club)) (1912) etc. (Török, 1937).

In 1913, Várad-velencei Athletikai Club (in Romanian, Clubul Athletic Velenţa (Velenţa Athletics Club)) merged with Törekvés Munkás Testedző Egyesület, and in 1919, Magyar Államvasutak Testgyakorlók Köre (in Romanian, Asociaţia de Cultură Fizică a Căilor Ferate Maghiare (Hungarian Railways Association for Physical Training)) merged with Nagyváradi Egyetértés Sport Kör (Török, 1937).

In the first two years following its establishment, the rivalry between Nagyváradi Atlétikai Club and Nagyváradi Sport Egylet led to the improvement of the playing style. The manager of Nagyváradi Sport Egylet, Niessner Aladár, also made a significant contribution to the development of local football. He was the first player from Oradea to be selected to play for the national team of Hungary. This happened on April the 5th, 1903 in a game against Czechoslovakia which was held in Budapest and won by the Hungarians with a score of 2 – 1.

The first shots with a football

At the end of the 19th century, the round-ball game appeared on the territory of the Austro-Hungarian Empire, and in 1901 the first football championship of Hungary took place under the tutelage of Magyar Labdarúgó Szövetség (in Romanian, Federaţia Maghiară de Fotbal (The Hungarian Football Federation)), which was founded on January the 19th, 1901. On the banks of Sebes Körös, football appeared a little bit later.

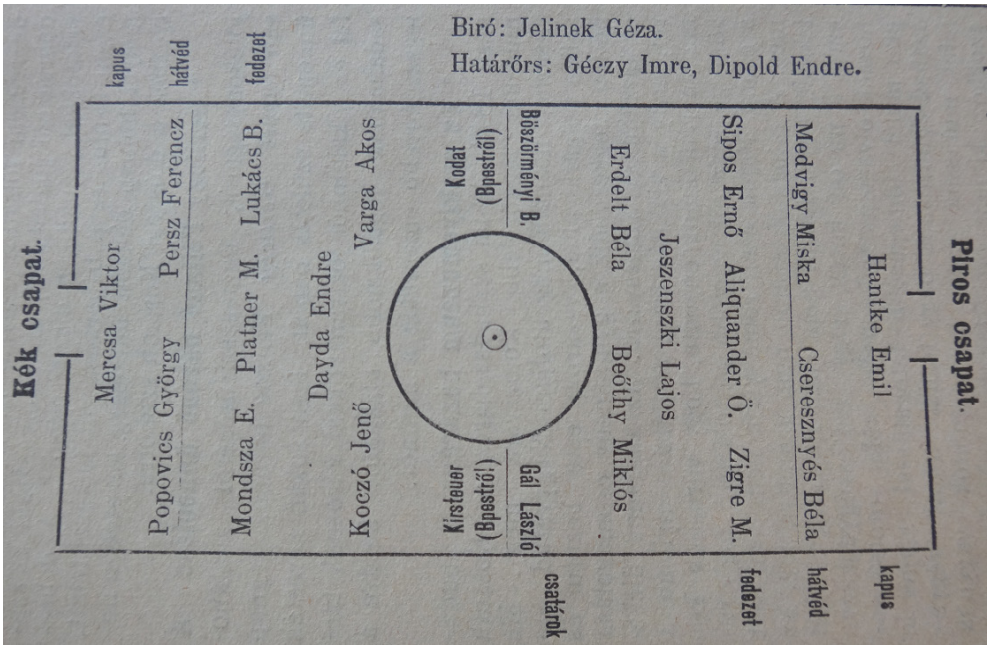
Picture 1. Sportsfield in Rhédey Kert 1900 (Borovszky, 1901)

Picture 2. Mezey Mihály around 1900 (From the album of Mezey András)

The first sports movements of the city are related to the individual actions of a few intellectuals who returned home after finalizing their studies in the West.

The local paper "Nagyvárad", in its edition from April the 27th, 1902, describes the history and regulations of football. At the same time, it presents the young people who were practicing football every Tuesday, Thursday, Saturday and Sunday in Rhédey Kert (Picture 1) coordinated by Mezey Mihály (Picture 2), the director of the Nagyváradi Torna Kör sports association, and Jelinek Géza, the secretary of the same (Sas, 1902a).

Nagyváradi Torna Kör organized the very first football match in the history of this city. This game took place on June the 1st, 1902 on Sport-tér in Grădina Rhédey (Rhédey Garden) (Dési, 1902).



Picture 3. The line-up of the teams attending the game of June the 1st, 1902 (Sas, 1902b)

The June 3rd, 1902 issue of Nagyváradi Napló newspaper presents the events: "Two teams were standing face to face: a blue one and a red one, each defending its own goal. Two blonde players from the blue team stood out due to their skills: Kirsteuer and Kodat who came from Budapest at the invitation of Nagyváradi Torna Kör. It is only natural that our athletes do not treat the art of

football in the most impeccable way because they are still beginners, but they have demonstrated that they have both the talent and the will to do so, and they can reach a high level in a short time." The score was 2-0 in favor of the blue team. The price of an entrance ticket was 1 forint (Sas, 1902c, p. 1) (Picture 3).

Zigre Miklós (Nicolae) and Koczó Jenő were lawyers, and Alliquander Ödön (Picture 4) was working as an engineer.

Picture 4. Alliquander Ödön around 1950
(from the album of Alliquander Éva)

This match marked the beginning of the journey of the beautiful game with the round ball, which developed and improved with each year.

The football fields of Nagyvárad

The gathered documentation shows that the first football games took place on the Balassi Tér (currently named, „Piaţa Ion Creangă"), but after several complaints from the residents of the area regarding disorderly conduct, the game was moved behind the Bóné fountain (currently, the land behind Rulikowski Kázmér cemetery) (Török, 1937).

Since the people of Oradea became more and more interested in this sport, between 1885-1910, the Polgári Lövészegylet association leased Grădina Rhédey from the city hall of Nagyvárad under the condition that it would maintain its green spaces (Lakatos, 1911a) & (Borovsky, 1901).

The city's sports arena called Sport-tér (Sporttér) or Sport Pavillon (currently called, Stadionul Tineretului (Youth Stadium)) from Grădina Rhédey, was inaugurated on June the 4th, 1895 (Pictue 5 & 6). At the same time, a ground floor building and two small towers were placed in service for dancing, a new restaurant and a buffet, a project which belonged to Rimanóczy Kálmán. Here, in summer people were practicing cycling, and in winter, they were skating (Fehér, 1897).

"Sporttér was provided with a bicycle track with grandstands, lawn tennis courts (grass courts), a synthetic ice skating rink, a heated locker room and a kiosk" (Némethy & Biró, 1901, p. 56).

Although initially Sporttér was destined for several types of sports (skating, athletics, cycling, football and gymnastics), due to lack of interest, the Polgári Lövészegylet association used it mostly for their own goals, building additional tennis courts (Lakatos, 1911b).

Picture 5. Sport Pavillon in 1898 (Péter, 2002)

According to studies, in 1910, Mikló Béla also brought a "football" into the city and searched for young people eager to prove themselves on Füzes street (currently called, Sf. Apostol Andrei Street), the trench of Nagyvárad

Fortress, the Bunyitay Liget (currently called, Parcul Ion Constantin Brătianu (Ion Constantin Brătianu Park)) (Picture 7) and Nagy Vásár tér (currently called, Parcul 1 Decembrie (1 Decembrie Park)). He learned the secrets of football in Vienna (Török, 1937).

Picture 6. Sporttér (Kemény, 1912)

Picture 7. Insula Dőry (Dőry Island) and Bunyitay liget (Kemény, 1912)

Because the lease agreement for Grădina Rhédey concluded between the Polgári Lövészegylet association and the City Hall of Nagyvárad expired on January the 1st, 1910, Nagyváradi Atlétikai Club requested from the City Hall the right to use Sporttér and the Dőri lake and island from Városliget (Bunyitay Liget), for sports related purposes (Sas, 1910) (Picture 6 & 7).

In the first year of activity, in 1910, the playing field of Nagyváradi Atlétikai Club was in Városliget – Bunyitay Liget. Although women and girls had free access to the matches, they still preferred boat rides, tennis or the diabolo game (Jakobovits, 1943). "In the first weeks, the team received two locker rooms from mister Pankolics. The team's warehouse was in one of the rooms, having on stock a ball, a string and a pump. In the first year of activity, the players were marking the lines, and the firefighters were pulling ropes around the field. The matches were attended by two linesmen, one at each goal, because, back in those days, the football goals didn't have nets." (Jakobovits, 1943, p. 53).

At the City Council meeting, they discussed taking over Sporttér from Polgári Lövészegylet and assigning it to the local sports associations. "Given the importance of sports and physical education, the council proposes to fulfill the request. In this sense, it proposes for the city to buy from Polgári Lövészegylet the building of Sporttér for the amount of 25.000 crowns. For the city to spend 7.000 crowns to refurbish the buildings, 7.600 crowns to build an athletics field,

8.000 crowns to build 20 tennis courts. For the renovated Sporttér along with the newly built additional facilities, to be put at the disposal of the three local sports associations. These associations assumed the obligation to repay 5% of the invested amount" (Sas, 1911a, p. 2).

Thus, in the summer of 1911, the football teams moved to the new stadium named „Sporttér", which spurred the clubs towards other meridians. Football goals with wire nets were set up, and football fans could weekly watch interesting games with other local and regional teams (Jakobovits, 1943).

The inaugural match of the football field was played against the Aradi Testgyakorlók Köre team, on Szent István's day, on August the 20th, 1911. The two teams appeared with two groups of players. Nagyváradi Atlétikai Club: The first team (Robogó, Sebő, Szvertka, Muharos, Felhő, Farkas, Fenyő II, Kovács I, Milodanovics, Hanni, Bátki). The second team: Kun Ármin, Schmidt Béla, Friss József, Horváth Ferenc, Mikló Béla, Kovács László, Jancsó Béla, Uray Tibor. The away team's tenured players won the game by 9-1, and the only goal of the home team was scored by Kovács (Sas, 1911b) & (Sas, 1911c).

In 1912, an article appeared in the Nemzeti Sport newspaper, according to which the City Hall of Nagyvárad allocated 55.000 crowns for the building of an iron-reinforced concrete grandstand with 1500 seats, toilets, locker rooms and warehouses on the premises of Sporttér, and the three sports associations renting it, were to repay annually the expenses (Friedrich, 1912).

The outbreak of the First World War and the following years, led to a decline in football. The local teams continued their activity only with their junior teams.

The attendance of the teams to Hungary's regional football championships

Starting from 1901, the Hungarian Football Federation (Magyar Labdarúgó Szövetség) organized football championships only for the teams from Budapest, but the 1907-1908 season marked the very first championship for teams from outside of Hungary's capital city. The winners of the regional series were playing an elimination based final tournament.

In football history, the region represented by the territory of the former Austro-Hungarian Empire is known as the "Danubian School". This is about a certain playing style, characterized by short and repeated passes, by the technicality of the players, with a primary emphasis on the technical-tactical factor in relation to the physical one (Angelescu & Cristea, 2011).

The 1911-1912 football season marked the first time attendance of the football clubs of Nagyvárad to Hungary's regional football championship. The Nagyváradi Sport Egylet and Nagyváradi Atlétikai Club teams played in the

central region's group along with Debreceni Kereskedelmi Alkalmazottak Sport Egyesülete, Debreceni Munkás Testedző Egyesület, Debreceni Torna Egylet, Miskolci Munkás Testedző Egyesület and Miskolci Sport Egyesület. Under the command of coach Szabó Andor, the NAC team finished the season on the second place ahead of the local team Nagyváradi Sport Egylet („Vidéki bajnokság – Középmagyarországi kerület", n.d.).

Picture 8. Nagyváradi Atlétikai Club – Miskolczi Atlétikai Club (Katz, 1911)

In the 1912-1913 edition of the regional football championship, Eastern region, in the Nagyváradvidéki group, out of the total of nine teams, five were from Nagyvárad: Nagyváradi Atlétikai Club (the winner), Nagyváradi Sport Egylet, Törekvés Munkás Testedző Egyesület, Bihari Vivó Club and Nagyváradi Sport Club (Dénes, Sándor & Bába, 2013).

In the Eastern zone championship, Nagyvárad group, in the 1913-1914 competitional year, Nagyváradi Atlétikai Club has finished on the first place, winning all 16 matches of the championship against Debreceni Kereskedelmi Alkalmazottak Sport Egyesülete, Debreceni Torna Egylet, Debreceni Vasutas Sport Club, Bihari Vivó Club, Törekvés Munkás Testedző Egyesület, Nagyváradi Egyetértés Sport Kör, Debreceni Nyomdászok Sport Club, Nagyváradi Sport Club and Nagyváradi Sport Egylet („Vidéki bajnokság – Keleti kerület, Nagyváradi alosztály", n.d.).

Upon the outbreak of the First World War, the players of the team were called to serve in the war, and for 4 years the football teams continued their activity with the junior players. In all four seasons, the teams had charitable matches with regional or local military teams.

Conclusions

The new football field of Grădina Rhédey, named „Sporttér", built in 1911, meant a development of local football. In the three championship seasons (1911-1914), the Nagyváradi Atlétikai Club team had the best results (twice first place and once second place).

Up until the outbreak of the First World War, 18 school sports associations and clubs were established in Nagyvárad. The years that followed represented a decline in football. The local teams continued their activity only with the junior teams.

The names of the following students, who were among the first ones to play football, are part of Nagyvárad city's history: Friedländer Sándor, Várady József, Rottenberg, Pankolics Károly, Jakabovits (Jakobovits) Elemér and Elekes (Török, 1937).

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Medalia Nagyváradi Sport Egylet – Din colecţia Muzeului Naţional al Banatului inventar 819

Poza Mezey Mihály în jurul anului 1900 - Albumul lui Mezey András

Poza Alliquander Ödön în jurul anului 1950 - Albumul lui Alliquander Éva

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STUDY REGARDING THE DEVELOPMENT OF STRENGTH DURING ONLINE PHYSICAL EDUCATION CLASSES WITH 8TH GRADE STUDENTS

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ABSTRACT. Strength is the ability of the human body to overcome internal or external resistance (Dragnea, A., 2006). Strength motor quality plays an important role in streamlining the instructional-educational process (Ardelean, T., 1981). Strength is one of the most important qualities that the human body has and the one that has a special role in ensuring the basis for the development of other motor qualities (Dragnea, A., 2006). Materials and methods: This study is a research about the development of strength in the online environment in the 8th grade school children. The students that have taken part in the study were between the age of 13 and 15, studying at the Vaida Voievod middle school in Cluj-Napoca. The students were selected from two different study groups, which ranged between 27 to 30 pupils. I've been analyzing their physical development, throughout our trainings which took place twice a week, and two hours of physical education, which contained specific exercises. The testing took place at two stages. The initial testing (T.1) took place in November 2020, while the second (T2) was done in May 2021, both consisting of muscle development, pull ups (30 sec), push-ups (30 sec), squats (30 sec), hip thrusts (30sec). Results: for each test, I've calculated the arithmetic mean. For each test or control test we calculated the arithmetic mean and the standard deviation. I will further present the value of the arithmetic mean for the pull ups test (30 ''): T1-11.33, T2-15.2. Next I will present the result of the arithmetic mean for the push-ups test (30 ''): t1-15.46, t2-20.33. Arithmetic mean for hip thrusts test (30 ''): t1-20,73 t2-23,13. Arithmetic mean for the squats test (30''): t1-26.46 t2-29.06. Conclusions: Following this study we can say that we came to the

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conclusion that there are more students who approached the scales given in the specialized books. These students were very receptive to the exercises we proposed through the online classes.

Keywords: *increasing strength, exercises, middle school children*

REZUMAT. ***Studiu privind dezvoltarea forţei în timpul lecţiilor de educaţie fizică online cu elevi de clasa a VIII-a.*** Forţa este capacitatea corpului uman de a învinge rezistenţa internă sau externă (Dragnea, A., 2006). Calitatea motrică a forţei joacă un rol important în eficientizarea procesului instructiv-educativ (Ardelean, T., 1981). Forţa este una dintre cele mai importante calităţi pe care le are corpul uman şi cea care are un rol deosebit în asigurarea bazei pentru dezvoltarea celorlalte calităţi motrice (Dragnea, A., 2006). Materiale şi metode: Studiul de faţă este o cercetare privind dezvoltarea forţei în mediul online la şcolarii din clasa a VIII-a. Elevii care au luat parte la studiu au avut vârsta cuprinsă între 13 şi 15 ani, studiind la şcoala gimnazială Vaida Voievod din Cluj-Napoca. Elevii au fost selectaţi din două grupuri de studiu diferite, care variau între 27 şi 30 de elevi. Am analizat dezvoltarea lor fizică, de-a lungul antrenamentelor noastre, care au avut loc de două ori pe săptămână, şi a două ore de educaţie fizică, care conţineau exerciţii specifice. Testarea a avut loc în două etape. Testarea iniţială (T.1) a avut loc în noiembrie 2020, în timp ce cea de-a doua (T2) a avut loc în mai 2021, ambele constând în dezvoltare musculară, tracţiuni (30 sec), flotări (30 sec), genuflexiuni (30 sec), ghemuiri (30 sec), împingeri de şold (30 sec). Rezultate: pentru fiecare test, am calculat media aritmetică. Pentru fiecare test sau test de control am calculat media aritmetică şi deviaţia standard. Voi prezenta în continuare valoarea mediei aritmetice pentru testul de tracţiuni (30 ‘‘): T1-11,33, T2-15,2. În continuare voi prezenta rezultatul mediei aritmetice pentru testul de flotări (30 ‘‘): t1-15,46, t2-20,33. Media aritmetică pentru testul de împingere a şoldurilor (30 ‘‘): t1-20,73, t2-23,13. Media aritmetică pentru testul de genuflexiuni (30 ‘‘): t1-26,46 t2-29,06. Concluzii: În urma acestui studiu putem spune că am ajuns la concluzia că sunt mai mulţi elevi care s-au apropiat de scalele date în cărţile de specialitate. Aceşti elevi au fost foarte receptivi la exerciţiile pe care le-am propus prin intermediul cursurilor online.

Cuvinte cheie: *creşterea forţei, exerciţii, elevi de gimnaziu*

Introduction

Physical education and sport have become in Romania social phenomena of national interest that have a special contribution and a high efficiency in increasing the general motor capacity, the bio-motor and spiritual potential of the population (Ardelean, T., 1981).

Under the current reform of Romanian education and given the restrictions imposed by the SARSCOV-2 pandemic, any research aimed at increasing the efficiency of sports activity is welcome.

Motor quality - "strength plays an important role in making the instructional process more effective. This is possible given that strength is one of the most important qualities of the human body and the one that has a special role in providing the basis for the development of other motor qualities" (Dragnea, A., 2006, p. 79).

Starting from the premise that there is no lower limit in the development of the motor quality of strength and that there are only methods and means suitable for their development, this paper aims to demonstrate that strength is a motor perfectible quality and that it should be developed from an early age.

I would also like to point out that it is possible to work with weights when physical education classes are held online, provided that the weights used are appropriately adapted to the pupils' possibilities.

Aim, objectives and research hypothesis

The present work deals with the efficiency of the strength motor capacity of 8th grade students in physical education classes in an online environment by using mainly their own weights, but also weights taken from other sports activities that put the subjects in a position to participate actively and consciously, obtaining a positive result.

The general aim of this work is to identify the development of strength motor capacity in 8th grade students following the application in the training process of non-specific means taken from different sports activities such as: sports games, gymnastics, athletics, fitness, etc.

Through the present research we aim to contribute to the development of new ways of conducting the physical education class in the online environment that take into account a minimum physical effort consumption and a high emotional output, so that strength development can be achieved quickly and at the same time efficiently.

On the basis of the proposed goal, several objectives were set based on the study of literature and interdisciplinary sources.

The framework objective of the research is to develop strength motor skills in 8th grade students in online physical education classes.

The optimization of strength motor capacity based on general physical training programs using non-specific means will be combined with the measurement of its spatial, temporal and instructional parameters, measurements and evaluations that take into account both qualitative and quantitative aspects that will lead to objective results of monitoring the development of strength in 8th grade students.

The operational objectives of our work were aimed at the specific adaptation of physical education classes and the fulfilment of the tasks of the observational approach to achieve the proposed goal:

1. Consultation of the literature and interdisciplinary
2. Establishing measurable parameters of general physical fitness
3. Determine the causes contributing to the decrease in strength motor capacity in 8th grade students
4. Eliminating general physical trainings errors
5. Improving general fitness indicators by developing general upper and lower limb pushing strength

Methods and materials

Methods used: bibliographic documentation method; observation method; experimental method; method of analysis and interpretation of result.

According to the hypothesis of strengthening and improving the motor quality of strength, in the online physical education classes we proposed and introduced a series of exercises and operational models used in other branches of sport to improve the tested parameters.

Materials used in the research: a chair, a bed or a sofa, 2 bottles of water (1.5 l girls, 2.5 l boys), a plush toy, 2 pillows, a balloon, a roll of toilet paper, a broom handle.

Research subjects

The research involved 15 subjects from the 8th grade aged between 13 and 15 years, included in the educational system of Vaida Voievod middle school in Cluj-Napoca.

The students were chosen from the 8th grade with a total of 27 students. Subjects were chosen from the 8th grade, based on attendance and training. As a limit of the study there were 2 medically exempted students for the whole year, and 3 more partially exempted students. We tracked general physical development by doing 2 individual workouts per week and 2 hours of physical education. Testing took place in two stages. The initial testing (T.1) was performed in November 2020 and the second testing (T.2) performed in May 2021, both in terms of tests for motor quality strength and recording some anthropometric parameters.

All students had the necessary conditions for the development of the experimental research.

Tests used

The fact-finding investigations were carried out between 20 November 2020 and 20 May 2021: first test: - initial 1 - 15 November 2020; second test: final 5 - 15 May 2021.

In order to obtain representative results, we used 4 tests and control samples that allowed us to objectively assess the level of strength training in a representative sample of subjects for our research.

1. Supine pelvic raises 30" (maximum number in 30")
2. Arm pulls 15" (maximum number in 15")
3. Push-ups 30" (maximum number in 30")
4. Squats 30" (maximum number in 30").

Results

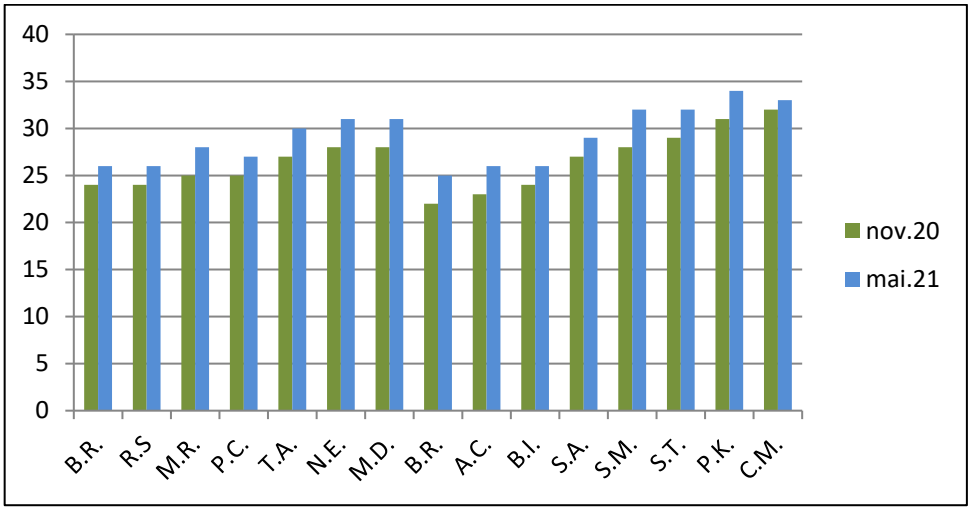

Figure 1. Results of the arm pull-ups test (15'')

We can see that this index registers higher values at the end of the test, meaning in May, compared to November. The lowest result in November was recorded by S.M, of only 9 pulls, which in May reached 13 pulls. The best results in November were recorded by T.A., B.R., A.C. who each recorded 13 pulls, they maintained the trend and were the best in May when they recorded 16 and 17 pulls respectively.

We will present the result of the push-ups (30'').

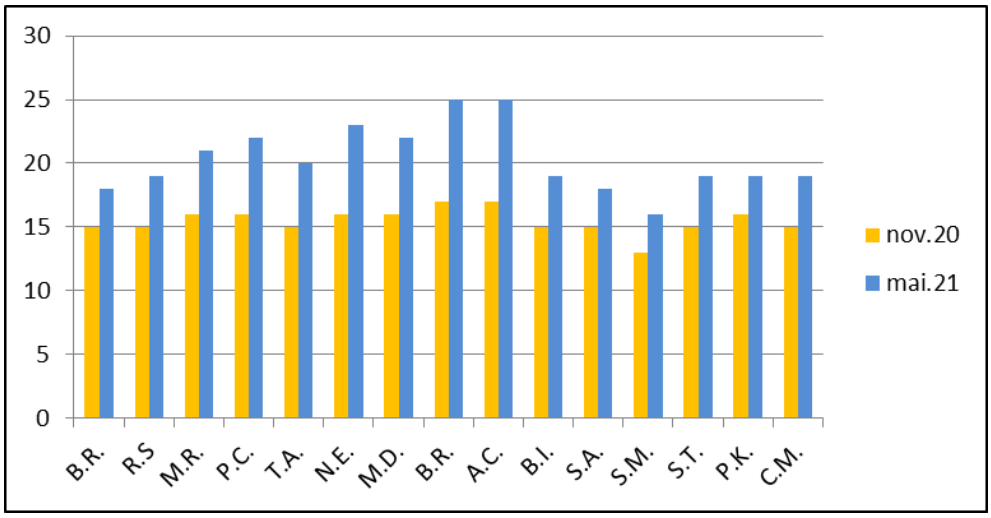

Figure 2. Results of the push-ups test (30'')

It can be seen that this index also has higher values at the end of the test than at the beginning of the test. The lowest result in November was recorded by S.M. of 13 push-ups, which in May reached 16 push-ups in 30 seconds. The best result in November was recorded by B.R. and A.C. and was 17 push-ups, they maintained their average and were the best in May when they recorded 25 push-ups. The girls did push-ups with support on the backboard.

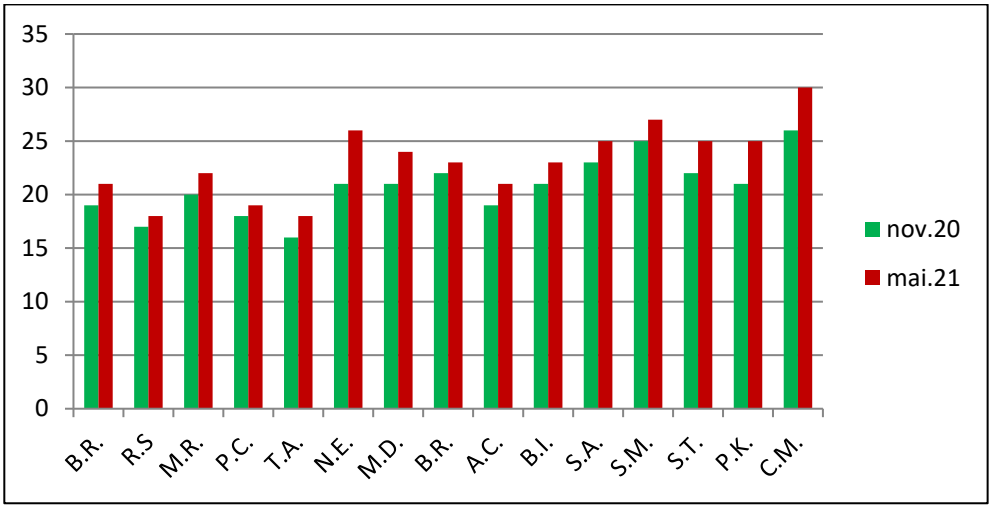

Figure 3. Evolution of the hip thrusts from supine position indicator (30'')

For supine pelvic raises (30''), improvements were recorded from 16 lifts in 30 seconds to 18 lifts. The best result was recorded by C.M who went from 26 lifts to 30 lifts in 30 seconds, which can be considered a performance for this age.

We present below the value of the results obtained as well as the graphical representation of the 30" squat test (maximum number in 30").

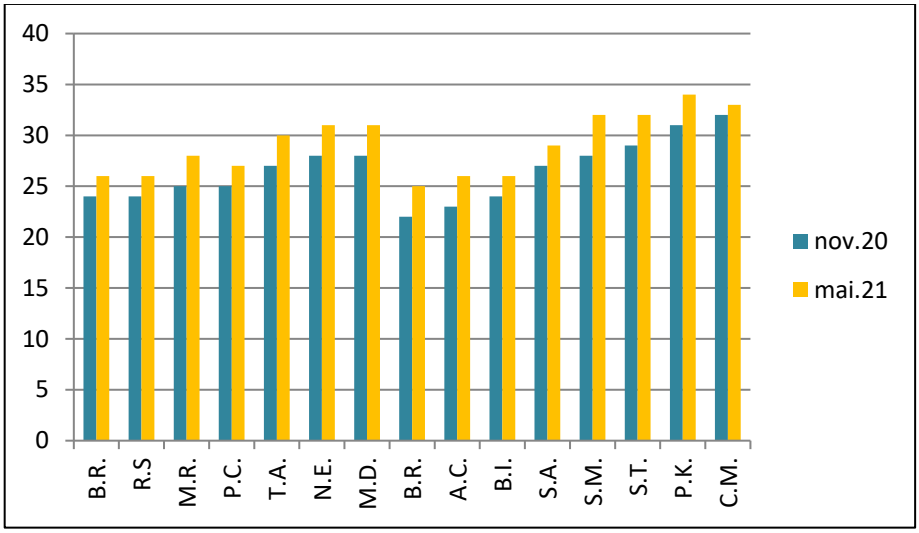

Figure 4. Results of the squats test (30'')

It can be seen that this index also has higher values at the end of the test than at the beginning of the test. The lowest result in November was recorded by B.R. of 22 squats which in May reached 25 squats in 30 seconds. The best result in November was recorded by P.K. and it was 31 squats, he maintained his average and was also the best in May when he recorded 34 squats.

At the moment we have not found any other studies on this topic, in conclusion we had no comparison with other authors.

Study conclusions

Following this study, we can say that we concluded that there are more students who have come close to the scales given in the studies. These students were very receptive to the exercises we proposed through the online classes.

Following the application of the experimental program, it was found that the results of the assessment for motor quality strength showed progress in the final test, with progress considered statistically significant.

Consequently, it can be appreciated that the hypothesis of our experimental approach is confirmed, in terms of the improvement of the quality of life of 8th grade students who followed the proposed exercise program. At the same time, they also developed their motor quality and strength.

General physical education lessons should be designed in such a way as to create new situations of solving, contributing to the education of memory, balance, orientation in space, coordination of movements through the appropriate use of physical education.

General conclusions

We conclude that the hypothesis of this work has been confirmed, as it could be proved by the research results.

We started from the hypothesis that if during the instructional-educational process, in the physical education lesson in the online environment means taken from other branches of sport are used, physical training programs appropriate to the level of training are carried out and modern methods of instruction are used, then an improvement in the performance of students in specific control tests can be achieved, with positive influences also on the motor quality of strength.

Overall strength reaches its maximum potential around the age of 13-15. Therefore, the development of strength, which does not stop at this age, is closely linked to the development of vertical and horizontal dexterity, the development of speed, as well as dynamic strength in the lower limbs. To this end, we have a rich methodology, which includes numerous specific methods and a variety of general and specific means: weights ensuring maximum or submaximal demand, principles of continuity and progressivity, force accumulation included in the combined motor qualities.

It is of major importance to make the subjects aware of the positive influence these means have on their physical appearance, ensuring that fitnes and capacity for effort are maintained for as long as possible.

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== ERATA ==

Published article "High School Female Students' Satisfaction Degree after Practicing Specific Aquagym Programs as an Extracurricular Activity", in *Studia Universitatis Babes-Bolyai Educatio Artis Gymnasticae*, LXVII, 2, 2022, pp. 73-86

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