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Article

Initiation in Kin Ball—Pre and Post Pandemic Effects on Hand Strength, Resistance and Coordination

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Abstract: The research deals with the particularities of the initiation in the sport of kin ball, of 94 students (54 boys and 40 girls), without a history of practicing the sport intensively, and the measure of the influence of some components of the motor capacity. Kin ball is a sport that appeared in Canada, in an academic setting and can become an alternative sport in the common university curricula in Romania. The research was carried out in 4 research groups in 2019 and 2022, two of boys and two of girls, similarly, before and after the declaration of the acute phase of the Covid-19 Pandemic, generating physical activity constraints. The originality of the research refers to the initiation, unprecedented in Romania, in the Kin ball sport, through 20 training sessions, carried out in 10-day stages and the evaluation of some motor skills on the subjects. During the experiment, the following components were tested pre- and post-intervention Kin-Ball: palmar muscle strength using the dynamometer, general resistance by running as long as possible for 2 min and general coordination function - body balance, by the Matorin test. The statistical calculation included the application of the Kolmogorov-Smirnov test, depending on which parametric or non-parametric statistical significance tests were applied and the estimation of the size of the intervention effect. The results highlighted particularities of initiation in Kin ball, but also significant differences ($p < 0.05$) in all measurements performed in 2022. The tests in 2019 recorded both significant and statistically insignificant differences, also highlighted by the calculation of the d indicator of Cohen. The lower initial level of all motor components measured in 2022 and their significant improvement represent aspects that can be understood as collateral effects of the lack of movement during the pandemic.

Keywords: Kin ball; COVID-19 Pandemic; palm strength; endurance; coordination

Introduction

Recreational physical exercises produce significant improvements for the quality of life, both physically and mentally (Agyar, 2013; Ponce-Bravo et al., 2015). Physical education teachers are guided to use a series of traditional means, specific to each national culture (Yildiz et al., 2021). However, a series of research highlights the complementarity of other intervention programs with the aim of increasing motivation and participation, developing motor skills in the youth generation (Amado et al., 2014). Among these, we can mention the most diversified sports (Pricop et al., 2020, Rhea & Martin, 2010), adventure programs (Buckley, 2012), parkour (Kidder, 2013), programs of judo (Ion-Ene et al., 2014), climbing (Baláš et al., 2021) or swimming (A. Badau et al., 2022).

A large part of the means of intervention with a sports character use, in a very varied way, a common tool, namely the ball (Fernandez-Rio et al., 2022). The use of the ball is done today in extremely varied forms, keeping fun and goodwill, together with the development of individual or collective physical and mental capacities. Ball games, known, most often, as sports games, also support the formation and development of group processes and phenomena, such as social facilitation, the development of interpersonal relationships; ball games stimulate communication, support cohesion and combat deindividuation (Dragnea, 2006; Johnson et al., 2016; Westendorp et al., 2014).

The ball has excited people since ancient times (Wertmann, 2020), being present in some ancient cultures: from Homer's *Odyssey* to the rubber ball in Mayan's culture, the ritual game in Aztec's culture, *cuju* in China, *kemari* in Japan, *fireball* or *ulama* in North and Central America (Ancient Ball Games, 2022). In modern times, these have evolved into games such as football, basketball, handball or volleyball, which are played recreationally, educationally, but above all performatively.

Motor activities with the ball produce fun and good mood, favoring the release of endorphins, improving the main functions of the body, fully supporting the overall improvement of human health (Hall et al., 2016, Robinson et al., 2018). Playing with the ball is generally considered to belong to playful activities, but the ball is used in different forms and in the case of other bodily activities such as gymnastic, agonistic, recreational or compensatory sports activities (Epuran, 2013; Park, 2013; Dragu, 2010). In contemporary sports games, the ball is the main object around which the sports activity is organized (Tuncel, 2016). The ball can be used as a means of expressing mastery and individual skills (in artistic gymnastics, golf, bowling), but also as a means of training in compensatory activities (Basabe et al., 2022). Sometimes with the help of the ball some qualities and motor skills are developed using the weighted ball, the ball thrown at the target, or the ball thrown at a distance (Jermyn et al., 2021; Zhu & Bingham, 2010).

In the last decades, it is observed that physical education and sports teachers focus too much on the performance side of sports games and less on the educational side (Lara & Cachón, 2010). Proceeding in this wrong way, formal education diminishes its achievement of educational ideals such as cognitive development and personality formation of students (Ferrari et al., 2009).

The ball used in sports or recreational games has different size, weight and consistency depending on the specific regulations. In this context, we can say that the ball was perhaps the object with the most important role in the development of contemporary sports, the diversity of its manipulation forms being the most interesting aspect (Abdulsalam et al., 2022; Liu, 2021). The continued concern to increase the diversity of the use of the ball, means that new forms of sports activities continue to appear, often referred to in the specialized literature as alternative sports (Lara & Cachón, 2010). The didactic and educational objectives of using alternative sports in physical education activities aim at motor development, intellectual development, cooperation, co-education, collaboration, commitment, value formation, etc. (Kleiner & Höger, 2022) An alternative game that uses the ball in a very special way is kin ball, with special features of its size, weight and use (Daniel et al., 2023; Barrette, 2010).

Kin ball is an alternative sport of Canadian origin, which appeared in 1986, overseen and regulated by the International Kin-Ball Sport Federation. The federation includes 15 countries around the world, being practiced by almost 4 million people worldwide (FIKB / IKBF, 2023). Kin ball is played by highlighting teamwork, by dynamically exploiting the collaborative spirit of teammates. Playing this game increases the motivation of less active players, even compared to other sports (Hall et al., 2016; Zurita-Ortega et al., 2023). The specificity of Kin-Ball is that, unlike other sports, it is played in three teams of four players, where a huge ball (1.2 m) is not allowed to fall to the ground (Pedregosa, 2009; Didactics, 2016). It should be noted that over time the giant ball began to get more and more sophisticated uses in several sports activities, being present in fitness, medical recovery, being the subject of interesting efficiency research (D. Badau et al., 2018).

In Kin ball points are scored when the team playing the ball commits a foul. The team designated to play the ball must kick it only when all teammates are in contact with the ball, and the defending team must control the ball before it touches the ground.

Relatively little scientific research has appeared on Kin ball, and most of it concerns the practice of this sport under standard conditions, as well as means of initiation-learning. Based on the study of 13 games from the 7th edition of the Spanish championship, Amate R.D. et al. (2015) characterized kin ball as a defensive sport, with medium-high intensity efforts, with a match duration of about 46 minutes, with an activity/rest ratio of about 1/1.51 and an average time to achieve a point of 12.07 sec.; a kin ball sports meeting totals about 73 points with a total of 390 hits of the ball.

The present research aims to be original in that it proposes the practice of kin ball in Romania, while also measuring some effects of the motor capacities of the practitioners.

Methodology

The purpose of the research

The research aimed, on the one hand, to teach kin ball for the first time in Romania, and on the other hand, to test the usefulness of practicing kin ball, in the sphere of some components of the motor capacity, among young students, without antecedents of practicing the sport intensively.

The research objective

These objectives collectively aimed to explore the initiation process, evaluate its impact, and understand the implications of engaging in Kin ball activities on various motor skills among students, both before and after the Covid-19 Pandemic:

1. Exploration of initiation in Kin ball - investigating the process of introducing students without prior intensive experience to the sport of Kin ball.

2. Assessment of motor capacity components - measuring and analyzing the impact of various motor capacity components (palmar muscle strength, endurance, coordination) in students engaging in Kin ball initiation.

3. Comparison pre and post pandemic effects - assessing and comparing the changes in measured motor skills among participants before and after the acute phase of the Covid-19 Pandemic, which imposed constraints on physical activity.

4. Evaluation of training impact - assessing the effectiveness of the Kin ball initiation program by conducting evaluations before and after a series of 20 training sessions held over specific intervals.

5. Exploration of educational impact - to examine the educational significance of integrating Kin ball into the academic sphere in Romania, particularly in terms of its potential contribution to developing motor skills in young students without prior extensive experience in the sport.

6. Statistical analysis for comparison helping to interpret the results; the use of statistical tests to verify the normality of distributions to use parametric tests, or as the case may be, non-parametric tests to verify the differences between pre- and post-intervention measurements; evaluation of the effect size of pre- and post-intervention changes.

7. Understanding pandemic-related effects - investigating the potential impact of reduced physical activity during the pandemic on the motor skills of participants engaging in the Kin ball initiation program.

Participants and procedures

A number of 94 young Romanian students participated in one of the two editions of the extracurricular project „Freshman Camp”, carried out in 2019 and 2022, by the University of Pitești, in the Bughea de Sus, Argeș, Romania. On this occasion, 20 kin ball introductory training sessions were implemented, starting with three motor tests of the level of palmar strength, running endurance and general coordination. At the end of the projects, the final tests of the previously presented motor components were carried out.

The distribution by gender (Table 1) was as follows: Boys = 54 (57.4%), Girls = 40 (42.6%) on a distribution from 19 to 27 years. The projects started in September of the years 2019 and 2022, immediately after the participants were admitted to the university system, before they participated in the university curricular actions. The selection of participants was based on supporting the friendships of students of different majors, across social boundaries, as a further contribution to the civic mission of higher education (Hudson et al, 2022). Enrollment to participate in the projects was voluntary, the selection being made on the basis of previous participation in volunteer actions, trying to achieve a gender balance. Most of the participants did not present a relevant previous history of intensive practice of a sport, and this aspect did not constitute a criterion for acceptance or rejection in the project.

Table 1. Distribution of participants by research group and gender.

	Male			Female		
	no	%	old	no	%	old
Grup 1- year 2019	24	54,5	21,5±2,1	20	45,5	20,8±2,6
Grup 2- year 2022	29	58	20,4±1,1	21	42	20,6±1,8

The Covid pandemic started worldwide in March 2020, so group 1 performed the experiment in September 2019 before its outbreak, and group 2 performed the experiment after the completion of the acute phase generating constraints to participate in physical activities, in September 2022. All participants had participated in 20 training sessions each, with data collected at the beginning and end of the program.

Kin-Ball experimental program

Table 2 shows the activities of the kin ball intervention program. The kin ball program was adapted to maintain the essential teaching and learning objectives inherent in the practice of kin ball, inspired by several sources (Zurita-Ortega et al., 2020, Amate, et al. 2015). The program included 20 sessions: 2-hour training sessions, two each day for 10 days, in both 2019 and 2022 actions.

Table 2. List of activities of the kin-ball intervention program.

Characteristics	Sessions				
	1-4	5-8	9-12	13-16	17-20
Activity	Poison	Four corners	Indiana Jones	Four corners	Indiana Jones
	Tripod	Together	Tripod	Centipede	Four corners
	Indiana Jones	Kin ball	Poison	Ultimate rugby	Together
	Centipede	Omnikin	Together	Together	Tripod
	Ultimate rugby	Ultimate rugby	Match	Match	Match

Note: Centipede - Lying on their backs on the floor, participants pass the ball; Tripod - holding the ball between three people; Indiana Jones - A person running in a circle of players avoids being hit by the ball; Kin ball Omnikin - Hitting the ball with both hands together; Together: At the "together" signal all teammates must simultaneously touch the ball; Ultimate rugby- Passing the small ball into the team without the other two teams being able to intercept it; Poison - aiming the ball at other players; Four corners - participants placed in four corners of a square, send the ball by volleying to another corner of the field.; Match: match simulations.

Methodological and organizational adjustments

Following the experimentation of the general rules of the game, we sought to obtain a correct learning environment through the use of explanations, practical demonstrations, the practice of warm-up and preparation exercises, the practical practice of the elements and technical procedures characteristic of kin ball and the organization of games and competitions. In the first training sessions, a 65 cm gym ball, smaller than the 122 cm Omnikin ball, was used to understand the main positions and movements. The first simulations of match-meetings were conducted on two teams and not on three (as in the official rules of Kin-ball), and the colors of the teams were made based on concrete material possibilities.

Variables and instruments

The basic principle on the basis of which the tests for measuring strength, endurance and coordination capacities were selected was the lightness of their application and the maintenance of a state of entertainment and joy characteristic of the performance of extracurricular activities and spending free time for students.

The research was focused on the didactic process of initiation-teaching of the sport of kin ball and on the measurement of some components of motor qualities, namely palmar muscle strength, resistance, general coordination and balance. Muscle strength was measured by the palmar flexion test, using a dynamometer. Endurance was measured by a modified test, namely by measuring the distance in meters covered in 2 min. of running, with individual start carried out at 15 sec. intervals. General body coordination and balance were measured by the Matorin Test, with the result measured in degrees of rotation; 3 trials were performed on the favored side, taking into account the best performance.

Proceeding

For initiation into kin ball, the following methodical steps were carried out: presentation explanations and introduction to the new issue, practical demonstrations, practice of warm-up and preparation exercises, practical practice of technical elements and procedures and the organization of games and competitions (see Figure 1).



Figure 1. Poses of kin ball initiation and teaching (personal photo collection).

To measure physical capabilities, pre- and post-intervention tests were performed individually, outdoors on the sports field of the tourist base, and the evaluation was performed by the same people from the project management team.

Data analysis

Comparative analysis of pre- and post-intervention data was performed by means of the paired-samples t-test, performed separately for the groups of boys and girls. A comparative analysis of the level of the components of the motor qualities tested, in the different groups of the years 2019 and 2022, was also performed by means of the t-test for paired samples. Normality and homogeneity were measured by the Kolmogorov-Smirnov test, ensuring that the variables were normally distributed ($p \geq 0.05$). Effect size (Cohen, J, 1988) was calculated using Cohen's standardized d scale interpreted as follows: null (0–0.19), low (0.20–0.49), moderate (0.50–0.79) or high (≥ 0.80). All data were analyzed using SPSS, version 23.0.

Results

Tables 3 and 4 show the descriptive, univariate and bivariate analysis. The data related to the assessment of strength and resistance presented normal distributions (based on the calculation of Kolmogorov-Smirnov test), the bivariate analysis could use parametric tests, respectively Paired Sample t test. The data related to the assessment of general coordination and balance showed asymmetric distributions (based on the calculation of the Kolmogorov-Smirnov test), the bivariate analysis being able to use only non-parametric tests, respectively the Wilcoxon Pair-Z test.

Table 3. Comparative results of the muscular force (MF) and resistance (RES) tests performed pre- and post-intervention with kin ball means, normal distributions.

Variables	group 1/2 M/F	no	M	SD	Kolmogorov- Smirnov test, $p \geq 0,05$	paired sample t test	sig	p
MF pre-2019	1M	24	45.25	4.436	0.154	2.519	0.019	<0,05
MF post 2019	1M	24	46.25	4.436	0.200*			
MF pre-2019	1F	20	22.45	2.856	0.200*	4.224	0.001	<0,01
MF post 2019	1F	20	27.10	3.626	0.200*			
MF pre-2022	2M	29	39.90	4.117	0.200*	7.388	0.001	<0,01
MF post 2022	2M	29	45.66	3.994	0.075			
MF pre-2022	2F	21	20.38	2.500	0.200*	9.663	0.001	<0,01
MF post 2022	2F	21	31.57	4.632	0.050			
RES pre-2019	1M	24	800.42	46.483	0.200*	2.635	0.015	<0,05
RES post 2019	1M	24	807.08	44.476	0.176			
RES pre-2019	1F	20	652	28.023	0.197	1.073	0.297	>0,05
RES post 2019	1F	20	654	29.272	0.200*			
RES pre-2022	2M	29	729.66	56.283	0.200*	6.027	0.001	<0,01
RES post 2022	2M	29	783.45	54.266	0.200*			
RES pre-2022	2F	21	641.43	35.396	0.054	5.630	0.001	<0,01
RES post 2022	2F	21	690.00	32.249	0.052			

Note: Muscular Force (MF)-indicator of dynamometer; Resistance (RES)- measuring in meters; Male (M); Female (F). * This is the lower bound of the true significance.

Table 4. Comparative results of coordination-balance (CB) pre- and post-intervention with Kin ball means, asymmetric distributions.

Variables	Group	no	M	SD	Kolmogorov-Smirnov test, p ≤ 0,05	Wilcoxon Pair-Z test	sig	p
CB pre-2019	1M	24	344.17	33.221	0.000	1.131	0.258	>0,05
CB post 2019	1M	24	346.25	30.333	0.000			
CB pre-2019	1F	20	310.00	38.389	0.002	2.521	0.012	<0,05
CB post 2019	1F	20	326.00	39.256	0.001			
CB pre-2022	2M	29	344.14	31.681	0.000	2.041	0.041	<0,05
CB post 2022	2M	29	349.66	24.854	0.000			
CB pre-2022	2F	21	302.86	33.637	0.011	2.831	0.005	<0,01
CB post 2022	2F	21	319.52	37.212	0.036			

Note: Coordination Balance (CB)- measuring in degree (0-360); Male (M); Female (F).

Discussion

The results of the research presented in Figures 2–4 and Tables 3 and 4 demonstrated the increase of the measured components of the motor capacity (palmar strength, general resistance and general coordination-balance), in young subjects without intensive sports history, through the means of initiation and learning of the kin ball game. As a general observation all three measured motor components were developed as a result of the proposed kin ball program, but not all results are statistically significant ($p < 0.05$). Although statistically significant differences were demonstrated in different ways (using both parametric and non-parametric tests), based on the data obtained, statistically significant differences are observed in the following evaluations:

- Boys' palmar muscle strength, in 2019, [t (24) = 2.519; $p < 0.05$];
- The palmar muscle strength of girls, in 2019, [t (20) = 4.224; $p < 0.01$];
- The palmar muscle strength of boys, in the year 2022, [t (29) = 7.388; $p < 0.01$];
- The palmar muscle strength of girls, in the year 2022, [t (21) = 9.663; $p < 0.01$];
- The general resistance of boys, in the year 2019, [t (24) = 2.635; $p < 0.05$];
- The general resistance of boys, in the year 2022, [t (29) = 6.027; $p < 0.01$];
- The general resistance of girls, in the year 2022, [t (21) = 5.630; $p < 0.01$];
- The general coordination and balance of girls, in 2019, [z (20) = 2.521; $p < 0.05$];
- General coordination and balance of boys, in the year 2022, [z (29) = 2.041; $p < 0.05$];
- The general coordination and balance of girls, in the year 2022, [z (21) = 2.831; $p < 0.01$];

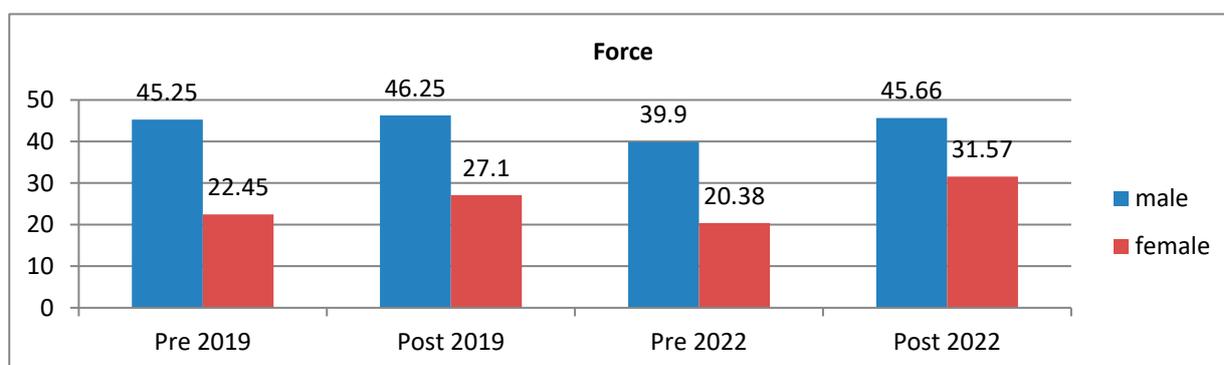


Figure 2. Evolution of force.

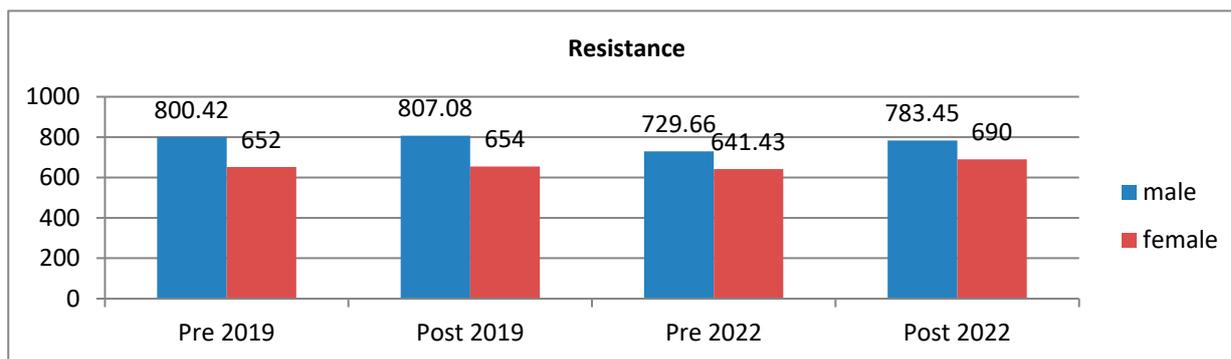


Figure 3. Evolution of resistance.

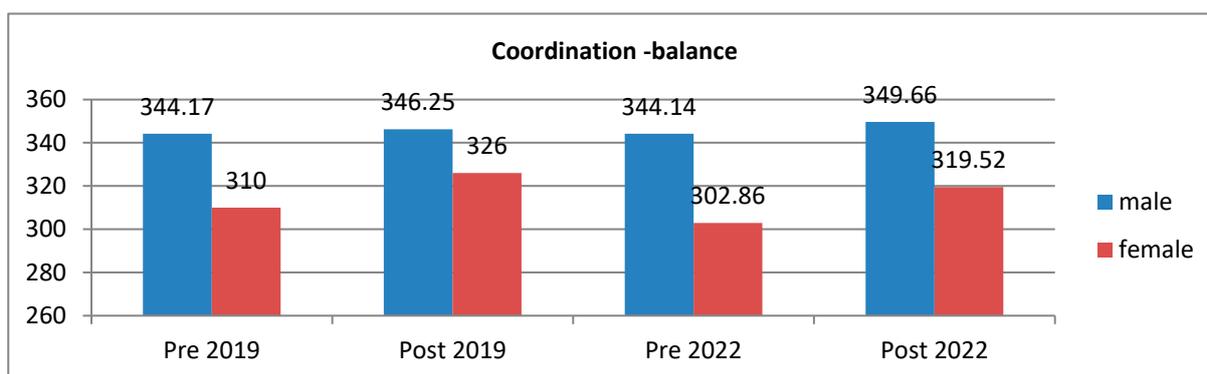


Figure 4. Evolution of coordination-balance.

An increase in the average performance of the groups was found in the following evaluations, but the difference was not statistically significant:

- The general resistance of girls, in 2019, [$t(20) = 1.073$; $p > 0.05$];
- The general coordination and balance of boys, in 2019, [$z(24) = 1.131$; $p > 0.05$].

Measuring the effect (Table 5) sought to identify the practical significance of the differences between the measured performances, beyond the statistical one, trying to show which of the effects were large, moderate or small. Following the calculations based on Cohen's d indicator, it was established that the size of the performance improvement effect is high in the case of all evaluations with statistically significant differences (minimum $p < 0.05$). Apart from these, the case of coordination-balance in boys in the 2022 project is noteworthy, where the effect is moderate. Also, in two comparative evaluations from the year 2019, the same ones in which the difference in pre- and post-intervention kin ball averages did not turn out to be statistically significant, the effect size turned out to be low: endurance in girls and coordination-balance in boys.

Table 5. Effect size calculation (Cohen's d).

Variables	M/F	t/z	gl	r^2	d- Cohen	explain
Force 2019	Male	2.519	23	0.216	1.05	high
Force 2019	Female	4.224	19	0.484	1.938	high
Force 2022	Male	7.388	28	0.661	2.792	high
Force 2022	Female	9.663	23	0.802	4.03	high
Resistance 2019	Male	2.635	23	0.232	1.099	high
Resistance 2019	Female	1.073	19	0.057	0.492	low
Resistance 2022	Male	6.027	28	0.565	2.278	high

Resistance 2022	Female	5.630	23	0.58	2.348	high
Coord.-Balance 2019	Male	1.131	23	0.053	0.472	low
Coord.-Balance 2019	Female	2.521	19	0.251	1.157	high
Coord.-Balance 2022	Male	2.041	28	0.13	0.771	moderate
Coord.-Balance 2022	Female	2.831	23	0.258	1.181	high

Although the same participant selection criteria were maintained in both 2019 and 2022 projects, it can be seen from Figures 1–3 that in many cases the level of motor performance at pre-intervention was lower in 2022 than in 2019, for all measured components. Based on the data collected, we can appreciate that in the context of the worldwide Covid 19 pandemic, large masses of students in Romania, under legal constraints, followed the online school regime for long periods of time and did not perform physical exercises regularly, with noticeable effects on the level of individual motor capacities.

The notable advancement in 2022 can be attributed to reduced initial motor capabilities caused by pandemic-related isolation, supported by findings from prior studies (Stracke et al., 2022; Mihăilă et al., 2021). This facilitated easier progress due to physical exercises and Kin ball practice amid lower starting motor levels in 2022 versus 2019 across all groups.

The study's findings validate other Kin ball research, beneficial for educators diversifying cooperative, social, and cognitive activities (Narvaez, 2015; Lara & Cachón, 2010). Methodological limitations were present due to easy testing, ensuring minimal disruption to the 2019 and 2022 Freshman Camp programs.

Conclusions

The study focused primarily on the introduction of the sport called Kin Ball in Romania and on exploring the challenges of this initiation process in four groups of young people (two boys and two girls). It highlighted the ease of learning this game, allowing participants with limited sports experience to engage effectively. The implementation of Kin-Ball initiation techniques served as a test of an alternative method of instruction for physical education and sport teachers.

The research facilitated the evaluation of some components of the motor capacity (palmar muscle strength, resistance, coordination) and the possibility of improving them through a specialized training of 20 initiation sessions and learning kin ball.

The research had the advantage of evaluating and comparing the motor components of initiation into kin ball before (evaluations carried out in 2019) and post (evaluations carried out in 2022) the Covid-19 pandemic, which imposed constraints on people's physical activity.

The research used descriptive statistics, the Kolmogorov Smirnov test for testing the normality of distributions, the paired sample T test, the nonparametric Wilcoxon-Z test and calculated the effects of changes by Cohen's d.

The evaluation of the effects of the Kin ball program in 2019 revealed a significant improvement in the palmar muscles in both the girls ($p < 0.01$) and boys ($p < 0.05$) groups, as well as a significant improvement in body coordination in the girl's group ($p < 0.05$) and a significant improvement in endurance in the boy's group ($p < 0.05$). Statistically insignificant differences ($p > 0.05$) were recorded by the group of girls in endurance and the group of boys in coordination-balance. In 2022 all assessments showed statistically significant improvements at a significance threshold of at least < 0.05 .

The differences between the results recorded in 2019 and 2022 can be attributed to the effects of the Covid 19 pandemic in terms of the level of physical training of young people. Thus, the research demonstrated lower average levels of physical capacities in the young people included in the research in 2022 compared to 2019, explained by the long periods of physical inactivity imposed by the constraints of the pandemic. From another point of view, the lower level of the components measured in 2022 allowed a greater capacity for progress and an easier improvement of them.

The records as a whole can lead to the conclusion that the practice of kin ball can improve physical capabilities, if it is practiced systematically or intensively.

These findings correlate with research objectives highlighting successful initiation of the Kin ball, assessment of components of motor ability, comparison of pre- and post-pandemic effects, evaluation of training impact, exploration of educational impact, statistical analysis, and understanding of pandemic-related effects. on the motor skills of the participants.

Despite its potential, Kin ball remains an unfamiliar game to many physical education instructors due to factors such as limited popularity and challenges in accessing the specific materials needed for practice, such as the 48-inch ball.

Ethics approval and consent to participate

The present investigation, which involved human volunteers, adhered to the ethical principles outlined in the Declaration of Helsinki and received approval from the University "1 Decembrie 1918" of Alba Iulia. Prior to registration, all participants were provided with comprehensive information regarding the study's objectives, methodologies, potential hazards, and advantages. All individual subjects included in the study provided written informed permission.

All methodologies were executed in adherence to the pertinent norms and legislation.

All the patients gave their Informed consent to participate in this study, in the private osteopathy and therapeutic massage office.

The University Professional Ethics and Deontology Commission within the "1 Decembrie 1918" University in Alba Iulia noted the following:

- the authors requested the consent of the subjects involved in the research before carrying out any procedures;
- the authors have evidence regarding the freely expressed consent of the subjects regarding their participation in the study;
- the authors take responsibility for observing the ethical norms in scientific research, according to the legislation and regulations in force.

Author Contributions: All authors contributed equally to the conception of this article.

Funding: This study did not need external funding to be carried out, each 30-minute therapy session was carried out free of charge by the therapist.

Informed Consent Statement: Not applicable.

Data Availability Statement: The authors affirm that the data substantiating the conclusions of this study may be found in the journal itself and its Supplementary material. The primary researcher can provide the raw data supporting the study's findings upon a fair request.

Conflicts of Interest: The authors of this manuscript declare that they have no affiliations or involvement with any organization or entity that has a financial interest or non-financial interest in the subject matter or materials discussed. Financial interests include honoraria, educational grants, participation in speakers' bureaus, membership, employment, consultancies, stock ownership, equity interest, expert testimony, or patent-licensing arrangements. Non-financial interests include personal or professional relationships, affiliations, knowledge, or beliefs.

References

- Abdulsalam, Z. S., Abdulameer, W. H., & Hamza, J. S. (2022). Analysis of the history of ball sports. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, 10-10.
- Agyar, E. (2013). Life Satisfaction, Perceived Freedom in Leisure and Self-esteem: The Case of Physical Education and Sport Students. *Procedia - Social and Behavioral Sciences*, 93, 2186–2193. <https://doi.org/10.1016/j.sbspro.2013.10.185>
- Amado, D., Del Villar, F., Leo, F. M., Sánchez-Oliva, D., Sánchez-Miguel, P. A., & García-Calvo, T. (2014). Effect of a multi-dimensional intervention programme on the motivation of physical education students. *PLOS one*, 9(1), e85275.
- Amate, R.D., Moral, F.A., Luque, G. T., & Sanchez A.J.L.(2015). Estructura temporal y gestual del kin-ball, *Apunts. Education Fisica y Deportes* [Time and gestual structure of kin-ball. *Journal. Physical Education and Sport*], 120, 36-42. [https://doi.org/10.5672/apunts.2014-0983.es.\(2015/2\).120.05](https://doi.org/10.5672/apunts.2014-0983.es.(2015/2).120.05)
- Ancient Ball Games | Ball Games of the World.* (n.d.). Word Press. Retrieved February 23, 2022, from <https://sites.psu.edu/ballgamesoftheworld/ancient-ball-games/>
- Barrette, M., de Martini, D., Marci, Z., Maurer, D. (2010). *Kin-Ball*. Macolin: Ufficio federale dello sport UFSP

- Basabe, M. P., Melgarejo, S. A., García, C. E., Géliga, E. V., & Ávila, N. D., (2022). Booklet of compensatory corrective pre-sports games for students with intellectual disabilities. *PODIUM. Journal of Science and Technology in Physical Culture*, 17(3):1006-1017
- Badau, A., Szabo-Csifo, B., Ciulea, L., Alexandrescu, R., & Badau, D. (2022). The Effects Induced by a Specific Program on the Development of Segmental Flexibility in Athletes Aged 7–14 in Synchronized Swimming. *Children*, 9(1). <https://doi.org/10.3390/children9010017>
- Badau, D., Badau, A., & Clipa, A. (2018). Interaction between values of anthropometric body and static balance related to the characteristics of the three plastic fitness equipment. *Materiale Plastice*, 55(December), 600–602. <https://doi.org/10.37358/mp.18.4.5082>
- Baláš, J., Gajdošík, J., Krupková, D., Chrastinová, L., Hlaváčková, A., Bačáková, R., & Giles, D. (2021). Psychophysiological responses to treadwall and indoor wall climbing in adult female climbers. *Scientific Reports*, 11(1), 1–8. <https://doi.org/10.1038/s41598-021-82184-6>
- Buckley, R. (2012). Rush as a key motivation in skilled adventure tourism: Resolving the risk recreation paradox. *Tourism Management*, 33(4), 961–970. <https://doi.org/10.1016/j.tourman.2011.10.002>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Second Edition, Lawrence Erlbaum Associates, Publishers, New York University, 8-14
- Daniel, R., Ion-Sebastian, E., Valentina, Ș., & Carmen, E. (2023). Methodological aspects for beginning the game of kin-ball. *Ovidius University Annals, Series Physical Education & Sport/Science, Movement & Health*, 23(2): 476-479
- Didactics, T. (2016). *Formative and shared assessment in a unit of Kin-Ball*. Tandem Didactics of Physical Education, (53), 60-65
- Dragnea, C. A. (2006). *Elemente de psihosociologie a grupurilor sportive* [Elements of psychosociology of sports groups]. CD Press, 64-70
- Dragu, M. (2010). Theoretical and methodological considerations on teaching movement games to secondary school pupils. *Journal of Physical Education & Sport/Citius Altius Fortius*, 28(3).
- Epuran, M. (2013). *Motricitate și psihism în activitățile corporale* [Motricity and psychism in physical activities].Vol.2, FEST, 118-306
- FIKB / IKBF, 2023. (n.d.). Retrieved February 25, 2023, from <https://www.kin-ball.com/en/>
- Fernandez-Rio, J., Zumajo-Flores, M., & Flores-Aguilar, G. (2022). Motivation, basic psychological needs and intention to be physically active after a gamified intervention programme. *European Physical Education Review*, 28(2), 432-445.
- Ferrari, A., Cachia, R., & Punie, Y. (2009). Innovation and creativity in education and training in the EU member states: Fostering creative learning and supporting innovative teaching. *JRC Technical Note*, 52374, 64.
- Hall, N., McDonald, G. K., Hay, J., Defries, D., & Pryce, R. (2016). Effect of Activity Type on Youth Physical Activity during Structured Activity Sessions. *Health Behavior and Policy Review*, 3(6), 546–556. <https://doi.org/10.14485/hbpr.3.6.4>
- Hudson, T.D, Rockenbach, A.N., Mayhew, M.J. (2023). Campus Conditions and College Experiences that Facilitate Friendship Across Worldview Differences. *Journal of Higher Education*, 94 (2), 227-255. <https://doi.org/10.1080/00221546.2022.2082785>
- Ion-Ene, M., Roșu, D., & Neofit, A. (2014). Judo Adapted to the Therapy of Disabled Children. *Procedia - Social and Behavioral Sciences*, 137, 37–42. <https://doi.org/10.1016/j.sbspro.2014.05.249>
- Jermyn, S., O'Neill, C., & Coughlan, E. K. (2021). The Acute Effects from the Use of Weighted Implements on Skill Enhancement in Sport: A Systematic Review. *Journal of Strength and Conditioning Research*, 35(10), 2922-2935.
- Johnson, T. M., Ridgers, N. D., Hulteen, R. M., Mellecker, R. R., & Barnett, L. M. (2016). Does playing a sports active video game improve young children's ball skill competence?. *Journal of science and medicine in sport*, 19(5), 432-436.
- Kidder, J. L. (2013). Parkour: Adventure, Risk, and Safety in the Urban Environment. *Qualitative Sociology*, 36(3), 231–250. <https://doi.org/10.1007/s11133-013-9254-8>
- Kleiner, K., & Höger, B. (2022). *Sports Didactics in Europe: History, Current Trends and Future Developments*, 381.
- Lara, A. J., & Cachón, J. (2010). Kinball: Los deportes alternativos en la formación del/la docente de educación física[Kinball: Alternative sports in the training of the education teacher physical] *II Congrés Internacional de Didàctiques*.

- Liu, R. (2021). Research and analysis of ball sports learning in inspiring and aiding students' diversification education. *Revista de Psicología del Deporte (Journal of Sport Psychology)*, 30(2), 67-80.
- Mihăilă V.C., Paraschiva G.A., Mihăilă L.M., Has the Pandemic Changed the Cultural Profile of the Youngest Sports Teachers? *Discobolul – Physical Education, Sport and Kinetotherapy Journal*. 60(4), 509-517. <https://doi.org/10.35189/dpeskj.2021.60.4.13>
- Narvaez, C. M.,(2015). Kinball como promotor de convivencia y cohesion social. *Boletín Semillas Ambientales*, 9(2).
- Park, R. J. (2013). Sport, gender and society in a transatlantic Victorian perspective. *Gender, Sport, Science: Selected Writings of Roberta J. Parks*, 69-101.
- Pedregosa, P. R. (2009). *Cooperative games for Kin-Ball*. Wanceulen SL
- Ponce-Bravo, H., Ponce, C., Feriche, B., & Padial, P. (2015). Influence of two different exercise programs on physical fitness and cognitive performance in active older adults: Functional resistance-band exercises vs. recreational oriented exercises. *Journal of Sports Science & Medicine*, 14(4), 716.
- Pricop A.D., Pelin R., Florescu O., Mezei M., Diversification of Sports Activities in Technical Higher Education by Improving Sports Facilities. *Discobolul – Physical Education, Sport and Kinetotherapy Journal*, 59(3), 202-215. <https://doi.org/10.35189/dpeskj.2020.59.3.1>
- Rhea, D.J., Martin S., Personality Trait Differences of Traditional Sport Athletes, Bull riders, and Other Alternative Sport Athletes, *International Journal of Sports Science&Coaching*, 5,1, 75-85. <https://orcid.org/0000-0002-2054-000>.
- Robinson, L. E., Veldman, S. L., Palmer, K. K., & Okely, A. D. (2017). A Ball Skills Intervention in Preschoolers: The CHAMP Randomized Controlled Trial. *Medicine and science in sports and exercise*, 49(11), 2234-2239.
- Stracke, C. M.,Burgos, Santos-Hermosa D., Bozkurt, G., Sharma, A., Cassafieres, R.C., Swiatek C., Dos Santos, I., Mason, A., Ossiannilsson, J. Shon E., Wan, M, Agbu, J.G.O., Farrow, R., Özlem, K., Nerantzi, C., Ramírez-Montoya, M. S., Grainne, C., Cox, G. & Vi, T., (2022).
- Responding to the Initial Challenge of the COVID-19 Pandemic: Analysis of International Responses and Impact in School and Higher Education. *Sustainability* 14(3), 1876. <https://doi.org/10.3390/su14031876>
- Tuncel, Y. (2016). Nietzsche, sport, and contemporary culture. *Sport, Ethics and Philosophy*, 10(4), 349-363.
- Wertmann, P., Chen, X., Li, X., Xu, D., Tarasov, P.E., Wagner, M. (2020), New Evidence for Ball Games in Eurasia from ca. 3000-year-old Yanghai Tombs in the Turfan Depression of Northwest China, *Journal of Archaeological Science: Reports*, Vol. 34, Part B, 102576. <https://doi.org/10.1016/j.jasrep.2020.102576>.
- Westendorp, M., Houwen, S., Hartman, E., Mombarg, R., Smith, J., & Visscher, C. (2014). Effect of a ball skill intervention on children's ball skills and cognitive functions. *Med. Sci. Sports Exerc*, 46(2), 414.
- Yildiz, Ö., Deveci, A., & Yildiz, M. (2021). Opinions of physical education teachers on national and cultural values gained through physical education and sports activities. *International Journal of Recreation and Sports Science*, 5(1), 90-104.
- Zhu, Q., & Bingham, G. P. (2010). Learning to perceive the affordance for long-distance throwing: Smart mechanism or function learning? *Journal of Experimental Psychology: Human Perception and Performance*, 36(4), 862.
- Zurita-Ortega, F., Ortiz-Franco, M., Ubago-Jiménez, J. L., González-Valero, G., Alonso-Vargas, J. M., & Melguizo-Ibáñez, E. (2023). Kin ball to promote the motor development of students with special educational needs: effects of an intervention programme. *Sport Sciences for Health*, 1-10.
- Zurita-Ortega, F., Ubago-Jiménez, J. L., Puertas-Molero, P., Ramírez-Granizo, I. A., Muros, J. J., & González-Valero, G. (2020). Effects of an alternative sports program using Kin-Ball in individuals with intellectual disabilities. *International Journal of Environmental Research and Public Health*, 17(15), 5296.

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