THE EFFECTS OF THE CONTEMPORARY DANCE ON THE PHYSICAL ABILITIES AND BODY BALANCE ON THE 6-9 YEAR-OLD GIRLS: PILOT STUDY

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ABSTRACT. Introduction. Contemporary dance, with influences from ballet and gymnastics, is an appealing and effective way of practising physical drills in an entertaining way. **Objective.** The aim of the study was to verify the effect of a 4 week contemporary dance training programme and of some measuring tools as well as the analysis of the entertainment contemporary dance on the motor skills and body balance of the 6-9 year old children. **Materials and Methods.** The subjects were 16 girls of 6-9 years of age (M=7, STDEV=1,06) who attended contemporary dance training sessions twice a week for a period of 4 weeks. The level of the motor skills was evaluated through standing broad jump (SBJ), back saver sit & reach with alternatively reached legs (S&R_RL – right leg reached, S&R_LL – left leg reached), Matorin test (MatT), crunches (C). The balance was measured standing on both legs (SBL) and on one leg (SOL) on Wii Balance Board from Nintendo (WBB), connected to SeeSway, Ross Clark software. The resulting data were analysed with the SPSS programme. **Results.** There have been identified statistically significant differences between the initial and final measurements when testing the motor skills and improvements in the balance parameters between the two evaluations, but these differences have not been statistically significant for any of the parameters measured. **Conclusions.** The study shows that a 4-week workout programme of entertainment contemporary dance may contribute to the development of motor skills. Also, the measuring tools are adequate and easy to use.

Key words: *contemporary dance, 6-9 year-old girls, motor skills, balance, Wii Balance Board.*

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REZUMAT*. Efectele dansului contemporan asupra calităților fizice și echilibrului la fete de 6-9 ani: studiu pilot.* **Introducere**. Dansul contemporan, cu influențe din balet și gimnastică, este un mijloc atractiv și eficient de practicare a exercițiilor fizice în scop recreativ. **Obiective**. Scopul studiului a fost verificarea efectului unui program de antrenament de dans contemporan 4 săptămâni și a instrumentelor de măsurare, precum și analiza influenței dansului contemporan recreativ asupra calităților motrice și echilibrului la copii de 6-9 ani. **Materiale și Metode**. Subiecții au fost 16 fete de 6-9 ani (M=7, STDEV=1,06), care au participat la antrenamente de dans contemporan de două ori pe săptămână timp de 4 săptămâni. Nivelul calităților motrice s-a evaluat prin: săritura în lungime de pe loc (SBJ), flexia longitudinală a trunchiului cu picioarele extinse alternativ înainte (S&R_RL – piciorul drept extins, S&R_LL – piciorul stâng extins), testul Matorin (MatT), ridicarea trunchiului în așezat (C). Echilibrul a fost măsurat în pozițiile stând pe ambele picioare (SBL) și pe un picior (SOL) pe placa de echilibru Wii Balance Board de la Nintendo (WBB), conectată la software-ul SeeSway, Ross Clark. Datele au fost prelucrate statistic cu ajutorul programului SPSS. **Rezultate**. S-au identificat diferențe semnificative statistic între măsurătorile inițiale și finale la testarea calităților motrice, iar la parametrii echilibrului îmbunătățiri între cele două evaluări, dar diferențele nu au fost semnificative statistic pentru nici unul dintre parametrii evaluați. **Concluzii.** Studiul indică faptul că, un program de antrenament de dans contemporan recreativ, cu durată de 4 săptămâni, poate contribui la dezvoltarea calităților motrice. Totodată, instrumentele de măsurare sunt adecvate și ușor de folosit.

Cuvinte cheie: dans contemporan, fete în vârstă 6-9 ani, calități motrice, echilibru, Placă de echilibru Wii.

INTRODUCTION

The recreational physical activities have caught the attention of various experts in different activity fields due to their influence on our daily life. During childhood, practising physical drills is good both for the improvement of the body systems and functions as well as for the mental well-being and cognitive development (Landry, Driscoll, 2012; Robinson et al., 2016; Warburton et al., 2006).

In Ancient Greece, dance was considered important due to its contribution to the physical, emotional and mental growth and development of the children (Lawler, 1964). Contemporary dance is a physical activity through which a person may express and transmit ideas, feelings, and emotions by means of body movements and gestures (Payne, Costas, 2021). In choreography, it is often used one or more of the techniques of the modern dance but various elements of gymnastics, classical ballet, steps from other dancing styles may be introduced (Payne, Costas, 2021).

In order to experience the benefits of dancing, it is essential that the practitioners should possess the motor skills necessary for acquiring the technique. According to Roche and Huddy (2015), if the dancer does not have the physical ability to realize the movements and the creative resources to adapt them to his or her needs, there may appear feelings of frustration.

For dancing, as well as for adaptation to the daily activities, it is necessary to have a certain level of motor skills. Even though these are improved with age, it is essential that in the first school years specific drills which aim to develop the physical abilities should be practised (Barela, 2013).

The training which focuses on the ballet technique imply muscle toning and coordination development, in order to raise the capacity of maintaining balance in various situations (Schmit et al., 2005). According to Batista (2022), flexibility is a basic motor skill in classical ballet, but also in contemporary dance and gymnastics. The entertainment gymnastics implies practising certain elements which suppose flexibility, balance, force and coordination as well as those which are considered acrobatic or various jumps which have a lower degree of complexity compared to those belonging to the performance gymnastics (Jackowski et al., 2015).

OBJECTIVE

The aim of the present study was to analyse the influence of recreational contemporary dance on the motor skills of the 6-9 year old children. Also, we focused on the analysis of the intervention programme and on the measurement tools which will be used in the research.

MATERIALS AND METHODS

The subjects of our study were 16 girls aged between 6 and 9 (M = 7, STDEV = 1.06) who practised for the first time a physical activity in an organised environment. The written approval from the parents was obtained. The subjects attended two sessions of recreational dance training a week for a period of four weeks after classes. Each session lasted for 60 minutes.

The intervention programme

The intervention programme consisted in 8 sessions of contemporary dance training practised recreationally. The preparation of the body for effort was done on music, after the classical method in contemporary dance, and in the end some stretching movements through maintaining a position of maximal amplitude for 10 seconds were performed (Figure 1).

Following that, during the first training session of the week (T1) some static ballet drills and artistic jumps were practised, while during the second session (T2) some acrobatic elements were performed. At the end of each session a game for body recovery after effort was played and three minutes of relaxing stretching on music with a very low rhythm followed.


Figure 1. Stretching exercices

The training intensity was moderate and the complexity was high for the training level of the subjects. Throughout the session the correctness of movements was focused on in order to facilitate the process of acquiring the motor skills. In the first two weeks out of 60 minutes, the effective working time was 35 to 40 minutes and the rest of 20 minutes was dedicated to explanations, demonstrations and correcting of the possible mistakes that appeared in the performance. In the final two weeks, the pauses for explanations were reduced to 10-15 minutes.

During the activity, out of the 5 feet positions from the ballet, we used position 1(P1), position 2 (P2) and position 3 (P3), and out of the arms positions were used the bras bas position (BB), position 1 (P1) and position 5 (P5).
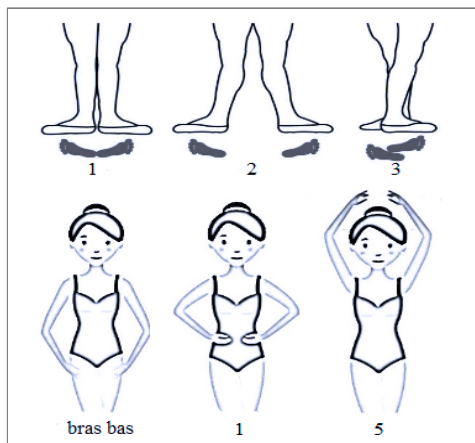
Figure 2. Feet and arms positions

The drills practised were: relevé from P1 with arms in P5 (4 x), relevé from P2 with arms in P5 (4 x), demi Plié from P2 with arms in P1 (4 x), with feet in P2 and arms in BB, relevé with arms in P5, comeback, demi plié with arms in P1, comeback (4 x), maintaining pasé (4 seconds / leg).

The jumps used were: sauté from P1 (4 x), sauté from P2 (4 x), échappé from P1 in P2 and from P2 in P1 (8 x), changement (8 x), and in week 2 and 3 was added petit jeté jumping from P3 (4 x / leg).

In T2, after the exercises dedicated to developing flexibility, the subjects performed the following acrobatic elements:

- Forward rolls (in week 2 and 3, they were executed with a final high jump) – 5 x;
- Backward rolls (in week 2 and 3, they were executed with a final high jump) – 5 x;
- Side rolls with extended arms up (3 repetitions in a row) – de 5 x / side;
- Extended legs kneeled chin stand – 5 x;
- Wall supported flexed feet headstand – 3 x 5";
- Wall supported extended legs head stand– 3 x 5".

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The measurements performed

Before and after the 4 weeks of training the motor skills were evaluated as follows: the coordination capacity through the Matorin test (MatT); the flexibility through measuring in centimetres the longitudinal flexion of the trunk with legs alternatively extended forward (S&R_RL– right leg extended, S&R_LL- left leg extended) from the level of the extended leg sole; the explosive force of the inferior limbs through measuring in centimetres the standing broad jump (SBJ); the force of the abdominal muscles through counting the crunches for a minute (C).

The evaluation of the subjects' posture balance was done through standing on both legs (SBL) and on one leg (SOL) with the arms close to the body and looking forward on the Wii Balance Board from Nintendo (WBB), connected to SeeSway, Ross Clark software. According to Clark & all, (2010), the equipment was validated for its use for educational, clinical and research aims.

In our research we analysed the movement of the pressure centre (COP) while maintaining each position for 30 seconds through the following parameters: the length in centimetres of the pressure centre trail on the support surface (LCop), the velocity of the trail travelled by COP in cm/s (VCop), the amplitude of the COP movement on anterior-posterior plan (AmplAp) and on medio-lateral plan measured in centimetres.

The collected data were analysed statistically by means of SPSS programme, version 2, and a descriptive analysis, the distribution verification and a comparison of averages in the variables envisaged will be carried out.

RESULTS

The motor skills evaluation

All the motor skills evaluation tests which were carried out show that the final measurements have registered higher averages than the initial measurements (Table 1).

As a result of the verification of the data distribution, through Shapiro-Wilk test, it was concluded that they were normally distributed at SBJ and S&R_LL variables (p > .05), but they were not normally distributed at MatT, S&R_RL and C variables in both moments of the measurements. (p ≤ .05). Considering these results, for comparing the averages it was used the Pair Sample t-test in the case of normally distributed scores and the Wilcoxon test when the scores did not have a normal distribution. In both cases the differences between the averages were significant (Table 1).

Table 1. Means, standard deviations and comparison of physical skills means according with distribution (N = 16)

	UM	Mean	STDEV	t*/Z**	df	Sig. (2-tailed)	Effect size (Cohen's D)
SBJ_M1	cm	87.00	12.97	-3.40*	15	0.004	-1.70
SBJ_M2	cm	91.81	15.22				
MatT_M1	degrees	185.63	15.37	- 3.077**	-	0.002	-2.83
MatT_M2	degrees	240.63	43.58				
S&R_RL_M1	cm	-1.81	5.84	- 3.109**	15	0.001	-2.59
S&R_RL_M2	cm	2.13	4.84				
S&R_LL_M1	cm	-2.94	5.43	-7.42*	15	0	-3.82
S&R_LL_M2	cm	1.50	5.25				
C_M1	nr	7.44	7.75	- 3.072**	15	0.003	-1.78
C_M2	nr	12.00	9.93				

Note: * t-test; **Wilcoxon test

Consequent to performing the tests on pairs, statistically significant differences were noticed between the initial and final average values of the following parameters: standing leap and flexion of the trunk on the left leg (Table 1). Also, in the same table one can notice that the other three tests, Matorin, flexion of the trunk on the right leg and crunches – analysed through Wilcoxon test, the results show that the differences are significant, which suggests that the intervention programme influenced positively the motor skills analysed.

The balance evaluation

Evaluating the balance by means of the Wii Balance Board included testing standing on two legs (SBL) and standing on one leg (SOL).

When standing on both legs (SBL) the average values of the analysed parameters show slight improvements of the balance after the intervention programme – lower values in the final measurements (M2). The analysis of the distribution through the Shapiro Wilk test show that the scores registered were not evenly distributed, and the comparison of means using the nonparametric Wilcoxon test (Table 2) proved that the differences were not significant (p > .05).

Also, when testing SOL the averages scores of the analysed variables were lower in the final evaluation (Table 3), the distribution test Shapiro-Willk did not show values of p > .05 on both measurements and data comparison did not reveal significant differences between the two measurements p bidirectional having values higher than .05 (Table 4).

Table 2. Wilcoxon Signed Ranks Test for SBL test (N=16)

	Statistics Test[a]	
Variable pair	**Z**	**Asymp. Sig. (2-tailed)**
LCop_2 - LCop_1	-1.241[b]	.215
VCop_2 - VCop_1	-1.103[b]	.270
AmplAP_2 - AmpIAP_1	-1.288[b]	.198
AmplML_2 - AmplML_1	-.427[b]	.670

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks

Table 3. Descriptive Statistics SOL (N=16)

Descriptive Statistics

Variable	UM	N	Mean	Std. Deviation
LCop_1	Cm	16	155.044	38.3339
LCop_2	Cm	16	137.806	37.8750
VCop_1	cm/s	16	5.163	1.2733
VCop_2	cm/s	16	4.600	1.2707
AmpIAP_1	Cm	16	5.538	2.0915
AmplAP_2	Cm	16	6.825	7.1462
AmplML_1	Cm	16	4.987	2.6140
AmplML_2	Cm	16	4.525	3.0802
Valid N (listwise)		16		

Table 4. Wilcoxon Signed Ranks Test for SOL test (N=16)

	Statistics Test[a]	
Variable pair	**Z**	**Asymp. Sig. (2-tailed)**
LCop_2 - LCop_1	-1.862[b]	.063
VCop_2 - VCop_1	-1.848[b]	.064
AmplAP_2 - AmpIAP_1	-.031[b]	.975
AmplML_2 - AmplML_1	-.852[b]	.394

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

DISCUSSIONS

Standing broad jump (SBJ) is an evaluation tool used in the Physical Education classes in Romania, and due to this fact the subjects in this survey were used to performing it. Although the registered results show that the SBJ mean rises from 87.00 to 91.81 cm, and the intervention programme contained a lot of leaping exercises, one cannot conclude that the explosive force in the inferior limbs improves after practising these exercises in eight contemporary dance training sessions. The development of the muscle mass is a factor which may influence these modifications, but the subjects of the survey were aged between 6 and 9 years, during which period the muscular mass is not quite developed. (Cáceres et al., 2018). We consider that the leaps performed during the training sessions may influence the correctness of the execution technique of the standing leap, which may lead to the results improvement.

The data collected in the Matorin test, through which the coordinative capacity was evaluated showed the significant improvement of the average results between the two measurements, from 185.63 to 240.63. Although this motor skill improves in time, the optimal age for coordination improvement is 10 years old (Urichianu, 2020).

When performing the Matorin test, a part of the subjects had the tendency to ignore rules because of their desire to have better results and stepped outside the circle drawn for landing or they did not maintain the arms near the body during the jump. When offered the opportunity to repeat the jump, at the second trial the subjects managed to perform the test better.

When performing the longitudinal flexion of the trunk, a test used in order to evaluate flexibility, the subjects met some difficulties to maintain the leg extended. After further explanations and indications, the subjects fulfilled the task easily.

According to the tests the ability of longitudinally flexing the trunk improved statistically, both with the right leg extended forwards ($Z_{(15)}$ = -3.190, p = .001) and with the left leg ($t_{(15)}$ = -7.416, p = .00). These results suggest that the intervention programme had a positive impact on flexibility. Still, we have to consider the fact that the subjects are at the age when the resistance of the tissues when stretched is low, this being a factor which may influence the modifications appeared at the flexibility level (Magnusson, Renström, 2006).

When testing the crunches, there was identified a statistically significant difference between the values of the parameters averages C_M1 (M = 7.44) and C_M2 (M = 12.00), according to $Z_{(15)}$ = -3.072, p = 0.003. These results show that the exercises from the intervention programme, done for a period of 4 weeks,

influenced positively the force of the abdominal muscles, for 12 subjects the number of crunches at the moment M2 being higher than at M1, and 4 subjects didn't manage to do crunches at the evaluations.

Although each test started with an explanation and a demonstration, when crunches were performed some subjects did not manage to raise their trunk in the first seconds because they were not used to the movement. Initially it was considered that they do not have the abdominal force necessary, but after some trials, they succeeded in performing at least one correct execution. Two of the subjects, after a first achievement, managed easily to perform at least 8 correct executions, for which reason we considered that less than a minute is not enough time for all the children to manage to perform crunches, even if they have the necessary abdominal force.

Maintaining balance on both legs was considered an easy task for the children, for which reason not all the subjects concentrated on it and after the first seconds they moved their watching direction, their head or even started to talk. When the SOL test was performed, a bigger effort was required in order to maintain balance for 30 seconds and consequently they concentrated more. Still, not all the subjects managed to maintain the leg raised during the entire test and they touched with the raised leg the board or the ground at least once.

The SBL test results, where $p > 0.05$ for all the parameters evaluated, indicate the fact that the differences between the initial and final measurements are not statistically significant Still, after the intervention programme the length of the pressure centre (Lcop) was shortened and the movement speed was lower in both tests. Also, the movement amplitude was lower, both in backwards-forwards plan and sideways. (Table 2). These results suggest that the subjects had better posture control even if the differences were not statistically significant. According to Usui et al. (1995), at the age of 6 the posture control has slower improvements and taking into consideration the fact that the intervention programme took place for only 4 weeks, it is possible that the application length may be too short.

At the SOL test, LCop was shorter after the intervention programme, at the initial measurement the mean being 155.04 cm and the final one 137.81 cm. Also, the VCop variable dropped between the two measurements from 5.16 cm/s to 4.60 cm/s. These results show the fact that the exercises performed during the intervention programme had a positive impact on the length and speed of the pressure centre (VCop) in the SOL test. Also, according to the data in Table 3, the amplitude of the pressure centre raised in backwards - forwards plan, even if these modifications were not significant from a statistical point of view. This thing may be explained by the fact that maintaining the balance at

the age of the subjects is characteristic to adapting through strategies different from those of the adults, which lead to lack of consensus of the speed and amplitude during the movement of the pressure centre (Garcia et al., 2011; Ferronato & Barela, 2011; Verbecque et al., 2016).

a)   b)

c)   d)
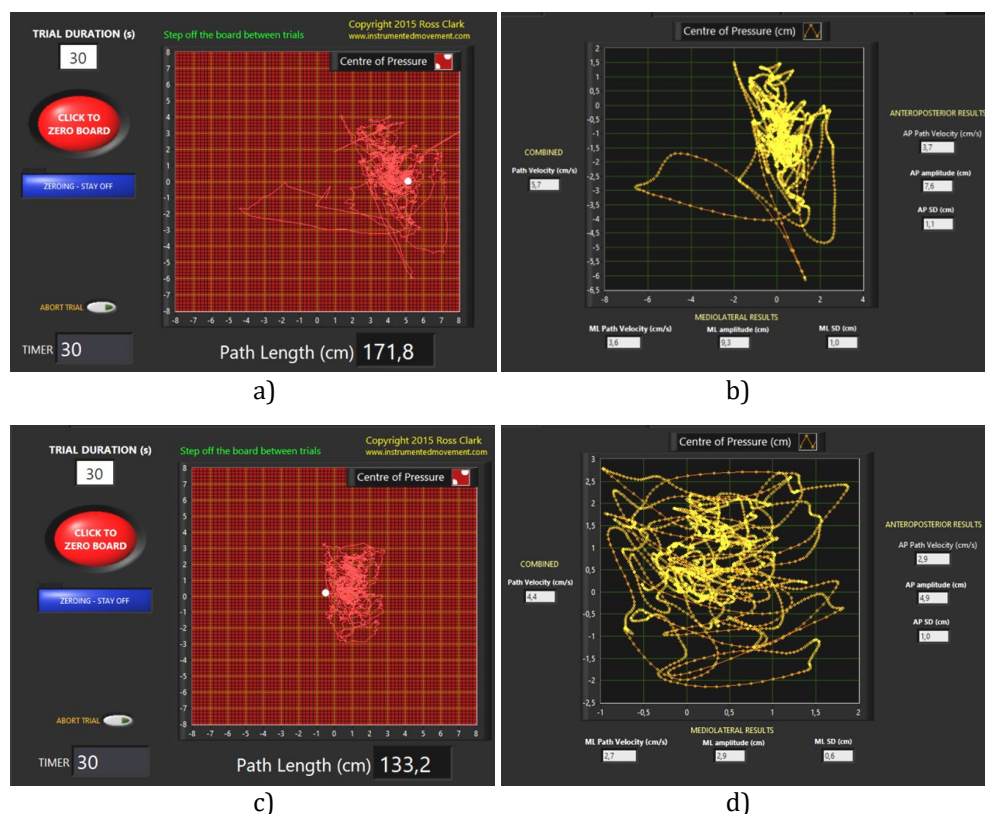
Figure 3. The SOL test parameters recorded using Wii Balance Board

Figure 3 confirms the facts previously stated, as it represents the recording of the balance parameters of one of the subjects, analysed with the Wii Balance Board in the SOL test. Images a) and b) represent the initial measurements (M1) and c) and d) the final ones.

CONCLUSIONS

After interpreting the data, one can conclude that the exercises practised during the intervention programme have contributed to the acquisition of the movements necessary for performing the tests which measure the motor skills. Also, we consider that the intervention programme had the appropriate dosage and complexity to influence the development of the explosive force of the lower limbs, of the coordination, flexibility and abdominal muscle force of the 6-9 year old girls, but we consider that a longer period of time is necessary in order to register higher progress.

The balance evaluation through the 4 parameters showed higher values at the end of the intervention programme, but these were not statistically significant. Although, according to the specialised literature the analysis of the movement of the pressure centre is meaningless when referring to children between 6 and 9, we consider that carrying out a research over a longer period of time and including a control group will eliminate all the variables appeared with the age and will help us verify if practising entertainment contemporary dance may influence posture maintaining at a lower school age.

With reference to the instruments used for measurements, we consider that they are efficient and easy to use for the researchers, being portable and low cost, as well as for the subjects, considering the fact that they did not meet major obstacles which should not be solved on the spot. It is recommended that 2 or 3 trials should be performed before measuring, in order to get used to the equipment.

REFERENCES

Barela, J. A. (2013). Fundamental motor skill proficiency is necessary for children's motor activity inclusion. *Motriz: Revista de Educação Física*, *19*, 548-551. https://doi.org/10.1590/S1980-65742013000300003

Batista, A., Neto, E., Branquinho, L., Ferraz, R., Ribeiro, J., Forte, P., & Ávila-Carvalho, L. (2022). Flexibility of Ballet Dancers in COVID-19 Pandemic: A Prospective Observational Study in Portugal. *International Journal of Environmental Research and Public Health*, *19*(15), 9235. https://doi.org/10.3390/ijerph19159235

Cáceres, X. S., Cornejo, J. M., Farfán, C. D., Herrera, M., Gómez-Campos, R., Lazari, E., & Cossio-Bolaños, M. (2018). Relationship between body adiposity and horizontal jump in school children and adolescents. *Rev Chil Pediatr*, *89*(6), 701-708. https://web.archive.org/web/20190501073016id_/https://scielo.conicyt.cl/pdf/rcp/v89n6/en_0370-4106-rcp-01003.pdf

Clark, R. A., Bryant, A. L., Pua, Y., McCrory, P., Bennell, K., & Hunt, M. (2010). Validity and reliability of the Nintendo Wii Balance Board for assessment of standing balance. *Gait & posture*, *31*(3), 307-310.
https://doi.org/10.1016/j.gaitpost.2009.11.012

Ferronato, P. A. M., & Barela, J. A. (2011). Age-related changes in postural control: rambling and trembling trajectories. *Motor Control*, 15(4), 481-493. https://doi.org/10.1123/mcj.15.4.481

Garcia, C., Barela, J. A., Viana, A. R., & Barela, A. M. F. (2011). Influence of gymnastics training on the development of postural control. *Neuroscience Letters*, 492(1), 29-32. https://doi.org/10.1016/j.neulet.2011.01.047

Grgic, J. (2022). Test–retest reliability of the EUROFIT test battery: A review. *Sport Sciences for Health*, 1-8. https://doi.org/10.1007/s11332-022-00936-x

Jackowski, S. A., Baxter-Jones, A. D. G., Gruodyte-Raciene, R., Kontulainen, S. A., & Erlandson, M. C. (2015). A longitudinal study of bone area, content, density, and strength development at the radius and tibia in children 4–12 years of age exposed to recreational gymnastics. *Osteoporosis International*, *26*(6), 1677-1690. https://doi.org/10.1007/s00198-015-3041-1

Landry, B.,W., Driscoll, S.,W. (2012). Physical activity in children and adolescents. PM&R. 4 (11) , pp. 826-832. https://doi.org/10.1016/j.pmrj.2012.09.585.

Lawler, L. B. (1964). *The dance in ancient Greece* (p. 128). London: Adam & Charles Black. http://ancientgreekdance.orchesis-portal.org/wp content/uploads/2018/ 06/LillianBrady-Lawler_The-Dance-in-Ancient-Greece.-In_The-Classical-Journal-Vol.-42-No.-6-Mar.-1947-pp.-343-349..pdf

Magnusson, P., & Renström, P. (2006). The European College of Sports Sciences Position statement: The role of stretching exercises in sports. *European journal of sport science*, *6*(2), 87-91. https://doi.org/10.1080/17461390600617865

Payne, H., & Costas, B. (2021). Creative Dance as Experiential Learning in State Primary Education: The Potential Benefits for Children. *Journal of Experiential Education*, *44*(3), 277–292. https://doi.org/10.1177/1053825920968

Rival, C., Ceyte, H., & Olivier, I. (2005). Developmental changes of static standing balance in children. *Neuroscience letters*, *376*(2), 133-136.
https://doi.org/10.1016/j.neulet.2004.11.042

Robinson, L. E., Palmer, K. K., & Bub, K. L. (2016). Effect of the Children's Health Activity Motor Program on Motor Skills and Self-Regulation in Head Start Preschoolers: An Efficacy Trial. Journal Frontiers in Public Health, Vol. 4, ISSN=2296-2565, DOI=10.3389/fpubh.2016.00173,
https://www.frontiersin.org/articles/10.3389/fpubh.2016.00173

Roche, J., & Huddy, A. (2015). Creative adaptations: integrating Feldenkrais principles in contemporary dance technique to facilitate the transition into tertiary dance education. *Theatre, Dance and Performance Training*, *6*(2), 145-158. https://doi.org/10.1080/19443927.2015.1027452

Schmit, J. M., Regis, D. I., & Riley, M. A. (2005). Dynamic patterns of postural sway in ballet dancers and track athletes. *Experimental brain research*, *163*(3), 370-378. https://doi.org/10.1007/s00221-004-2185-6

Kwan, S. (2017). When is contemporary dance?. *Dance Research Journal*, *49*(3), 38-52. https://doi.org/10.1017/S0149767717000341

Şerbescu, C. (2008). *Condiţia fizică a şcolarului mic.* Editura Universității din Oradea

Urichianu, B. A. (2020). Fortificarea stării de sănătate a elevilor din ciclul primar prin componentele intelectuale şi motrice. Rezumatul tezei de doctorat în ştiinţe pedagogice. Chişinău, Universitatea de Stat de Educaţie Fizică şi Sport a Republicii Moldova. Google Academic: http://www.cnaa.md/files/theses/2020/55839/bogdan_urichianu_abstract.pdf

Usui, N. et al. (1995). Development of the upright postural sway of children. *Developmental Medicine & Child Neurology*, 37: 985-996. https://doi.org/10.1111/j.1469-8749.1995.tb11953.x

Verbecque, E., Vereeck, L., & Hallemans, A. (2016). Postural sway in children: A literature review. *Gait & posture*, *49*, 402-410. https://doi.org/10.1016/j.gaitpost.2016.08.003

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Cmaj*, *174*(6), 801-809. https://doi.org/10.1503/cmaj.051351