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# Motor Skills and Motivation Development by Implementing Handball Elements in First Part of Physical Education Lesson

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**ABSTRACT. Introduction:** Physical education lesson are the ideal environment for educating and consolidating active lifestyle habits that will last throughout the students' lives. Teachers play a central role in the success and longevity of school-based interventions. Students' motor skill levels are directly associated with their participation in physical education lessons or movement activities. Motivation is recognized as an important factor related to students engagement and active participation in physical education lessons. Therefore, it might be reasonable to assume that physical education programs will have a more positive impact when students are motivated to participate. **Purpose:** Through hypothesis testing we wanted to evaluate the effect of the intervention on motor skills and motivation in physical education lessons. **Material:** Longitudinal experimental study design without control group, number of subjects N=38 subjects from two different classes. The research instrument was a questionnaire composed of 3 subscales and an application trail counted in seconds and number of cumulative points from shots on goal. **Results:** The results support the tested hypotheses that the intervention will improve motor skills and increase the motivation score, demonstrating that there are significant differences between pre-test and post-test. **Conclusion:** The ludic character of the physical education lesson can significantly influence the active participation of students in the physical education lesson, also improving the level of motor skills.

***Keywords:*** *physical education, motor skills, motivation, handball.*

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**REZUMAT.** ***Ameliorarea deprinderilor motrice şi a motivaţiei utilizând elemente specifice jocului de handbal în partea introductivă a lecţiei de educaţie fizică.*** **Introducere:** Orele de educaţie fizică reprezintă mediul ideal pentru educarea şi consolidarea obiceiurilor unui stil de viaţă activ, care vor dăinui pe tot parcursul vieţii elevilor. Profesorii joacă un rol central în succesul şi longevitatea intervenţiilor bazate pe şcoală. Nivelul de deprinderi motrice ale elevilor sunt direct asociate cu participarea acestora la lecţia de educaţie fizică sau la activităţi de mişcare. Motivaţia este recunoscută ca fiind un factor important legat de implicarea şi participarea activă a elevilor la orele de educaţie fizică. Prin urmare, ar putea fi rezonabil să presupunem că programele de educaţie fizică vor avea un impact mai pozitiv atunci când elevii sunt motivaţi să participe. **Scop:** Prin testarea ipotezelor ne-am dorit să evaluăm efectul intervenţiei asupra deprinderilor motrice şi a motivaţiei în lecţia de educaţie fizică. **Material:** Design de studiu experimental longitudinal fără grup de control, număr subiecţi N=38 alcătuind 2 clase diferite. Instrumentul de cercetare a fost chestionarul compus din 3 subscale şi un traseu aplicativ contorizat în secunde şi număr de puncte cumulate din aruncările la poartă. **Rezultate:** Rezultatele susţin ipotezele testate, conform cărora în urma intervenţiei se vor ameliora deprinderile motrice şi va creşte scorul motivaţiei, demonstrând faptul că există diferenţe semnificative între pre-test şi post-test. **Concluzii:** Caracterul ludic al lecţiei de educaţie fizică poate influenţa semnificativ participarea activă a elevilor în lecţia de educaţie fizică, ameliorând de asemenea nivelul deprinderilor motrice.

***Cuvinte-cheie****: educaţie fizică, deprinderi motrice, motivaţie, handbal.*

## INTRODUCTION

According to a WHO report, 80% of the adolescent population does not regularly practice any type of physical sports activity (Guthold, 2020). Data collected from 1.6 million students with aged beetwen 11-17 years from 146 countries show that 81% of them were under-active in 2016 (Guthold, 2020). Physical education lesson are the ideal environment for educating and consolidating active lifestyle habits that will last throughout their lives (Trigueros, 2019). European pre-adolescent children (aged 6 and 12 years) spend 209 minutes/day (64%) of their time at school in sedentary activities, while they spend only 16 minutes/day (5%) in moderate to vigorous physical activity (Zhang, Relations among School Students' Self-Determined Motivation Perceived Enjoyment, Effort, and Physical Activity Behaviors., 2009).

Evolving with technology, students' free time allocated for practicing motor activities has turned into an overloaded schedule where digitalization and inactivity predominate. Therefore, in modern education, both the lessons and the teacher must adapt to the requirements of students, because their motor skills are much poorer, so the motor skills once practiced in free time need to be maximized in the physical education lesson.

Teachers play a central role in success and longevity of school-based interventions (Lander, 2017). Learning of motor skills increases the possibilities to move, to experience new motor sensations, to enrich the universe of knowledge, which favors the expression of personality (Dragnea, 2006). Student's motor skills level are directly associated with their participation in physical education lessons or movement activities (Okely, 2001). Children's motor activities practice contribute to their physical and motor development (Chen W. H.-B., 2017). Empirical studies have shown that motor skills were positively associated with physical activity participation and negatively associated with sedentary behaviors in children (Fisher, 2005). Furthermore, childhood manipulative skills significantly predicted whether the adolescent would participate in any moderate to vigorous activity and spend time in organized activities compared to locomotor skills (Barnett, 2009). Knowing fundamental skills has been associated with an important contribution to children's physical, cognitive and social development and is believed to be the basis for an active lifestyle (Lubans, 2010).

Physical preparation programs in physical education can provide positive developments in motor and technical skills (Kahraman, 2023). Students' free-time physical activity is related to motivational experiences in physical education. Perceptions of competence, autonomy and relatedness, self-determined motivation, enjoyment and physical activity in physical education directly or indirectly predict free-time physical activity (Cox A. E., 2008). Enjoyment of physical activity is a motivational construct that is a significant determinant of children and adolescents' physical activity behaviors. Enjoyment is a psychological experience characterized by fun, sympathy and pleasure. It can be influenced by factors such as the intensity of physical activity, children's perceptions of success and the emotional state before physical activity (Burns, 2017). It is argued that physical education programs in schools present a tremendous opportunity to positively influence attitudes and patterns of participation in physical activity among adolescents (Alderman, 2012; Bassett, 2013; Chen, 2014). Motivation is recognized as an important factor related to student's engagement and meaningful participation in physical education classes (Cox, 2009). Motivation in physical education was associated with increased activity during class time; intention to engage in physical activity outside of class time; positive changes in students' experiences of physical education; and intention to participate in physical

education in the future (How, 2013; Standage,2003; Zhang, 2009; Shen, 2010). It might therefore be reasonable to assume that physical education programs will have a more positive impact when students are motivated to participate (Haerens, 2010). Therefore, due to some phenomena that the body undergoes during the lesson, some physiological changes occur, which we will call characteristics.

Focusing on the introductory part of the physical education lesson we can achieve these characteristics traditionally, or integrated into games. According to the traditional method, we only address the physical component. Without increasing the complexity or introducing an element of innovation, the monotonous nature of this part comes into play and the students lose interest. As a effect of this part, the fundamental part will be affected later on.

By practicing the motor skills in the first part of the lesson, we approach not only the physical side but also the technical, theoretical or even tactical side. In order to prepare the body optimally for the effort, we need to take into account the following factors (cardio-respiratory, muscular, articular, nervous system excitation, by increasing attention the subjects will react faster and more efficiently). Warm up is the physiological and psychological preparation for the lesson tasks ahead. Warming up increases body temperature which has been shown to be a major facilitator of performance. It stimulates the central nervous system which coordinates the athlete's systems, reduces motor reaction time and develops coordination (Bompa, 2001).

## THE STUDY'S HYPOTHESES

In accordance with the literature, in activity carried out in physical education classes as a result of trying to improve motor skills in the preparatory part of the lesson, we test the following hypotheses. Under H1 the physical performance will be tested. Furthermore, H2 has the aim to measure the effect of the intervention on those three subscales. H3 will test the physical differences between the classes and H4 will measure the differences between genders.

H1.1 There are significant differences between the pre-test and post-test in the time to complete the sport trail.

H1.2 There are significant differences between pre-test and post-test in total number of points at goal-scoring.

H2.1 There are differences between pre-test and post-test in motivation score as an effect of the experiment.

H2.2 There are differences between pre-test and post-test in the total score on autonomy, relatedness and competence as an effect of the experiment.

H2.3 There are differences between pre-test and post-test in the total self-efficacy score as an effect of the experiment.

H3.1 There are significant differences between 6th students and 8th students in terms of the pre-test and post-test average route completion.

H3.2 There were differences between 6th students and 8th students in terms of average shots on goal between pre and post test.

H4.1 There are gender differences in the time taken on the trail between pre-test and post-test.

H4.2 There are differences between genders in the number of points in shots on goal between pre-test and post-test.

## PARTICIPANTS

In this study it took part N=38 subjects, of which 21 were male and 17 were female, composing 2 different heterogeneous classes, respectively 6th grade and 8th grade. The 6th grade students are N=18, 8 male and 10 female. Among them, 11 of them practice another sport other than physical education, 7 declare that they do not practice any other sport. The 8th grade students are N=20 students, 13 male, 7 female. Among them 9 declare that they practice sport, 11 declare that they do not practice sport. The sports history of the practicing sports is between 1-5 years. Firstly, verbal agreement was given by the director of the school and the teacher. Additionally, every parent was informed about this study. Ethical standards were in accordance with Declaration of Helsinki. All particular aspects and standards of ethic were respected. All participants were part of this intervention as volunteers.

## METHODS

In the present paper, we used a longitudinal experimental design without control group with pre-test and post-test. Both classes followed the same intervention. Students underwent initial testing on December 12, 2023 and final testing on March 12, 2024. Both measures consisted of two assessment methods: an applied trail with specific handball elements and the questionnaire method. The applied route consisted of different movement patterns required in the handball game, as well as passing, shooting, dribbling and demarcation procedures. This trail can also be applied through the influences of other sports such as basketball or football, but by analyzing the material base that the school had, we decided to approach handball. This method of evaluation had two forms

of counting the performance obtained: the time in which the student completed the trail measured in seconds and the number of points accumulated from the 3 shots at the goal measuring the accuracy of the shots by separating the goal into 9 zones. Garmin Fenix 5X Plus Sapphire watch was used to record the timing. The trail can be seen in figure 1.

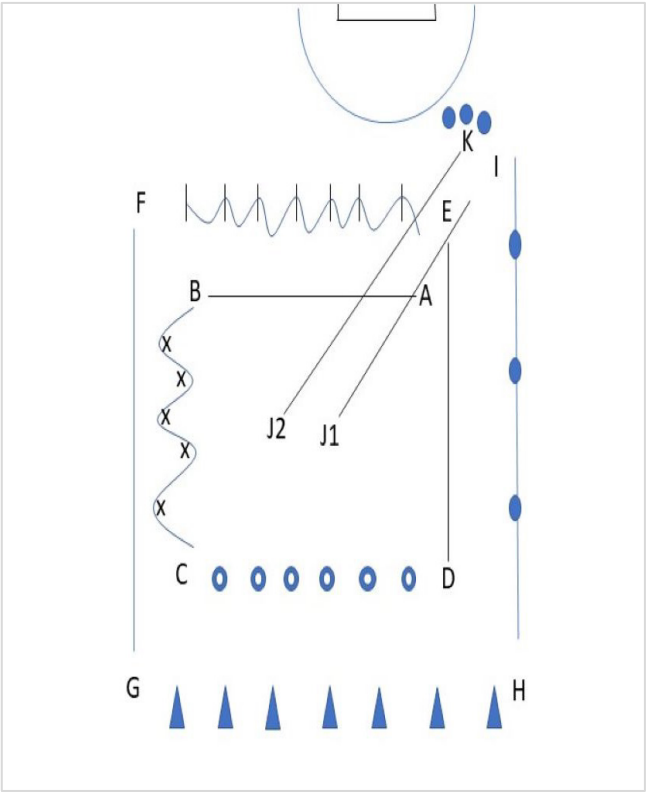


**Figure 1.** Trail

A-B – running over a distance of 8 m
B-C – driblling between the cones for a distance of 10 m
C-D – running with skipping over cones on 8 m distance
D-E – running backwards for a distance of 10 m
E-F – running with knees up over the buttock for a distance of 10 m
F-G – dribbling forward for 12 m
G-H – "in - out" between cones with passing ball, distance 10 m
H-I – running with ground ball passing (3 passes), distance 12 m
I-J1 – side running for distance 7 m
J2-K – other side running for distance 7 m

At the end of the trail there will be 3 balls placed at the semi-circle. After completing the trail the student must throw all 3 balls, and the throws will be counted in points as shown in figure 2.

| | | |
|---|---|---|
| 3 | 1 | 3 |
| 1 | 1 | 1 |
| 2 | 1 | 2 |

**Figure 2.** Scoring points on the goal frame for handball shots

The goal was divided into 9 parts. The sides were scored differently, with throws in the center area being 1 point, throws to the top left and right 3 points, and throws to the bottom left and right 2 points. After the 3 throws, the points obtained are added together with the time taken by the student to complete the trail. These two results represent the student's athletic performance. The effective amount of work has been divided into 4 stages which will be briefly presented below. We would like to point out that the 4 stages refer to the preparatory part of the organism for the effort, therefore the school program does not suffer any delay, so it can proceed normally. Starting with the first period, the children practicing the forms of movement with the ball (running with the front, with the back on the direction of movement, lateral running, running using only the right hand for dribbling, etc.). stage characterized by a low complexity, with the aim of getting the students used to the ball. Further, the groups was divided into two teams, each with the ball practicing on a small side different ways of dribbling and passing the handball, continuous running under different forms of movement, the subjects executing the teacher's command (pass the ball with teammate, pass the ball with opponent, etc). The second stage is characterized by an increase in complexity and practice of the forms of movement in the handball game. In the third period, bilateral game play at a low intensity was practice to the students, but they are not allowed to run, the game is played only by walking, students position the ball between the ankles and execute the movement only by jumping, etc. Stage characterized by a higher complexity, following the principle of specificity. The intensity remains low, being characteristic of the preparatory part. Finally, in the last period, students practice the full trail gradually increasing and controlled intensity.

Characterized by the practice of the competition test. Then, a questionnaire composed of 3 subscales was used: 1. Physical Education Autonomy Relatedness Competence Scale (PE-ARCS) (Lauren Sulz, 2016); 2. - Physical Education Motivation Scale (PEMS) (Lauren Sulz, 2016); 3. - General Self-Efficacy Scale (GSE) (Schwarzer, 1995), validated and adapted for Physical Education and Sport. By using this questionnaire we wanted to observe whether personality factors change as a result of our intervention. The didactic intervention was realized through the implementation of handball specific motor skills in the preparatory part of the lesson with the aim of increasing the duration of the students' handball handling.

The exercises in the preparatory part have been rationalized and standardized so that they constitute a preamble to the exercises used in the fundamental part of the lesson. The use of the exercises in the preparatory part was a prerequisite for a facilitated approach to the exercises in the fundamental part, thus creating a transfer to the formation and preservation of the targeted skills.

## RESULTS

To test hypotheses 1.1, 1.2, 2.1, 2.2, 2.3 we used the Paired Samples T-test. Instead, for hypothesis testing 3.1, 3.2, 4.1, 4.2 which involve comparing means between classes and between genders respectively, we used the Independent Samples T-test.

**Table 1.** Trail time

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | TIME_ TRAIL 1 TIME_ TRAIL 2 | 6.632 | 6.800 | 1.103 | 4.396 | 8.867 | 6.012 | 37 | .000 |

By testing hypothesis 1.1 we can see that the travel time of the trail has improved significantly, p<.01, the average of participants dropping by about 7 seconds since the pretest (M=50.26) compared (M=43.63) at post test; *T(df=37) = 6.01, p= .00, p<.01*.

**Table 2.** Number of points accumulated for shots on goal

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | THROW1 - THROW2 | -2.237 | 1.218 | .198 | -2.637 | -1.837 | -11.323 | 37 | .000 |

Also the number of points for shots on goal increased from pre-test to post-test, (M=2.63) compared with (M=4.87); *T(df=37) = -11.32, p=.00, p<.01;*

**Table 3**. Total motivation score

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Mot_tot_T1-Mot_tot_T2 | -4.237 | 3.522 | .571 | -5.394 | -3.079 | -7.416 | 37 | .000 |

Total score of motivation has increased from pre-test to post-test (M=37.24) compare with (M=41.47); *T(df=37)= -7.41, p=.00, p<.01;*

**Table 4.** Total score autonomy - relatedness – competence

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | ARC_tot_T1 - ARC_tot_T2 | -7.737 | 5.336 | .866 | -9.491 | -5.983 | -8.939 | 37 | .000 |

*Also* total score at autonomy-relatedness-competence has increased from pre-test (M=56.47), to post-test (M=64.21); *T(df=37)= -8.93, p=.00, p<.01;*

**Table 5**. Total self-efficacy score

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | Aut_tot_T1 - Aut_tot_T2 | -9.105 | 4.567 | .741 | -10.606 | -7.604 | -12.291 | 37 | .000 |

Hence, total score of self-efficacy from post test (M=38.16), to pre-test (M=47.26); *T(df=37)= -12.29, p=.00, p<.01.*

**Table 6**. Inter-class differences time on pretest route

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| TIME_ TRAIL1 | Equal variances assumed | .802 | .376 | 2.544 | 36 | .015 | 6.150 | 2.417 | 1.247 | 11.053 |
| | Equal variances not assumed | | | 2.491 | 29.086 | .019 | 6.150 | 2.469 | 1.102 | 11.198 |

**Table 7**. Inter-class differences time on route, post test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| TIME_ TRAIL2 | Equal variances assumed | 3.751 | .061 | -1.468 | 36 | .151 | -2.994 | 2.040 | -7.133 | 1.144 |
| | Equal variances not assumed | | | -1.442 | 30.316 | .160 | -2.994 | 2.077 | -7.235 | 1.246 |

Testing athletic performance between the 2 classes, according to the results the 8th students taken on average lower on the trail (M=47.35), compared with students from 6th (M=53.50), tested at pre-test; *T(df=36)= 2.54, p=.015, p<.05;* but, we observed at post-test, that 6th students had a better average time on the trail.

**Table 8**. Inter-class differences in shots on goal pre-test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| THROW 1 | Equal variances assumed | .299 | .588 | -1.595 | 36 | .119 | -.778 | .488 | -1.767 | .211 |
| | Equal variances not assumed | | | -1.593 | 35.417 | .120 | -.778 | .488 | -1.768 | .213 |

Also a higher score for shots on goal (M=5.35), compared to their peers in grade 6th (M=4.33); *T(df=36)= -4.35, p=.00, p<.01.*

**Table 9.** Differences in shots on goal

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| THROW 1 | Equal variances assumed | 1.631 | .210 | 2.704 | 36 | .010 | 1.249 | .462 | .312 | 2.186 |
| | Equal variances not assumed | | | 2.665 | 32.080 | .012 | 1.249 | .469 | .295 | 2.204 |

Due to some variables that we did not test, not being the purpose of our study, we found that male students on average score higher in shots on goal (M=3.19), compare to female students (M=1.94); *T(df=36)=2.70, p=0.010, p<.05.*

## DISCUSSION

Following the results obtained, we can generate the following discussions in relation to the literature. Testing the hypotheses 1.1 şi 1.2 shows that students improved their motor skills as a result of participating in the intervention. Students motor skills are directly associated with their participation in physical education lessons or movement activities (Okely, 2001). If childrens will practice motor activities will contribute to their physical and motor development (Chen W. H.-B., 2017). Motor skills were improved in the introductory part of the lesson, so the curriculum did not suffer. The characteristic of the introductory part have been kept, adding elements from sports games. Exercise programs in physical education can provide positive developments in motor and technical skills (Kahraman, 2023).

Testing the hypotheses 2.1, 2.2 we found that the total variable score improved post intervention. Perceptions of competence, autonomy and relatedness, self-determined motivation, enjoyment and physical activity in physical education directly or indirectly predict free-time physical activity (Cox A. E., 2008). Variables may improve as a result of introducing elements of sports games into the lesson, their playfulness may influence students' willingness to actively participate in the lesson.

Then we measured the differences in motor level between the two classes, obtaining better pre-test values for the 8th students. They completed the trail in an average of 47.35 seconds compared to 53.50 for the 6th graders. But at post-test , students in grade 8 showed very little improvement in their results (45.05), compared to the significant improvement of 6th graders (42.06). This again supports the hypothesis that students' motor skill levels are directly associated with their participation in physical education lessons or movement activities (Okely, 2001).

The last hypothesis tested supports the fact that male students have a higher level of motor skills than female students, scoring an average of 3.19 points when shooting at the goal, compared to girls who scored an average of 1.94. These results are in line with Moreno-Briseño (2010) which investigating the level of motor skills by gender, specifically throwing accuracy.

## CONCLUSION

The playfulness of the physical education lesson can significantly influence the active participation of students in the physical education lesson. According to the results, we can observe that the scores of the tested variables measuring students involvement and motivation in the physical education lesson improved after the intervention. Motor skills as measured by time on the trail and the number of cumulative points in shots on goal also improved. This shows a correlation between student engagement and student performance in the sample on which the intervention was applied. Also the motor ability of the 6th students exceeded that of the 8th graders in post-intervention. From this we can conclude either that the 6th grade students have a higher motor capacity than the 8th grade students, or that the programme we implemented is better suited to the 6th grade students than to the 8th grade students, or that we did not rationalize and standardize the exercises correctly for the 8th grade students.

### Study limitations

Our study has a number of limitations including:a study design with low research conclusiveness as we have no control group. Also fragmentation of the intervention program on the part of some of the students involved in the study due to health or personal reasons. We could not subject students to an adaptive program for our intervention, so the statistically significant effects may be due to some extent to the learning effect, not entirely to the quality of the intervention.

According to the results, the higher grade students score better on the pre-test, but the values equalize at the post-test. This shows the lack of correct rationalization and standardization of the exercises at the 8th grade level, which is a limitation of the study.

### Future research directions

According to the results obtained by testing the first two hypotheses, we can observe that there is a correlation between the time on the course and the number of points for shots on goal. These two variables are related to the improvement of motor skills, the other variable being the time to implement the intervention. A future research direction could be to what extent, but also up to what level, the number of hours of physical education correlates with motor skill improvement. It is well known that from the stage of consolidation of motor skills, one lesson per week is no longer sufficient to progress to mastery stage.

Also a future direction of research could be the problem reported at the pre-test level between classes, i.e. older students score better, but at the post-test the results are reversed. Is this due to a rationalization, standardization of the exercises not adapted to the potential of the class or due to other variables?

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