
Intervention program in childhood education for physical fitness work

Programa de intervención en educación infantil para el trabajo de la condición física

在儿童教育中体育锻炼的干预计划

Программа вмешательства в детское воспитание для физкультурно-оздоровительной работы

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Fechas · Dates

Recibido: 2020-03-06

Aceptado: 2020-06-06

Publicado: 2020-06-31

Cómo citar este trabajo · How to Cite this Paper

Lirola, M., J., & Hernández-Rodríguez, A. I. (2020). Intervention program in childhood education for physical fitness work. *Publicaciones*, 50(1), 385–394. doi:10.30827/publicaciones.v50i1.15993

Abstract

One of the main causes of coronary, respiratory and metabolic diseases among others, in today's society, is sedentary life. Sedentarism comes from the high rate of abandonment of physical-sport practice in the period of adolescence. The consolidation of healthy habits from an early age, including the daily practice of physical activity, is essential to improve adherence over time. The main objective of this study was to carry out a motor intervention program in an infant education class in order to improve their physical condition-health. Nineteen infants (10 boys, 9 girls) aged 3 years participated in this study. The intervention was conducted over a period of 6 weeks. Families were also made aware about the importance of physical activity. Anthropometric variables of height and weight were measured, as well as physical condition variables such as speed and long jump, before and after the intervention. The Kolmogorov-Smirnov test revealed the normality of the sample which allowed a comparison of means with Student's *t*-test. The results obtained in the physical tests reveal that the physical condition of the participants improved ostensibly, although this improvement was only statistically significant in the case of the 4x10 test. Nevertheless, the work in this line shows a positive tendency towards the improvement of the physical condition-health, thus education professionals are expected to continue working in this direction.

Keywords: motor skills; sedentary lifestyle; improved physical condition; infant education

Resumen

Una de las principales causas de enfermedades coronarias, respiratorias y metabólicas entre otras, en la sociedad actual, es el sedentarismo. El sedentarismo viene de la mano de la alta tasa de abandono de la práctica físico-deportiva en el periodo de la adolescencia. La consolidación de unos hábitos saludables desde edades tempranas, entre los que se incluye la práctica diaria de actividad física, es de gran importancia para mejorar su adherencia en el tiempo. El objetivo principal de este estudio fue realizar un programa de intervención de motricidad en una clase de educación infantil con la finalidad de mejorar su condición física-salud. Participaron en este estudio 19 infantes (10 niños, 9 niñas) de una edad de 3 años. La intervención se realizó durante un periodo de 6 semanas en la que también se llevó a cabo un trabajo de concienciación en las familias sobre la importancia de la práctica de actividad física. Se midieron variables antropométricas de talla y peso, y variables de condición física como la velocidad y el salto de longitud, antes y después de la intervención. La prueba de Kolmogorov-Smirnov reveló la normalidad de la muestra lo que permitió realizar una comparación de medias con la prueba *t* de Student. Los resultados obtenidos en las pruebas físicas revelan que la condición física de los participantes mejoró ostensiblemente, aunque esa mejora solo fue estadísticamente significativa para el caso de la prueba de 4x10. No obstante, el trabajo en esta línea muestra una tendencia positiva ante la mejora de la condición física-salud por lo que los profesionales de la educación deberían seguir trabajando en esta dirección.

Palabras clave: motricidad; sedentarismo; mejora condición física; educación infantil

概要

久坐的生活方式是当今社会冠心病, 呼吸道疾病和新陈代谢疾病的主要原因之一。在青春
期, 久坐的生活方式与体育和体育锻炼的高放弃率紧密相关。从小养成健康的习惯, 包括
每天进行体育锻炼, 对于降低随时间推进的上述相关率至关重要。这项研究的主要目的是
在儿童早期教育班中实施一项运动干预计划, 以改善他们的身体健康状况。其中19名三岁

幼儿(男10名,女9名)参加了这项研究。在为期6周的干预期间,我们还开展了提高家庭对体育锻炼重要性认识的工作。在干预前后,分别测量身高和体重等人体测量学变量以及速度和跳远等身体状况变量。Kolmogorov-Smirnov检验揭示了样本的正态性,从而可以用Student's t检验对均值进行比较。在体育测试中获得的结果表明,参与者的身体状况改善显著,虽然这种改善仅在4x10检验中表现出统计学意义。关于这方面的工作显示出面对身体健康状况改善方面的积极趋势,因此教育专业人员应继续朝这个方向努力。

关键词: 运动技能; 久坐的生活方式; 改善的身体状况; 婴儿教育

Аннотация

Одной из основных причин ишемической болезни, болезней дыхательных путей и обмена веществ, среди прочих, в современном обществе является сидячий образ жизни. Седентаризм обусловлен высоким уровнем отказов от физкультурно-спортивной практики в подростковом возрасте. Закрепление здоровых привычек с раннего возраста, включая ежедневную физическую активность, имеет большое значение для улучшения их соблюдения с течением времени. Основной целью данного исследования было проведение программы моторного вмешательства в дошкольной группе с целью улучшения физического состояния - здоровья детей. В этом исследовании приняли участие 19 детей (10 мальчиков, 9 девочек) в возрасте 3 лет. Программа проводилась в течение 6 недель, в течение которых также проводилась работа по повышению осведомленности семей о важности физической активности. Антропометрические переменные высоты и веса, а также переменные физического состояния, такие как скорость и прыжок в длину, измерялись до и после вмешательства. Критерий Колмогорова-Смирнова выявил нормальность распределения выборки, что позволило сравнить средние значения с помощью t-критерия Стьюдента. Результаты, полученные в физических тестах показывают, что физическое состояние участников значительно улучшилось, хотя это улучшение было только статистически значимым для теста 4x10. Однако работа в этом направлении показывает положительную тенденцию в плане улучшения физического состояния - здоровья, поэтому специалисты в области образования должны продолжать работать в этом направлении.

Ключевые слова: двигательные навыки; малоподвижный образ жизни; улучшение физического состояния; воспитание детей

Introduction

Physical condition is considered a health indicator whether for children, adolescents or adults. In this sense, low levels of physical fitness at early ages have been associated with an increased risk of developing cardiovascular disease, overweight/obesity, mental disorders and bone problems at older ages (Ruiz et al. 2009; Ortega, Ruiz, Castillo, & Sjöstrom, 2008). In line with these findings, Ortega, Silventoinen, Tynelius and Rasmussen (2012) analyzed a sample of more than one million Swedish adolescents and found that those with low muscle strength had a higher risk of mortality. Furthermore, in a recent systematic review (Lang et al., 2018), it examined the relationship between physical condition and health indicators for children and adolescents (including preschool children aged 5). Although few studies were found in preschoolers ($n = 5, 3.5\%$), the results showed significant associations between cardiorespiratory fitness and health indicators.

The first years in the life of human being constitute a critical period both for their development (Gallahue & Donnelly, 2007) and for the development of physically active behaviour (Timmons et al., 2012). Taking into account the aforementioned, it is imperative to increase the physical activity level in preschool children, as well as the planning of adequate physical exercise programs. According to World Health Organization (WHO, 2014), an important public health message should be the idea of “investment” in physical activity. For this reason, didactic intervention in motor skills from an early age is necessary to increase the time of motor engagement and development of motor skills that would otherwise be impossible due to the rigid school time structure, because when spontaneous physical activity is reduced and sedentary behaviors are increased (Reilly et al., 2005), the promotion of organized and appropriate physical activity programs for the comprehensive development of the child seems to be necessary for this “investment” to be made. Considering the physical activity program promoted by Pérez-Pueyo et al. (2019), at a national and international level, we know that promotion of daily physical exercise in leisure time through these programs results in the generation of adherence to the habit itself, and among 2118 people who participated, a mean of 4.43 out of 5 was obtained when asked about the continuity of physical practice. On the other hand, it is of special interest to make families aware of the importance of physical activity and their participation in a healthy habits program for the proper development of their children. In order to know the process of our motor intervention, it is necessary to include physical condition tests in the children’s education stage, as a tool to examine the progress and results on physical condition in children from 3 to 5 years old. Due to the lack of studies in this educational stage, only one reference study is known to date, where a scale with cuts and different classifications is exposed, to know if the results of physical condition are normal values in relation to different tests of physical condition in the infant-education stage (Cadenas-Sanchez et al., 2019). These benchmarks are necessary for the classification of children according to their performance in basic motor skills, as well as for the early prevention of biological risk factors for non-communicable diseases (e.g., obesity, diabetes, cardiovascular diseases, etc.). Therefore, it is necessary to carry out studies in which intervention proposals are made in the motor area and the physical condition is evaluated at these ages in order to continue providing reference values in preschool children.

Regarding the measurement of physical condition we can find in the scientific literature different physical tests, in a systematic review carried out by Castro-Piñero et al. (2010), among a diversity of physical tests, they only found robust evidence on the validity of the use of the 20m round-trip test (i.e., course navette) to evaluate aerobic resistance, the hand grip test to evaluate muscular strength, and the measurement of skin folds and body mass index to estimate body composition. Nevertheless, the European Commission developed the AL-PHA project (Assessing Levels of Physical Activity and Fitness) with the aim of establishing a battery of valid and reliable tests for the assessment of health-related physical condition in children and adolescents (Ruiz et al. 2011). Despite the fact that many of the pathologies that appear in adulthood are associated with physical condition during the first years of life, most physical condition batteries adapted to children tend to recommend application from the age of 6 (Castro-Piñero et al., 2010), as in the case of the ALPHA Fitness battery which is not designed for ages corresponding to childhood education. Thus, based on this scientific evidence, and thanks to a multicenter project at the national level, the PREFIT battery is shown as an appropriate instrument to assess the physical condition related to health in children from 3 to 5 years (Cadenas-Sanchez et al., 2016).

PREFIT battery includes the evaluation of body composition, muscle strength, motor fitness and cardiorespiratory endurance through a series of simple tests that have demonstrated optimal levels of validity and reliability, in addition to having scientific evidence that relates them directly to the current and future health status of the child.

- Body composition: body mass index and waist circumference.
- Muscle strength: hand-grip test and long jump.
- Motor aptitude: 4 x 10 m test and monopodal balance test.
- Cardiorespiratory endurance: 20 m round trip test (course navette adapted).

When applying tests for the assessment of physical condition, it is important to take into account the age of the participants, as this will determine the methodology used for their application. The current curriculum for this stage (Organic Law on Education 2/2006, of 3rd May) proposes a globalised approach to psychomotor skills in which the assessment of physical condition makes full sense. In this context, it is reasonable to bet on working methods based on experiences, activities and games applied in environments of affection and trust (LOE, art. 14.6); which translates into the use of methodological resources such as songs, motor stories and motor circuits.

In this line, the main objective of this study was to measure the physical condition of 3-year-old children in order to improve their initial values through a didactic intervention during a period of 6 weeks in which the motor story was used to work on the speed, strength and intra- and inter-muscular coordination of the lower body, as well as to activate the 3-year-old student during their school day, looking for some improvement in BMI. Later, the variables measured would be analyzed again in a second time or post-test.

Method

Participants

This study involved 19 infants (10 boys and 9 girls) in a three-year-old education class. In the pre-test the ages ranged from 3 years 2 months to 3 years 11 months ($M_{\text{age}} = 3.6$, $SD = .03$) and in the post-test from 3 years 4 months to 4 years 1 month ($M_{\text{age}} = 3.7$, $SD = .03$).

Instruments

Various tests extracted from the PREFIT Battery (Ortega et al., 2015) were used:

- Weight: The child will be placed on a scale barefoot, with their head raised in front of them and their arms stretched out along their body, thus their body weight will be measured.
- Size: As above, the child will be barefoot and the upper back will be joined to the measuring rod so that the measurement is taken from the heels to the top of the head.

- Jump from length to foot together: Measure the muscle strength of the lower body. This test is performed with the feet together behind a line and the jump is made without separating the feet forward.
- Motor skills: This test measures the child's speed, agility and coordination. The child will run back from side to side as fast as possible, covering a distance of 10 metres on four occasions (4x10).

Procedure

Authorisation was requested from the school's Management Board to carry out the tests and the intervention with the children in the three-year course of infant education. The Teaching Staff, families and students were informed of the tests and the period in which they were to take them, in order for them to wear comfortable sportswear and suitable footwear on the day of the application of the tests and on the days of the intervention. The informed consent of the parents/legal guardians for the participation of the students was collected. From the 25 possible participants, only 19 were granted permission, and the first data collection was subsequently organized. Just before the measurements were taken, a fantasy story based on Cofito and his adventures on Lipid Island was told with the aim of encouraging the children to make the tests more attractive to them. More information about this strategy has been published in other works (Cadenas-Sánchez et al., 2014; Cadenas-Sánchez et al., 2016). Thus, the intervention was organized as follows:

The evaluation was carried out in 2 sessions of 1 hour, as described below:

- Time 1 (Pre-test). Before the intervention, different tests were carried out to find out their physical condition and health (see section on measuring instruments).
- Time 2 (Post-Test). The group carried out the same tests at the end of the intervention (post-test).

Consequently, the following quasi-experimental pre-post design has been applied without a control group:

1. Pre-test administration.
2. Intervention program. A didactic intervention was carried out in which motor plays were worked on twice a week for 6 weeks.
3. Administration of the post-test.

In this type of design the mean obtained by the group in the pre-test is compared with the mean of the post-test of the same group. Therefore, to check the effectiveness of the intervention program, the results obtained in the evaluations made to the students before and after the interventions were compared. The quasi-experimental design of pre-post groups without a control group, with before-after measures, is a design that guarantees us adequate internal validity. In contrast to an experimental design, the groups are not created randomly, they are natural groups and, therefore, possible extraneous variables are not controlled.

Data analysis

First, the descriptive statistics of the sample were analyzed, including, age, gender, weight and height, calculating with these last two variables the BMI. Subsequently, a bivariate correlation analysis was performed between the variables under study (BMI and results of the jumping and speed test). Next, in order to analyze the possible significant differences between the data obtained in the pre-test and post-test, the Kolmogorov-Smirnov test was performed to reveal the normality of the sample. Finally, different mean comparison analyses were performed using the Student *t*-test.

Version 24 of the SPSS statistical programme was used for data analysis and processing.

Results

Descriptive statistics and correlation analysis

Table 1 shows the descriptive statistics of the different variables analysed. Pearson's correlation analysis showed in both Table 1 and Table 2 a significant and negative correlation between the speed test and the long jump, revealing that the more time invested in the performance of the 4x10 the shorter the distance achieved in the long jump. For the other BMI tests there was no significant level of relationship.

Table 1

Descriptive Statistics and Correlations between Variables (Pre-test)

	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	1	2	3
1. BMI	16.51	1.10	1.04	.72	-	.19	-.27
2. Speed 4x10	19.39	2.30	.37	.79		-	-.56*
3. Long jump	56.11	18.48	-.60	-.90			-

Note.* $p < .05$

Table 2 shows the descriptive statistics of the different variables analysed during the second time.

Table 2

Descriptive Statistics and Correlations between Variables (Post-test)

	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	1	2	3
1. BMI	16.46	1.11	1.15	.86	-	.14	-.20
2. Speed 4x10	17.01	1.40	-.67	-.51		-	-.69**
3. Long jump	66.42	22.21	.12	.44			-

Note.** $p < .01$

Sample normality test

The Kolmogorov-Smirnov test revealed that all variables in this study had a normal distribution of data with significance $>.05$.

Comparison of pre-test and post-test means

Table 3 shows the means of time 1 and time 2 for the different variables measured, as well as the degree of significance between the differences observed between one collection and another.

Table 3

Student t-test

	<i>M1</i>	<i>M2</i>	<i>t</i>	<i>df</i>	<i>p*</i>
1. BMI	16.51	16.46	.14	36	.891
2. Speed 4x10	19.39	17.01	-1.56	36	.000
3. Long jump	56.11	66.42	3.85	36	.128

Note. *M1*= Mean obtained from the pre-test; *M2*= Mean obtained from the post-test

Among the variables measured only the mean difference between the first and the second time after the intervention for the 4x10 speed test, is the one that has obtained a significant difference, improving the performance times in the second time.

Discussion and Conclusions

The objective of this research was to know the physical condition of a 3-year class of infant education and the didactic intervention from motor stories for the improvement of the variables related to physical condition. The results have provided preliminary evidence in which an improvement in all the measured variables is appreciated, being the significant change in the speed test 4x10. This test correlated significantly with the results obtained in the long jump test, which establishes a connection between both tests, reflecting that if there is an improvement in speed, there will also be one in the jump test. These results are in line with previous literature (Gallahue & Donnelly, 2007) where the development of a basic skill leads to the improvement of another.

Despite the results obtained in the current study, several limitations must be considered. The participants were selected by an intentional sampling, which means that the results obtained must be treated with caution and therefore avoid their generalization to the whole population. Therefore, future studies are required with a larger sample size that may allow another series of analyses to be performed, such as differences by gender. In addition, to have a control group. Along the same lines, new works should also examine other variables of physical condition and which are considered by the PREFIT battery (Ortega et al., 2015), such as resistance, or upper body strength in order to complete measurements in relation to physical condition and to contrast the results obtained from the rest of the tests in this research.

To conclude, the results provide preliminary evidence to consider the didactic intervention in motor skills as an instrument that acts with a positive character in the improvement of the physical condition from early ages, being observed in the research a significant improvement of the variable speed in only 6 weeks of intervention with motor stories. In addition, the tendency to improve in the rest of the variables of physical condition, even without reaching the level of significance, due to a certain extent to the number of participants in this study, can be appreciated. Current research provides encouraging results, but questions remain about the type, intensity, amount or frequency of physical activity required to improve children's health, as also pointed out by Venetsanou, Kambas, and Giannakidou (2015). Investing in developmentally appropriate physical activity and motor skills programs in the early years will contribute to improving the quality of life of today's children and future citizens of this world. If we follow the proposal of Sotelino, Mella and Rodríguez-Fernández (2019) we see how the intervention programmes that add to the future teachers of early childhood education (i.e., following a Learning and Service methodology from the universities) enhance the experience even more, benefiting not only the school and its students, but also undoubtedly improving the pedagogical training that university students receive. This research is proving to be of interest to teaching and health professionals.

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