Original Article

Effect of joint physical activity on the physical condition of parents and children

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ABSTRACT

Family physical activity can have beneficial effects on the physical condition of parents and children. Method: Uncontrolled longitudinal intervention study. 152 children aged 3 to 10 years (79 Boys: 5.60 ± 2.20 yr., 73 Girls: 6.90 ± 2.20 yr.) and 112 parents aged 30 to 40 years (36 Parents: 41.87 ± 4.45 yr.; 76 Mothers: 40.01 ± 2.96 yr.). They carried out 2 hours of joint activity on a weekly basis from October to June. Physical fitness was assessed by ALPHA-Fitness and PRE-FIT batteries at the beginning and end of the intervention. A descriptive analysis and a t-student for paired variables were performed. Results: The 3-6-year-old girls improved the Standing long jump (33.50 ± 10.61 vs 78.11 ± 8.64 cm) * and the 20 m shuttle run test (7.00 ± 2, 83 vs. 22.50 ± 0.71) *, (*p <0.05). Girls over 6 years of age decreased in Handgrip strength and 4x10 m shuttle run test (15.84 ± 1.21 vs 16.95 ± 83) * but improved in the 20 m shuttle run test (13.97 ± 5.48 vs 23.09 ± 7.49) *, (*p <0.05). The parents improved their BMI (25.04 ± 2.60 vs 24.19 ± 1.50)*, the right Handgrip strength (37.02 ± 10.25 vs 41.17 ± 9.57 kg)*, the Standing long jump (156.17 ± 31.48 vs 181.00 ± 28.82 cm)*, 4x10 m shuttle run test (12.95 ± 1.30 vs 12.11 ± 1.09 s)* in the 20 m shuttle run test (37.90 ± 20.43 vs 54.20 ± 9.51 turns)*, (* p <0.05). Conclusion: A physical exercise based on joint family activity produces improvements in some variables related to the physical condition of the girls and in the parents. Implication: Parents should exercise and plan family sports activities if they want their child to be active. **Key words:** SPORT, CHILDHOOD, FAMILY, PARENTS, PHYSICAL TEST.

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INTRODUCTION

There are many reasons, both physical and psychological, for encouraging physical activity in children (Fedewa, & Ahn, 2011). In childhood and adolescence, high levels of cardiorespiratory fitness and a suitable body composition are associated with future healthier cardiovascular profile and a lower risk of death (Janssen, & LeBlanc, 2010), while improvements in muscle strength are negatively associated with overall adiposity (Ruiz, Castro-Piñero, Artero et al., 2009).

Although there is consensus on these benefits, in the western world children's physical activity is decreasing (Metcalf, 2010). In Spain, only 48% of the young people between 6 and 18 years old do at least 60 minutes of daily physical activity and 49% of the girls and 37% of the children do not practice any sport during their free time (Román, Serra-Majem, Ribas-Barba et al., 2008). The indicator of child physical activity in Spain is cataloged at the -D level (physical exercise from 21 to 40%) (Román et al, 2017). Therefore, in our country, the prevalence of overweight and obesity in children and adolescents is still very high (close to 40%), although in the period 2000-2012 it has stabilized (Sánchez-Cruz, Jiménez-Moleón, Fernández-Quesada et al. Al., 2013).

A strategy to promote child health is to increase the level of habitual physical activity, from sedentary lifestyle to moderate intensity and from moderate to vigorous intensity, so children should be as active as possible (Aznar, & Webster, 2006, FEMEDE, 2017). In order to improve and maintain levels of efficient physical activity, the immediate family environment (father, mother, brothers and sisters) is a strong influence on children's physical activity levels and other health-related behaviors (Sallis, Prochaska, & Taylor, 2000), reflecting the importance of family support for children and adolescents to be less sedentary and more physically active.

Possible mechanisms for the relationship between parents' levels of activity and children include the role of parents as the role model, the exchange of activities among family members, the support provided by parents to their children in relation to physical activity and genetically transmitted factors that predispose the child to increasing his levels of physical activity (Edwardson, & Gorely, 2010).

If parents have a positive attitude towards physical activity, they are more likely to provide a response and greater motivation to their children, who are more likely to be physically active in adulthood (Burke, Beilin, Durkin et al., 2006). It is possible to affirm that, with respect to physical activity behaviors, sedentary lifestyle, food intake and the environment in the home, parents are role models for their children who probably develop similar habits to those of their parents (Ogden, Carroll, Curtin et al., 2010).

However, although some studies indicate that moderate or vigorous physical activity in both parents is associated with increased physical activity in children (Fuemmeler, Anderson, & Mâse, 2011), others affirm that there is no relation between the time that parents and children spend on physical activity (Jago, Fox, Page et al., 2010), but there is a powerful association between the time of sedentary lifestyle of the girls and their mothers and the time of television consumption of parents and their children (Jago et al., 2010). According to Casimiro and Pieron (2001), the influence of parents on the sports practice of their children is significant ($p < 0.05$) in the primary school children by the practice of the father and very significant by the practice of the mother ($p<0.01$).

In order to combat childhood inactivity, many programs to promote physical activity are based on institutional school physical activity and out-of-school on demand, depending on availability, family resources, desires,

self-awareness, etc. There is some evidence that school-based physical activity interventions have a positive impact on duration of physical activity, television viewing, peak VO2, and blood cholesterol (Dobbins, Husson, DeCorby et al., 2013). But, in general, school-based interventions have little effect on rates of physical activity, systolic and diastolic blood pressure, body mass index, and heart rate. (Fiore, Travis, Whalen et al., 2006).

Therefore, given the limited effect of school activities on children's physical activity habits, interventions targeting school-age children should include strategies to increase parental support for physical activity and sports facilities, and to provide adequate support to correct this situation. (Loprinzi, & Trost, 2010).

The promotion of physical activity in the school environment should be based on programs that encourage more physical activity, such as 60 minutes of vigorous daily activity, intermittent, unsupervised, pleasant and involving a variety of activities, and thus obtaining more intense beneficial effects on the health and the behavior in the ordinary daily and typical circumstances of the child development (Corbin, Pangrazi, Beighle et al., 2004).

In addition to school physical activity, most out-of-school intervention studies have used supervised programs of moderate to vigorous physical activity for 30 to 45 minutes lasting 3 to 5 days per week (Strong, Malina, Blimkie et al., 2005). To increase physical activity levels, it may be fruitful to improve parental exercise (Fuemmeler et al., 2011). At present, studies are being carried out in which family physical activity is able to improve children sports initiation (Cueto-Martín, Morales-Ortiz, Burgueño, et al (2017).

In these out-of-school activities, many parents encourage the physical activity of their children by taking them to training, games and sports centers, encouraging them to play sports, paying sports fees, etc. But it is not uncommon for parents to be passive in observing their children. It would not only be necessary to increase the percentage of parents who encourage children to be active but also the percentage of parents who are active with their children and, conversely (percentage of children who encourage their parents to be active). But despite the benefits of family physical activity, there are hardly any studies in which the joint participation of parents and children with levels of intensity sufficient to attain physical improvements is proposed. The objective of this study was to carry out a program of joint physical activity, of the children and parents, and to evaluate some musculoskeletal, motor and aerobic capacities of the participants to determine the program influence over the physical condition of both.

MATERIAL AND METHODS

Design

Non-controlled longitudinal intervention study, non-selected participants, with pre and post intervention measures. At the beginning, the baseline of the basic physical qualities was determined in order to know the value of the indicators at the moment of the intervention**.**

Participants

152 children (79 children of 5.6 ± 2.2 years, 51.97%, 73 girls of 6.9 ± 2.2 years, 48.02%) and 112 parents (36 parents of 41.9 ± 4, 5 years, 32, 14%, 76 mothers 40.0 ± 3 years, 67.85%).

Depending on the age of the boys and girls, they were divided into two groups (Table 1). To accompany their children in the activities, the parents were distributed selectively in each group. In the group of 3-6 years, 65 parents participated, while in the 3-6 years group, 47 participated.

The range of children per family was 1-3 children. In the 3-6-year age group, the mean number of children per family was 1.18. In the group of more than 6 years, it was 1.59. There was only one family with three children. Mothers accounted for 67.85%.

Table 1. Children. Age at the beginning of the program

	3-6 years old				> 6 years old		
	n	Age (M ± DS)			n	Age (M ± DS)	
Boys	46	4.07 ± 0.90	Fathers 22	Boys	33	6.78 ± 2.22	Fathers 14
Girls	31	4.20 ± 0.75	Mothers 43	Girls	42	8.27 ± 0.97	Mothers 33
TOTAL	77	4.14 ± 0.83	65	TOTAL	75	7.53 ± 1.59	47

(Mean ± Standard Deviation)
The identified data is referred to at the beginning of the study.

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All participants continued their school, extracurricular activities, work and recreational activities without limitation.

The study was approved by the Human Research Ethics Committee of the University of Granada (application 322/2015). The parents signed an informed consent that explained the objectives and tests of the study as well as the methodology to be developed. Likewise, the authorization for the publication, reproduction and dissemination of the data on paper and the Internet was obtained.

Inclusion criteria

1. Participants reported being healthy, carrying out their school activities normally and / or not being on sick leave.
2. They stated that they did not suffer from any disease that could be incompatible with the practice of physical activity.
3. No participant was taking medication for a chronic condition.
4. There is no physical activity limitation outside this study.

Recruitment

Participants accessed the program through information that they obtained through audiovisual media, social networks, printed material and verbal transmission from person to person.

Chronology

The activities took place during the school year 2015-16 from September to June, at the rate of 2 hours each week (figure 1).

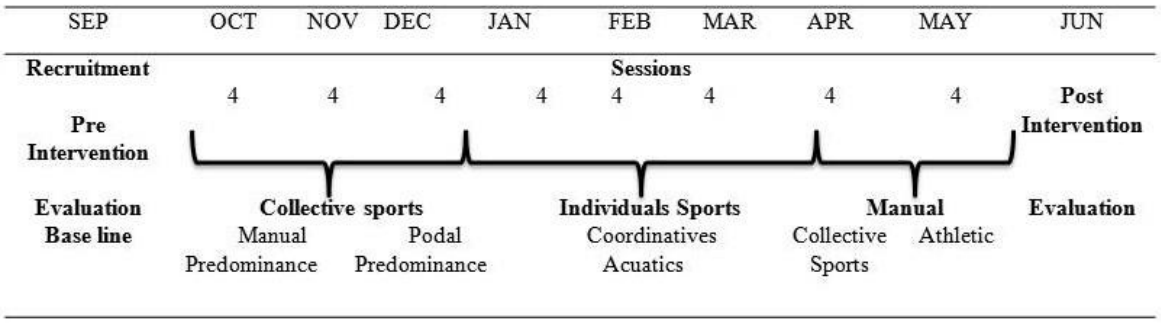

Figure 1. Schedule of activities.

There were 32 sessions with a total duration of 64 hours. 8 sports activities were practiced. Every 4 sessions (8 hours) a different sport was practiced. It began with 12 sessions of manually (handball, basketball) and foot (football), predominant collective sports and followed with sessions of individual sports with group training, (wrestling, rhythmic and artistic gymnastics and swimming), ending with 4 sessions of a collective sport (volleyball) and 4 sessions of one individual (athletics).

Development

The methodology was based on a mixed strategy with the practice of games to improve technique and tactics, performing real game and competition. There was no difference in motor patterns in relation to sex. Children and parents always performed the same activities together.

At the beginning of the sessions, the objectives, methodology and activities to be carried out were explained. These were adapted to the age and motor skills of children. Parents always adopted the role of the participants.

The number of children and adults in the activities of the sports team were compensated so that the level of activity of the parents would not be reduced.

Evaluation

Pre- and post-intervention evaluations used PRE-FIT and ALPHA-Fitness batteries. It was carried out at the beginning (October 2015) and at the end of the program of activities (June 2016).

The PRE-FIT battery (Ortega, Cadenas-Sánchez, Sánchez-Delgado and others, 2015, Ortega, Ruiz, Chillon et al., 2016) is validated for children between 3 and 5 years old. Includes assessment of:

1. Body composition: Body weight, height, Body Mass Index (BMI) and waist circumference.
2. Musculoskeletal Ability: Determined bilateral Handgrip strength and Standing broad jump.
3. Motor capacity: Speed and agility 4x10m shuttle run test.
4. Aerobic capacity: 20 m shuttle run test.

Both at the pre and post-intervention stages, measurements of the variables that compose the body composition and those that integrate the musculoskeletal capacity were performed, except for the long jump with feet together that was measured three times. The 20 m shuttle run test was measured only once.

The ALPHA-Fitness battery (Ruiz, Castro-Piñero, Spain-Romero et al., 2010, Ruiz, Spain-Romero, Castro-Piñero et al., 2016) is validated for children older than 6 years. Some of the tests included in this battery can also be used in adults (Leger, Mercier, Gadoury et al., 1988).

Includes assessment of:

1. Anthropometric component: Body weight, height, Body Mass Index (BMI) and waist circumference.
2. Muscle component: Standing long jump Test as an indicator of the strength of the lower limbs.
3. Motor component: Speed and agility 4x10m shuttle run test. As an integrated indicator of the speed of movement, agility and coordination of the subject.
4. Cardiorespiratory component: 20 m shuttle run test.

At both the pre and post intervention stages, two measurements of each test were performed; and the 20 m shuttle run test only once.

Protocol

The instructions in the PRE-FIT battery manual were followed: Assessment of fitness in Preschoolers and the ALPHA-Fitness Battery Instruction Manual.

Body weight and height: participants were weighed without footwear. The portable electronic scale OMROM HBF-500INT was used, with resolution 0.100 kg. Height was measured with a stadiometer (SECA 206).

Waist circumference: measured with an inelastic anthropometric tape (W606PM, Lufkin, US).

Standing long jump Test: It consisted of jumping with the feet together and with arm movement (without a run up) the greater horizontal distance possible. The distance reached is the measurement between the heel of the back foot and the starting line.

4x10 m shuttle run test: It consisted of running back and forth between two lines of 10 m, carrying 3 sponges in turn in the shortest possible time. The total distance was 40 m.

20 m shuttle run test. It consisted of running between two lines separated by 20 m in two directions, round trip. The race pace is determined by a sound signal. The initial velocity is 8.5 km / h-1 and is increased by 0.5 km / h-1 with intervals of 1 minute, called stages. The subject must step behind the 20 m line at the moment when the beep is emitted. The test ends when the subject stops when fatigue is reached or when after two consecutive times the subject fails to step behind the line before the sound of the beep. The aerobic performance was expressed in number of turns, that is, the number of times the participant performs the complete course of 20 m (1 lap = 20 m).

Sequence of tests

The tests were performed between 17.30 and 19.30 h. The sequence was as follows:

1. Weight and height (BMI).
2. Waist circumference.
3. Right Handgrip strength, followed by left Handgrip strength.
4. Standing long jump test.
5. 4x10 m shuttle run test.

6. 20 m shuttle run test.

Analysis

For the analysis of data, the average value was used in the morphological component tests and the highest performance in the other tests.

We performed an analysis of the descriptive variables and a t-Student analysis for paired variables. All statistical analyzes were performed using the statistical package for the Social Sciences (SPSS, v. 20.0 for Windows) and the level of significance was set at 0.05.

RESULTS

In girls aged 3-6 years, there were significant improvements in all physical fitness variables, except for the velocity and agility 4x10 m shuttle run test in which the improvements were not significant (Table II). Girls' starting values were lower than those of boys and they took longer in the Speed and agility test. The most significant improvements were in the Standing long jump (Figure 1) and in the 20 m shuttle run test (Figure 2). No significant changes in any of the variables were found in the children (Table II).

Table 1I Physical condition of children.

	BMI	Waist circumference (cm)	Right Handgrip strength (kg)	Left Handgrip strength (kg)	Standing long jump (cm)	4x10m shuttle run (s)	20 m shuttle run (laps)
				3-6 YEARS OLD. PREFIT BATTERY			
				BOYS			
PRE	16.91±1.27	53.21±2.36	4.48±2.29	4.28±2.54	68.76±21.53	17.74±1.24	16.95±5.60
POST	16.52±1.20	54.44±3.61	6.80±3.97	7.00±4.09	78.50±31.13	18.34±4.22	20.63±11.50
				GIRLS			
PRE	14.28± 0.38	50.33±0.81	**3.93±0.25***	**3.73±1.03***	**33.50±10.61***	21.07±2.16	**7.00±2.83***
POST	14.27±0.36	51.13±2.30	**6.40±0.56***	**5.71±0.93***	**78.11±8.64***	18.13±1.42	**22.50±0.71***
				> 6 YEARS OLD. ALPHA-FITNESS BATTERY			
				BOYS			
PRE	18.73± 2.06	61.08±9.85	10.97±8.88	11.99±6.76	108.42±35.38	14.45±1.79	29.50±18.21
POST	19.06±2.82	61.48±7.07	13.30±8.28	13.24±7.52	104.17±27.68	15.74±2.46	33.17±12.94
				GIRLS.			
PRE	16.01±2.27	**64.07±4.61***	**10.60±2.32***	**9.33±1.84***	92.12±17.66	**15.84±1.21***	**13.97±5.48***
POST	15.87±2.46	**57.05±1.92***	**6.86±2.96***	**6.49±2.59***	85.33±17.43	**16.95±1.83***	**23.09±7.49***

(Mean ± Standard Deviation) *p<0.05.

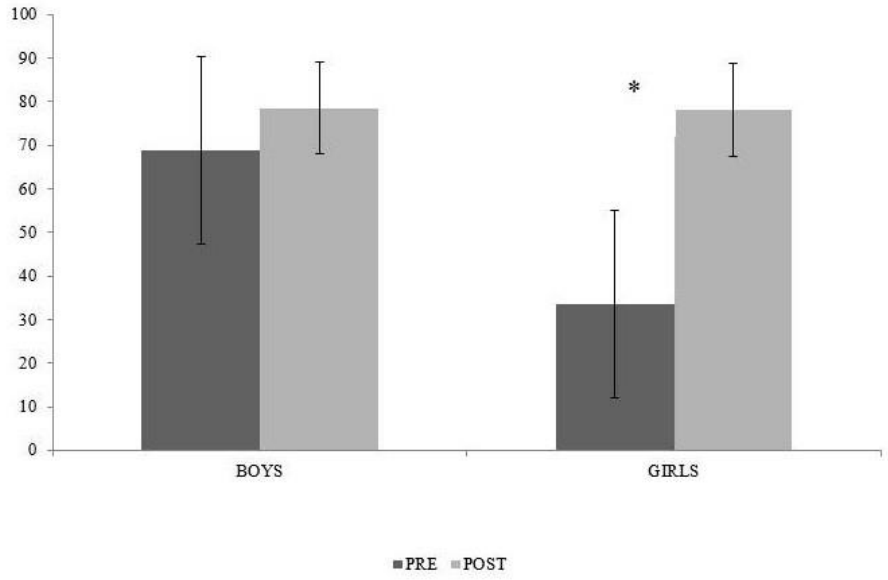

Figure 2. **3-6 years old. Standing long jump test (cm).** ****p<0.05.***

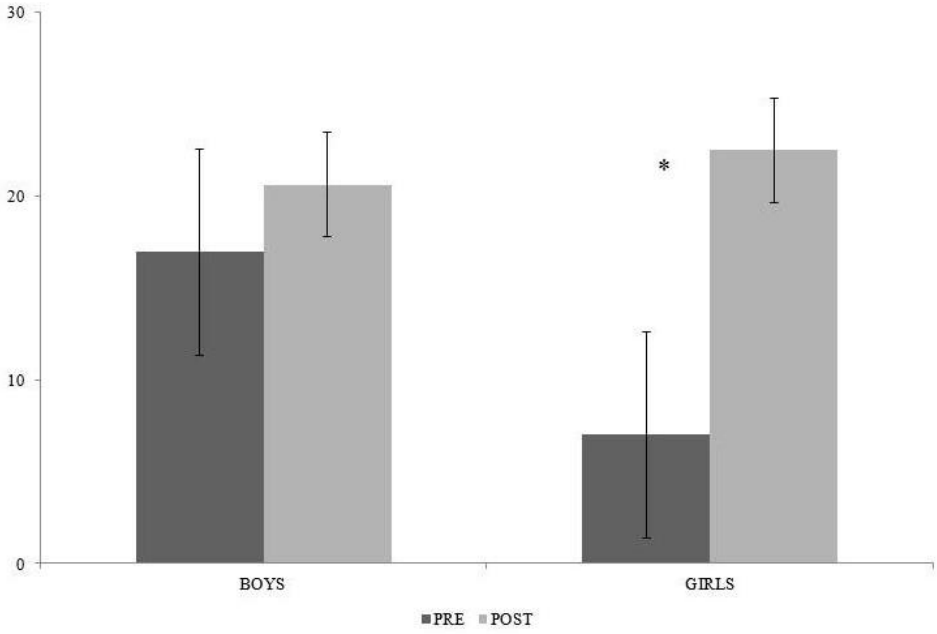

Figure 3. **3- 6 years old. 20 m shuttle run test (laps).** ****p<0.05.***

In girls over 6 years of age, there was a significant disimprovement of the variables related to strength (Handgrip strength and Standing long jump) and improvements in the waist circumference and aerobic capacity (Table II, Figure 3).

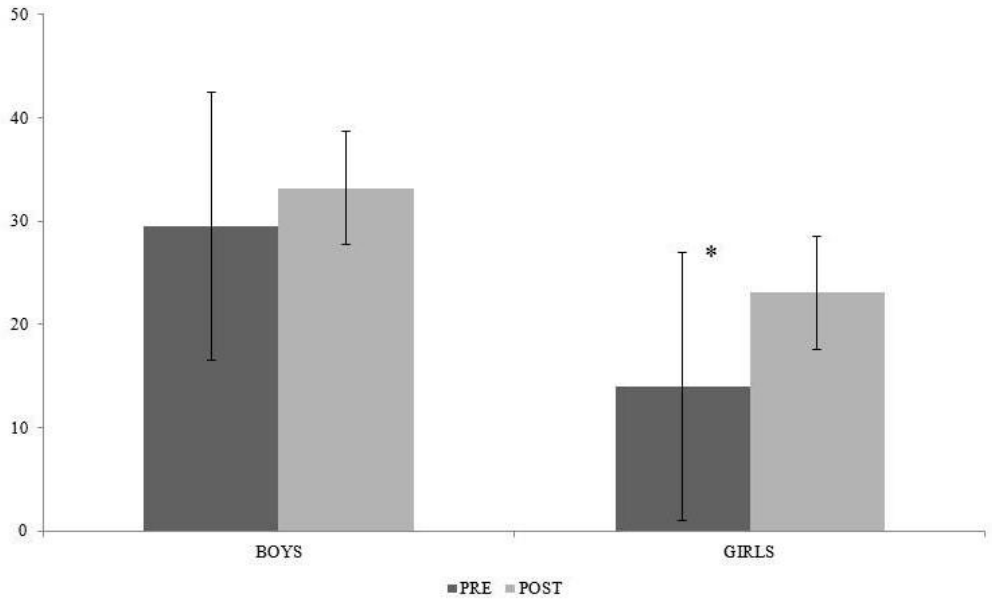

Figure 4. Participants over 6 years old. 20 m shuttle run (laps). *p<0.05.

In mothers, all variables related to physical abilities improved significantly. In the parents there was a significant decrease in BMI, and significant improvements of the Standing long jump, the velocity and the aerobic endurance capacity determined in the 20 m shuttle run test (Table III).

Table 1II Physical condition of parents.

	BMI	Waist circumference (cm)	Right Handgrip strength (kg)	Left Handgrip strength (kg)	Standing long jump (cm)	4x10m shuttle run (s)	20 m shuttle run (laps)
				MOTHER			
PRE	23.97±2.76	78.97±5.60	**28.73±3.73***	**29.30±3.79***	**130.80±22.01***	**13.90±0.98***	**25.90±16.74***
POST	23.38±1.59	78.60±5.80	**33.73±1.96***	**32.73±4.74***	**157.38±22.30***	**13.26±0.55***	**39.00±17.56***
				FATHER			
PRE	**26.03±2.10**	92.89±7.36	44.73±8.60	42.99±6.55	**178.09±18.27***	**12.05±0.90***	**47.67±15.70***
POST	**24.94±0.97***	89.70±2.95	46.13±9.42	40.76±7.91	**196.75±20.79***	**11.34±0.56***	**64.33±13.12***

(Mean ± Standard Deviation) *p<0.05.

DISCUSSION

There are numerous studies that relate parents' physical activity to that of their children and it is accepted that physical activity performed by the parents, father's occupation and ethnicity are significantly related to the frequency of exercise of the children, especially for girls (Gustafson, & Rhodes, 2006).

According to our results, joint physical activity of parents and children can improve some of the variables that are related to the physical condition of the girls, to maintain that of the boys and to improve those of the parents. For that to happen, the tasks carried out must produce an adequate motivational climate between parents and children that is key for children to remain psychologically involved in sports practice and the parents involved with sufficient intensity or effort to produce appreciable physical improvements (Ames, 1999).

There was no statistical improvement in the physical qualities of the boys (Table II), while in girls there were significant improvements in both groups studied. However, the initial values of the girls were lower than those of the boys and, even with the best results observed, their values in the evaluation after the intervention were lower than the boys.

The girls aged 3 to 6 years improved in all motor qualities evaluated except for speed and agility 4x10 m in which, although there was improvement, this was not significant, while in girls older than 6 years only the aerobic capacity determined in the 20 m shuttle run test was improved.

These results may be due to the girls' lower initial physical levels than the boys, to the fact that the girls adapted better to the proposed physical tasks or that they could better identify with the motor tasks employed. However, this observation is not a negative factor since the strengthening of girls' physical activities can improve their adherence to sports activities in the long term (Spessato, Gabbard, Valentini et al., 2013).

The motor capacity of speed and agility 4x10 m does not show significant differences in the younger girls and worsens among the older girls. Since our goal is not to improve performance but rather the knowledge of various motor tasks, we need a gradual learning that could be to the detriment of speed and agility, but in the future some motor activities could be planned in order to improve this aspect. These values coincide with those observed by Ortega, Artero, Ruiz et al., (2011) who determined a greater physical ability in boys, except in the flexibility test, a trend toward greater physical capacity in boys as their age increases and more stable levels of fitness in girls throughout growth.

Our results indicate that it is the parents who obtain the most remarkable improvements in their physical condition. In the parents there is an increase in the Standing long jump with feet together, the speed and agility 4x10 m shuttle run, 20 m shuttle run, as well as a decrease in body mass index. This is very useful to obtain a better physical condition since it is proven that to have better levels of physical condition is associated with a greater tendency to a body weight within normal parameters (Gálvez, Rodríguez, Rosa et al., 2014).

In mothers, in addition to the indicated improvements, an improvement of the musculoskeletal capacity is produced by increase in Handgrip strength and in Standing long jump with feet together. This result has special relevance because the grip strength of the hand has become a marker of nutritional status and is increasingly used as a variable result in nutritional intervention studies (Norman, Stobäus, Gonzalez et al., 2011; Cooper, Kuh, & Hardy, 2010).

One of the limitations of the present study is that the intervention was performed for 2 hours a week, but the authors believe that the programs of joint physical activity between parents and children carried out has reached a sufficient level of physical intensity to obtain the indicated improvements. The dose-response relationship of observational studies indicates that the greater the physical activity of children, the greater the health benefit (Fiore et al., 2006). But, the results of experimental studies indicate that in high-risk youth (e.g. obese), even modest amounts of physical activity may have health benefits (MacKelvie, Khan, Petit et al., 2003). In our participants there were no children with obesity and only the parents had a BMI of 26.03 ± 2.10 at the beginning of the study, which improved significantly at the end (24.94 ± 0.97).

In addition, the evaluation of the physical condition can be considered as an instrument that motivates the practice of physical activity and exercise, and it is necessary to relate the type of physical activity that children and adolescents do with the capacity to improve the basic conditional qualities.

In addition to the weekly frequency, in order to achieve substantive benefits, physical activity must be of at least moderate intensity, although activities of a vigorous intensity can provide an even greater benefit (Janssen, Katzmarzyk, Boyce et al., 2004). Activities based on aerobic exercise have a greater benefit to the general health of children, other than bone health which requires higher-impact physical activities (Veugelers, & Fitzgerald, 2005).

The improvements observed in fathers, mothers and daughters indicate that the intensity of the activities performed was appreciable but it was not for boys who, although they improved in some variables, these improvements were not significant. In the future it would be necessary to increase the intensity of the sessions specifically aimed at boys.

The improvements in physical condition and the body composition of fathers, mothers and daughters, demonstrate the importance of performing interventions to improve physical fitness, especially aerobic capacity, with emphasis on activities that are performed simultaneously by the whole family (Arriscado, Muros, Zabala et al., 2013). The physical activities proposed in our methodology are considered as extracurricular sports activities, which may represent a factor of equal physical activity opportunities for children of different socioeconomic levels. Therefore, in our society, more emphasis should be placed on the active role that parents should play in extracurricular sports activities as an easy and attractive means of promoting the physical fitness of both parents and children, facilitating family conciliation, the distribution of tasks between both parents, the prevention of episodes of abuse in sport and the inclusion of children with physical and mental limitations (Golle, 2015). In carrying out joint activities, the whole family promotes intergenerational and gender equality with non-sexist activities that favour participation (Spessato et al., 2013).

From the obtained results, we can deduce that our methodology seems to be efficient in the promotion of physical activity in order to improve the familiar physical condition and thereby to adopt patterns of physical activity maintained over a period of time. Coupled with a desirable increase in hours of school physical education and the promotion of educational programs focused on nutrition, they can be efficient measures to improve the health status of the population (Gálvez et al., 2014). At the minimum, a combination of joint physical activity, printed educational promotional materials and changes in school curriculum that promote family physical activity could have positive effects (Dobbins et al., 2013), although more research is needed on the long-term impact of these interventions.

In the future, not only the physical aspects of the family should be considered, but also the social aspects, since children with lower family income tend to have a less healthy physical condition and have higher risk of obesity than children with higher incomes (Jin, & Jones-Smith, 2015). Moreover, it would be necessary to evaluate the physical condition of the participants in these programs in relation to the place of residence, since sports clubs provide regular participation to children who live in urban areas and positively affect the development of their physical fitness (Golle, 2015). The information that could be obtained could help sport policies and programs aimed at improving the physical condition to reduce the risk of obesity among low-income families.

It would also be essential to consider variables from other domains (e.g., environment and behavior) to improve the knowledge of the factors that influence the relationship between parents and children and their influence on the physical condition of both. It would be interesting to homogenize the initial groups, to have a control group and to perform an exhaustive analysis of all school physical activities and their importance for the improvement of the parameters established in the batteries used.

CONCLUSIONS

The performance of joint physical activities by parents and children is effective in improving the aerobic capacities of girls. In the parents, there are improvements in BMI, in musculoskeletal, motor and aerobic capacities.

The involvement of parents in their children's activities not only has a beneficial effect on children's sports initiation, but also has a very positive influence on the physical condition of the parents.

CONFLICT OF INTERESTS

The authors have no financial or personal relationship that could lead to a conflict of interest in relation to the published article.

ETHICAL RESPONSIBILITIES

The procedures followed conformed to the norms of Clinical Research of the University of Granada and have been approved by the Human Research Ethics Committee of the same (application 322/2017).

REFERENCES

Ames, C. (1999). Achievement goals, motivational climate, and motivational processes. En G. C. Roberts (Ed). Motivation in Sport and Exercise. (pp.161-176). Champaign, IL: Human Kinetics.

Arriscado, D.; Muros, J. J.; Zabala, M., & Dalmau, J. M. (2013). Relationship between physical fitness and body composition in primary school children in northern Spain (Logroño). Nutr Hosp, 30(2), 385-394.

Aznar, S., & Webster, T. (2006). Actividad física y salud en la infancia y la adolescencia. Guía para todas las personas que participan en su educación. Ministerio de Educación. Madrid.

Burke, V., Beilin, L. J., Durkin, K., Stritzke, W. G., Houghton, S., & Cameron, C. A. (2006). Television, computer use, physical activity, diet and fatness in Australian adolescents. Int J Pediatr Obes, 1(4), 248-255. https://doi.org/10.1080/17477160600984975

Casimiro, A, J., & Pieron, M. (2001). La incidencia de la práctica físico-deportiva de los padres hacia sus hijos durante la infancia y la adolescencia. Apunts. Educación. Física y Deportes, 65, 100-104.

Cooper, R; Kuh, D., & Hardy, R. (2010). Objectively measured physical capability levels and mortality: systematic review and meta-analysis. Br .J. Sports Med, 341, c4467. https://doi.org/10.1136/bmj.c4467

Corbin, C. B.; Pangrazi, R. P.; Beighle, A.: Masurier, G. L., & Morgan, C. (2004). Physical activity for children, a statement of guidelines for children ages 5-12, National Association for Sport and Physical Education. An association of the American Alliance for Health, Physical Education, Recreation and Dance, Virginia.

Cueto-Martín, B.; Morales-Ortiz, E.; Burgueño, R.; Medina-Casaubón, J. (2017). MAMI DEPORTE®: Una Metodología Activa para la Mejora de la Iniciación al Deporte. Estudio preliminar. JSHR. 9(supl 1):121-128.

Dobbins, M.; Husson, H.; DeCorby, K., & LaRocca, R. L. (2013). School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. Cochrane Database Syst Rev, 2(2), 1- 262. https://doi.org/10.1002/14651858.CD007651.pub2

Edwardson, C. L., & Gorely, T. (2010). Parental influences on different types and intensities of physical activity in youth: A systematic review. Psychol Sport Exerc, 11(6), 522-535. https://doi.org/10.1016/j.psychsport.2010.05.001

Fedewa, A. L., & Ahn, S. (2011). The effects of physical activity and physical fitness on children's achievement and cognitive outcomes: a meta-analysis. Res Q Exerc Sport, 82(3), 521-535. https://doi.org/10.1080/02701367.2011.10599785

FEMEDE (2017) Plan Integral para la Actividad Física y el Deporte. Versión 1. Edad Escolar. Disponible en: http://femede.es/documentos/Escolarv1.pdf. (Acceso 01 junio, 2017)

Fiore, H.; Travis, S.; Whalen, A.; Auinger, P., & Ryan, S. (2006). Potentially protective factors associated with healthful body mass index in adolescents with obese and nonobese parents: a secondary data analysis of the third national health and nutrition examination survey, 1988-1994. J Am Diet Assoc, 106(1), 55-64. https://doi.org/10.1016/j.jada.2005.09.046

Fuemmeler, B. F.; Anderson, C. B., & Mâsse, L. C. (2011). Parent-child relationship of directly measured physical activity. Int J Behav Nutr Phys Act, 8(1), 17. https://doi.org/10.1186/1479-5868-8-17

Gálvez, C. A.; Rodríguez, G. P.; Rosa, G. A., et al (2014). Physical fitness level and its relationship with body weight status in school children. Nutr Hosp, 31(1), 393-400.

Golle, K. (2015). Physical fitness in school-aged children (Doctoral dissertation). University of Potsdam. Faculty of Human Science. Research Focus Cognition Sciences. Division of Training and Movement Sciences. Postdam. Germany.

Gustafson, S. L, & Rhodes, R. E. (2006). Parental correlates of physical activity in children and early adolescents. Sports Med, 36(1), 79-97. https://doi.org/10.2165/00007256-200636010-00006

Jago, R., Fox, K. R., Page, A. S., Brockman, R., & Thompson, J. L. (2010). Parent and child physical activity and sedentary time: do active parents foster active children? BMC public health, 10(1), 194-199. https://doi.org/10.1186/1471-2458-10-194

Janssen, I.; Katzmarzyk, P. T.; Boyce, W. F.; King, M. A., & Pickett, W. (2004). Overweight and obesity in Canadian adolescents and their associations with dietary habits and physical activity patterns. J Adolesc Health, 35(5), 360-367. https://doi.org/10.1016/S1054-139X(04)00058-8

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. Int J Behav Nutr Phys Act, 7(1), 40. DOI: 10.1186/1479-5868-7-40. https://doi.org/10.1186/1479-5868-7-40

Jin, Y., & Jones-Smith, J. C. (2015). Peer Reviewed: Associations Between Family Income and Children's Physical Fitness and Obesity in California, 2010–2012. Prev Chronic Dis , 12. E17. 140392. https://doi.org/10.5888/pcd12.140392

Leger, L. A.; Mercier, D.; Gadoury, C., & Lambert J. (1988). The multistage 20 metre shuttle run test for aerobic fitness, J Sports Sci, 6(2), 93-101. https://doi.org/10.1080/02640418808729800

Loprinzi, P. D., & Trost, S. G. (2010). Parental influences on physical activity behavior in preschool children. Prev Med, 50(3), 129-133. https://doi.org/10.1016/j.ypmed.2009.11.010

Metcalf, B. S., Hosking, J., Jeffery, A. N., Voss, L. D., Henley, W., & Wilkin, T. J. (2011). Fatness leads to inactivity, but inactivity does not lead to fatness: a longitudinal study in children (EarlyBird 45). Archives of Disease in Childhood, 96(10), 942–947. https://doi.org/10.1136/adc.2009.175927

Norman, K.; Stobäus, N.; Gonzalez, M. C., et al. (2011). Hand grip strength: outcome predictor and marker of nutritional status. Clin Nutr, 30(2), 135-142. https://doi.org/10.1016/j.clnu.2010.09.010

Ogden, C.; Carroll, M. D.; Curtin, L. R.; Lamb, M. M., & Flegal, K. M. (2010). About childhood obesity. JAMA, 303(3), 242-249. https://doi.org/10.1001/jama.2009.2012

Ortega, F. B.; Artero, E. G.; Ruiz, J. R., et al (2011). Physical fitness levels among European adolescents: the HELENA study. Br J Sports Med, 45(1), 20-29. https://doi.org/10.1136/bjsm.2009.062679

Ortega, F. B.; Cadenas-Sánchez, C.; Sánchez-Delgado, G., et al (2015). Systematic review and proposal of a field-based physical fitness-test battery in preschool children: the PREFIT battery. Sports Med, 45(4), 533-555. https://doi.org/10.1007/s40279-014-0281-8

Ortega, F. B.; Ruiz, J. R.; Chillon, P., et al. (2016). Manual de Instrucciones de la Batería PRE-FIT: Evaluación del FITness en PREescolares. Tomado el 14, marzo, 2017 en la dirección electrónica http://profith.ugr.es/pages/investigacion/recursos/manualprefitevaluaciondelfitnessenpreescolares_16032016/!

Román, B.; Serra-Majem, L.; Ribas-Barba, L.; Pérez-Rodrigo, C., & Aranceta, J. (2008). How many children and adolescents in spain comply with the recommendations on physical activity? J Sports Med Phys Fitness, 48(3), 380-7.

Román, B.; Serra, L.; Leis, R.; et al. (2017). Informe 2016: Actividad Física en niños y adolescentes en España. Disponible en: https://www.activehealthykids.org/wp-content/uploads/2016/11/spain-report-card-long-form-2016.pdf. (Acceso1 junio, 2017).

Ruiz, J. R.; Castro-Piñero, J.; Artero, E. G., et al. (2009). Predictive validity of health-related fitness in youth: a systematic review. Br. J Sports Med, 43(12), 909-923. https://doi.org/10.1136/bjsm.2008.056499

Ruiz, J. R.; Castro-Piñero, J.; España-Romero, V., et al. (2010). Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. Br. J. Sports Med. https://doi.org/10.1136/bjsm.2010.075341

Ruiz, J. R.; España-Romero, V.; Castro-Piñero, J., et al. (2016). ALPHA-fitness test battery: health-related field-based fitness tests assessment in children and adolescents. Nutr Hosp, 26(6), 1210-1214.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. Med Sci Sports Exerc, 32(5), 963-975. https://doi.org/10.1097/00005768-200005000-00014

Sánchez-Cruz, J. J., Jiménez-Moleón, J. J., Fernández-Quesada, F., & Sánchez, M. J. (2013). Prevalencia de obesidad infantil y juvenil en España en 2012. Rev Esp Cardiol, 66(5), 371-376. https://doi.org/10.1016/j.recesp.2012.10.016

Spessato, B. C.; Gabbard, C.; Valentini, N., & Rudisill, M. (2013). Gender differences in Brazilian children's fundamental movement skill performance. Early Child Dev Care, 183(7), 916-923. https://doi.org/10.1080/03004430.2012.689761

Strong, W. B.; Malina, R. M.; Blimkie, C. J. et al. (2005). Evidence based physical activity for school-age youth. J. Pediatr , 146(6), 732-737. https://doi.org/10.1016/j.jpeds.2005.01.055

Veugelers, P. J., & Fitzgerald, A. L. (2005). Prevalence of and risk factors for childhood overweight and obesity. Can Med Assoc J, 173(6), 607-613. https://doi.org/10.1503/cmaj.050445