

Education in movement to counteract sedentariness in preschoolers

Abstract

A reflective analysis of various methodologies is proposed to analyse the level of physical activity in pre-school children and prevent the concerning spread of overweightness and obesity. Through careful and scrupulous bibliographic research, using scientific studies from around the world, which report targeted interventions with the purpose of studying and implementing the prevention of these diseases, through the dissemination of the World Health Organization's guidelines on physical activity, sedentary behavior, sleep and the importance of their integration. "Education in movement", through learning new habits as a way of life, is one of the most concrete solutions, although it is not to be considered an easy and obvious thing. Targeted intervention in the nursery school, and not only there, as the ideal place to implement interventions aimed at preventing obesity through movement, a healthy diet and education in healthy lifestyles, is just as necessary as taking care of other areas, for a pedagogy of movement in the holistic conception of the Person.

Keywords: physical activity, preschool, screen time, benefits, health

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The use of the accelerometer to measure physical activity levels in preschool age

WHO guidelines on physical activity, sedentary behavior and sleep in preschool age

Early childhood is a very important period because there is rapid physical and cognitive development and habits are created that are exposed to changes and adaptations. The lack, or complete absence, of physical activity is one of the main risk factors for and contributes to the increase in overweight and obesity. According to the World Health Organization guidelines on physical activity in preschool age, a greater duration of sleep and physical exercise, a shorter duration of screen time, are favorably associated with motor and cognitive development and adiposity.

In a 2018 study carried out in Beijing, in which the physical activity, sedentary behavior and sleep of 254 preschool children were measured using accelerometers and screen time through questionnaires to parents, it turned out that only 15% of them met the guidelines. From this we deduce the urgent need to implement further interventions aimed at promoting compliance with the WHO recommendations.

The accelerometer

To facilitate the measurement of physical activity levels, we often tend to use the accelerometer, a generally small, light and robust instrument, which has made it easier and more immediate to monitor the timing and quality of the child's physical activity during the day. Accelerometers are devices designed to measure changes in force or acceleration over time. When used to measure physical activity, they can assess the intensity and total volume of movement as a function of time.¹ Given its versatility, it can be positioned in various parts of the body, including the wrist, ankle, thigh, lower back, hip and navel, and allows the exact measurement of intensity, which it can vary from light to vigorous depending on the calibration of the instrument itself.

According to the study implemented in Chicago to evaluate the differences in compliance and accuracy of positional accelerometers placed on the hip or wrist in 22 children aged between 13 and 35

months, positioning on the hip was found to be more effective than positioning on the wrist, because the data more accurately reflected physical activity behaviors. Furthermore, the requirement of three days of valid data, with monitor wear times of ≥ 9 hours, can be considered acceptable in order to obtain a reliable evaluation.

Variables that affect physical activity levels in preschool age

Variables that influence physical activity levels in preschool-aged children include age, gender, season, and learning environment. These factors can significantly impact how active children are. The Sogn og Fjordane Preschool Physical Activity Study² is a study conducted in western Norway which aimed to determine levels of physical activity, with the aid of the accelerometer, by gender and age in a sample of 1154 preschool children and study seasonal variations by sex and age in a subsample with longitudinal data over different seasons. The results show that males were more active and less sedentary than females and that physical activity increased with age for both sexes, with a greater increase in total and MVPA (moderate to vigorous intensity physical activity) in males. Furthermore, it differed between seasons, with higher levels of MVPA during the spring and summer months, compared to the winter and autumn months. In the specific case of this study, in the winter season, the MVPA tended to be lower due to the influence of the climate, an aspect not present in all geographical areas due to environmental and cultural differences. Additionally, the pattern of physical activity across seasons appeared to change by age and gender, as older males make more use of the good weather and daylight of spring and summer by playing outdoors than females.

For optimal growth and development, children are not active enough and may not have a sufficiently balanced diet.^{3,4} Given that in many developed countries children spend many hours a week in early childhood centres, they have been recognized as an ideal environment for implementing strategies to encourage the development of healthy behaviours, such as increasing and developing fundamental learning skills, movement, object control, locomotor skills and healthy eating within the daily routine. With the Healthy Start-Départ Santé intervention, after the assignment of 895 children to the intervention group and the control group, physical activity was assessed using

accelerometers worn on the waist, fundamental movement skills through the Gross Motor Development (TGMD-II) and nutrition by documenting the weight, type and composition of foods that were consumed. The intervention was associated with a statistically significant improvement in locomotor skills and physical activity levels improved in both groups. The repetition of the measures and the seasonal effects led to improvements in the control groups in the physical activity tests. Overall, food intake increased slightly in both groups, probably due to the increase in children's daily intake from year to year, and there was a marginal increase in the portions of fruit and vegetables served in the intervention group compared to the control group.

Physical activity, healthy eating and sleep duration: the positive impact on the child's health

Overweight and obesity prevention interventions in the family environment, in schools and childcare centres

Body mass index status is strongly predictive of future obesity, so it is very important to intervene at a young age.⁵ And considering that more than half of preschool children spend most of their day in nursery schools, they can be the ideal place for implementing interventions aimed at preventing obesity through movement and healthy eating. The CATCH Early Childhood program was conducted in 2008 at two Department of Education Head Start centers in Harris County, Texas, and included a classroom instructional program designed to promote healthy eating habits; promote motor skills, improve classroom management and increase overall physical activity; pamphlets for parents designed to modify the home diet and physical activity environment; and teacher training. Physical activity levels were measured through direct observation using the SOFIT-P tool, at baseline and post-intervention levels or, during outdoor and indoor activities. Food intake was measured through direct observation, at baseline and post-intervention, during breakfast, lunch and snack. Post-intervention, an increase in the percentage of 100% fruit, fruit and vegetable juice consumed was recorded, although this is not statistically significant. The parents' perception of their child's weight is interesting, in fact only 1.5% considered their children as overweight or obese, compared to 39% of them who belonged to these categories. This result highlights the need for early childhood programs to include parents, because they are responsible for setting all those environmental factors related to physical activity and healthy eating.

To confirm that parents' healthy behaviors positively influence the health of the child, conducted in the United States, the Block Food Frequency questionnaire was used to evaluate maternal intake of fruit and vegetables. A modified version of the International Physical Activity Questionnaire was used to assess mother and child physical activity behaviors over the past 7 days. Additionally, screen time was self-reported by the mother. Furthermore, the frequency of combined mother-child physical activity inside and outside the home was assessed, environments that have been carefully studied. From the results, children with a physically active mother engaged in more physical activity, combined mother-child physical activity, and less sedentary time. Additionally, the home environment is more important than the neighborhood environment in influencing preschool children's physical activity and screen time.

With nearly one-third of children and youths in the United States estimated to be overweight or obese, child care centers and schools

play a crucial role in providing nutrition education and promoting physical activity. A study⁶ carried out in Jackson County, Mississippi, recruited 434 children, aged between 3 and 5 years, to evaluate, pre and post intervention, the recognition of fruit and vegetables and the child's reaction to exposure to them. The program lasted 12 weeks and offered the opportunity to do physical activity and learn to eat healthily through interactivity, fun and classroom experiences. The project consists of 12 Circletime lessons, in which children are introduced to different types of fruit and vegetables, and 6 Color Me Active activities, "imaginary journeys" in which they pretend to take a journey that allows them to play a role of physical activity such as canoeing, hiking, etc. At the end of the project, there was a statistically significant improvement in fruit and vegetable exposure and recognition scores among the intervention and control groups. Additionally, parents in the intervention group reported spending more time in physically active play with their children and significantly less screen time compared to parents in the control group.

Physical activity, sedentary behavior and sleep duration

The occurrence of overweight and obesity among preschool children is exceedingly high within South African populations (22%), more so in females than in males and, for both sexes, in urban environments rather than in informal rural contexts. In a 2015 study⁷ conducted in Soweto, South Africa, physical activity, sedentary behavior and sleep were objectively measured with accelerometers worn for 24 hours for 7 consecutive days. Motor skills were assessed with the TGMD-2, divided into locomotor control tests and object control tests, each of which includes 6 skills. Of the children who had valid sleep and physical activity data, approximately 50% of the sample met the guidelines, 9.8% met one of the guidelines, and 35.3% met none of the guidelines. For gross motor competence, no children were classified as "below average," "poor," or "very poor." Males had lower standard object control and gross motor IQ scores than females.

In Australia approximately 15% of 4-year-old children are recognized as overweight and 6% as obese.⁸ Munch and Move,⁹ a key initiative in the New South Wales Government's 2009-2011 plan to prevent overweight and obesity in children, young people and their families, is a development professional program for early childhood workers, in particular to assist nursery schools and long-term day care centres, promote strategies within their centers that encourage nurturing healthy play, active play and fundamental movement skills. Foods and drinks have been categorized into one of 7 main categories, which are fruits, vegetables, dairy products, breads and cereals, healthy drinks (e.g. water and milk), extra foods or drinks. The evaluation of fundamental movement skills took place, using the Test of Gross Movement Development (TGMD-2) checklist, on four locomotor skills (running, galloping, jumping, horizontal jumping) and four object control skills (hitting a stationary ball, catch, kick, throw). The results of the study revealed an improvement in fundamental movement skills and a decrease in portions of sugary drinks in lunchboxes, although there were no significant changes.

Several studies have shown that a cause of overweight and obesity in old age is low sleep duration. A study conducted in Michigan, United States, evaluated the relationship between sleep duration, moderate-to-vigorous intensity physical activity, measured with a hip accelerometer for 7 days, and body composition. It shows that there is a significant association between physical activity, especially of moderate to vigorous intensity, and sleep duration, and a negative association between body fat percentage and sleep duration. A 1 minute increase in daily MVPA corresponds to a 2.28 minute increase in sleep duration, and a 1% increase in body fat corresponds to a 7.14 minute reduction in sleep duration.

The negative influence of a sedentary lifestyle and screen time on physical well-being in preschool age: how to counteract it

Relationship between physical activity, screen time and psychosocial well-being

The connection among physical activity, screen time, and psychosocial well-being is noteworthy. Psychosocial well-being during early life is linked with mental health and overall well-being outcomes, including depression, hostile behavior, and aggressive behavior in later stages of life,¹⁰ therefore it is essential to understand the link between physical activity, sedentary behavior and psychosocial skills. Sedentary behavior does not always have negative effects on cognitive development, in fact reading seems to have positive effects on it, compared to television viewing.¹¹ A study¹² conducted in South Korea aimed to examine the correlations among television viewing, reading, physical activity, and psychosocial well-being in children aged 0 to 5 years. The time spent reading (alone, reading together with the caregiver or reading by the caregiver), watching television and doing physical education activities or playing outdoors in the previous week was analysed. Psychosocial well-being was assessed with a 15-question questionnaire between 0 and 2 years and 17 questions between 3 and 5 years. The questionnaire was divided into: social skills, “children’s abilities to integrate behavioral, cognitive and affective skills to adapt to different contexts and social demands”; interactive skills, “children’s abilities to initiate interactive relationships with others”; emotional skills, “the child’s abilities to cope with (manage, express, and control) her feelings”. The results indicate that physical activity is particularly significant for increasing social and interactive skills among preschool children in South Korea. As for the times of the day when they are not active, it is preferable to promote reading to increase interactive and social skills. For the development of emotional skills, a moderate level of physical activity and television viewing is recommended. Furthermore, there appears to be convincing evidence that, at school age, physical activity improves cognitive performance, academic achievement and psychosocial functioning, as well as promoting a wide range of health benefits.

In conclusion, a study¹³ conducted in New South Wales proposes that engaging in higher intensity physical activity, especially of moderate to vigorous intensity, as well as participating in sports, might have a positive correlation with various aspects of executive function. Additionally, it suggests that sports participation could be inversely related to internalizing and externalizing behaviors, while positively linked with pro-social behaviors in preschool-aged children. Physical activity levels were gauged using hip accelerometers over a continuous period of 24 hours across 7 consecutive days, while participation in modified organized sports was evaluated using a 7-item survey derived from the Longitudinal Study of Australian Children.¹⁴ Executive function was tested using four tests, administered via an iPad: Mr Ant, to evaluate visuospatial working memory; Not This, to assess phonological working memory; Go/No-Go, to evaluate inhibition; and Sort Card, to evaluate the movement. Psychosocial challenges were evaluated using the Strengths and Difficulties Questionnaire,¹⁵ which comprises 25 items assessing five psychosocial domains: conduct problems, hyperactivity, emotional problems, peer problems, and prosocial behavior. The results suggest that both the intensity and nature of physical activity are linked to certain aspects of executive functioning and psychosocial well-being. Despite the fact that sport offers an opportunity for social interaction, self-esteem, and connection,¹⁶ in this sample, the duration of time spent engaging in

higher intensities of physical activity seemed to be correlated with fewer issues related to externalizing problems.

The effectiveness of physical activity interventions in preschool age

Following a study,¹⁷ based on the analysis of 249 articles and 15 independent studies taken from nine databases, for a total of 2,618 participants, it was found that the most appropriate interventions to improve the activity preschool physical activity, specifically aimed at increasing moderate-to-vigorous intensity physical activity, are provided in the early learning environment, are teacher-directed, incorporate environmental changes, promote unstructured activities or free play, and provide time for outdoor-play.

Association between physical activity and sedentary behavior of parents and children

Sedentary behavior, particularly screen time, is detrimentally associated with healthy growth and development in early childhood.¹⁸ At an interpersonal level, parental correlations are considered very important, which include behaviors and practices that parents transmit to their children. In a research conducted in Edmonton, Canada, by Carson, Langlois, and Colley in 2020, sedentary behavior, low-intensity physical activity, and moderate to vigorous physical activity were examined in 1,116 children aged 3 to 5 years and their parents. Accelerometers were worn on the hip for seven consecutive days to track activity levels. Overall, all parental behaviors were significantly correlated with children’s behaviors. It is clear that parental behaviors are fundamental to physical activity interventions and children’s sedentary behavior. Motor skills are considered to be strongly correlated with cognitive development, a physically active lifestyle and other health benefits. A study,¹⁹ carried out in Turku, Finland, evaluated gender variances and family-related variables, which may be associated with motor skills. 712 children, aged 5 to 5.3 years, completed tasks of fine motor control, motor coordination, body control, and strength and agility. In addition, parents filled out questionnaires asking them how much time their child spent watching television or DVDs, playing computer or console games, doing drawings and crafts, physically active indoors or outdoors, separately for weekdays and weekend days. From the results, other than gender, there were few statistically significant associations for different types of motor skills involving 506 participants. Drawing or making crafts for 60 minutes or more per day was associated with better manual control skills, compared to doing these activities for less than 60 minutes per day. Playing outdoors for 60 minutes or more per day was associated with better strength and agility scores, compared to being less active. Children with more educated parents had better body control scores than children with less educated parents. Finally, children attending kindergarten had better scores in strength and agility than children who did not attend.

Equally crucial is the significance of play, which is linked to the robust social, emotional, cognitive, and physical growth of young children.²⁰ Researchers and experts, while recognizing the intrinsic value of play for optimal development, advocate for active and collaborative engagement over passive and solitary play.^{21–24} “During the early years of life, parents, especially mothers, are their children’s most significant playmates”.²⁴ A study²⁵ carried out in Seoul, South Korea, examined the interactions of 106 mothers and their children using the Three Box Task. Mothers were filmed during 15 minutes of semi-structured free play with their child. A qualified examiner provided age-appropriate toys (a picture book, a kitchen set, and a doll’s house) in three separate boxes. Each mother was invited to engage in

play with her child as she typically does at home. The mothers were instructed to only use the toys provided in the boxes, beginning with the first box, progressing to the second, and concluding with the third. They also had the option of dividing the available time into intervals. The assessment focused on the mother's sensitive responsiveness to the child's emotional cues, vocalizations, and physical activity, as well as her efforts to facilitate learning and encourage exploration of the environment, joint engagement, and levels of physical activity.

The results revealed that males exhibited significantly higher levels of temperamental activity compared to females. However, there was no gender differences observed in maternal scaffolding, joint engagement, or levels of physical activity during play.

Furthermore, the study found that the positive effects of maternal scaffolding on joint engagement were more pronounced for children who were temperamentally less active than for those who were temperamentally more active.

Conclusion

With this article we have considered a broad overview of experiments on physical activity, very current, in preventing the worrying spread of overweight and obesity and in educating the very young generations on correct lifestyles, which inevitably influence all areas of personality (cognitive, motor, affective, relational, social). The scientific research, selected from different parts of the world, with large samples of pre-school children and using cutting-edge equipment, has allowed us a concrete state of the art, useful for reflecting on the results obtained, also relating them to our little Italians, however, taking into account environmental, dietary, cultural differences, etc. which inevitably influence. This work, even within the limits set out, could address that "culture of movement" which is not yet sufficiently rooted in Italian schools of all levels and inform, train teachers, educators and parents on that body which, if exercised even by moving, it can contribute to making man/woman, citizen/citizen aware that correct lifestyles increase the possibility of quality of life.

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Conflicts of interest

The author declares that there are no conflicts of interest.

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