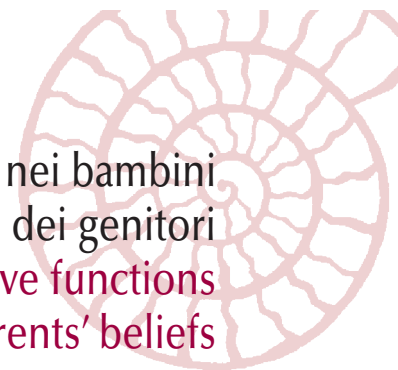


# Salute, attività fisica e funzioni esecutive nei bambini da 3 a 5 anni. Le opinioni dei genitori

## Health, physical activity and executive functions in 3-5 years old children: Parents' beliefs



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### ABSTRACT

This research aims to investigate parents' beliefs and practices about physical activities in their children. Questionnaires were administered during a "special physical activity day" in an Italian kindergarten. Survey's results highlight that parents believe physical activity is very important for their children, although there is evidence of discrepancies between what declared and what put into practice when it comes to physical activities. In spite of parents believing to be competent enough in this subject matter, results about their knowledge are very far from what recommended by the international health organizations. It is therefore necessary to provide parents with training in order to empower them regarding their role in children's physical development.

Durante "il giorno speciale per l'attività fisica" in una scuola dell'infanzia dell'Italia del nord sono stati somministrati ai genitori dei bambini dei questionari per indagare credenze e pratiche in merito all'attività fisica dei loro bambini. Nonostante i genitori credano molto importante la pratica dell'attività fisica per i loro figli emergono discrepanze tra quanto dichiarato e quanto praticato. Sebbene i genitori si considerino competenti nell'attività fisica i risultati sono molto distanti da quanto raccomandato dalle organizzazioni internazionali sulla salute. Si ritiene necessario, pertanto, provvedere a dei percorsi formativi per sensibilizzare i genitori al loro ruolo nello sviluppo fisico dei figli.

### KEYWORDS

Health, Physical activity, Executive functions, Pre-schoolers, Parents.  
Salute, Attività fisica, Funzioni esecutive, Bambini in età prescolare, Genitori.

\* While the whole article is the result of a collaboration and an agreement between the two authors, the specific contributions have been made as follows: Bruno Pernice prepared the questionnaire, gave it to the parents and withdrew it; Patrizia Tortella processed the data and spread the article.

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## 1. Introduction

A good health contribute to the quality of life and is one of the most important human right. Children have the right to play, to participate to recreational activities appropriate to the age and to take part to cultural, artistic, recreational and leisure activity (U.N. Convention on the Rights of the Child 1989).

What does “health” mean? The American Academy of Pediatrics (AAP 1997) states that “*every child should have the opportunity to grow and develop free from preventable illness or injury*”.

The International Classification Functioning ICF (WHO 2001) consider health in a new way, as a social aspect not limited to the medical and biological point of view. In this respect it becomes important to consider context and environmental factors as fundamental aspects of health, which is considered as the ensemble of body functions, body structure, activity and participation. All children should have equal opportunities and capabilities (Sen 1999) and governments, parents, educators and teachers have a fundamental role in building context and environment adequate for children in order to promote their development and well being.

The practice of physical activity in early childhood promotes health with major advantages for the musculo-skeletal system (Janz et al. 2001, 2004) and reduction of the risk of overweight and obesity (Moore et al. 2003; Fischer et al. 2005; Jago et al. 2005). Accordingly, The National Association for Sport and Physical Education (NASPE 2013), the American Heart Association (AHA 2013) and the American Association of Pediatrics (AAP 2013) recommend at least 60 minutes of unstructured physical activity and 30-60 minutes daily structured physical activity of mild to moderate intensity. WHO (2013) recommends that the new European policy framework Health 2020 includes actions to prevent and tackle overweight, obesity and under nutrition, through the development of a physical activity promotion strategy alongside nutrition action plans.

### 1.1 Why is physical activity so important?

The practice of physical education and sport is considered a fundamental right for all since more than three decades (UNESCO 1978).

Practicing physical activity promotes the development of fundamental motor abilities, and to be competent contributes to a better perception of the self. (Haywood, Getchell 2009; Zelazo, Zelazo & Kolb 1972). A motor competent child is more motivated to practice more physical activity for longer time and at higher intensity levels (Hands, Rose, Parker & Larkin 2010; Tortella, Tessaro, Fumagalli 2012; Kjelsas, Sigmondsson, Stensdotter, Haga 2011). Children with low perception of motor competence become less active, may not develop or maintain health-related physical fitness (Wrotniak, Epstein, Dorn 2006) and do not improve motor skill competence (Stodden, Goodway, Langendorfer, Robertson, Rudisill, Garcia & Garcia 2008). In addition, as lack of motor competence is associated to low levels of physical activities, these children are exposed to high risk of obesity that further contributes to a decrease in aerobic fitness and exercise capacity, due to the vicious cycle of inactivity (Knoepfli et al. 2008).

### 1.2 What is the relation between executive functions and health?

Physical, social, and emotional health contribute to the “well being” of the prefrontal cortex, because stress, lack of sleep, loneliness, lack of exercise, each damage EFs. Prefrontal cortex plays a prominent role in the neural circuit of executive functions (EFs) (Braver, Cohen, & Barch 2002). EFs are also called “executive control” or “cognitive control”.

Working memory, inhibition, (response inhibition, self-control-resisting temptations and resisting acting impulsively) interference control (selective attention and cognitive inhibition) and cognitive flexibility (to see from different perspectives, to be creative “thinking outside the box”, to adapt quickly to changed circumstances) are considered “the core EFs”. (Davidson, Amso, Anderson & Diamond 2006).

Reasoning, problem solving and planning are built from the higher order EFs (Lunt, Bramham, Morris, Bullock, Selway, Xenitidis & David 2012).

All these functions are fundamental top down mental processes and are important to every aspect of life.

### 1.3 Why are EFs so important for preschoolers?

Self control and focused attention are critical for school readiness (Morrison, Ponitz & McClelland 2010) and seems to be more associated with school readiness than are IQ (Blair & Razza 2007). Working memory and inhibitory control predict success in math and reading competence from preschool through university (Borella, Carretti & Pelgrina 2010).

It has been reported that children with poor EFs have difficulties in establishing positive teacher-student and child-to-child relations (Hamre & Pianta 2001).

Inhibitory control, early in life is predictive of adult good quality of life. Children who at age of 3-11 had better inhibitory control (were able to wait their turn, less easily distracted, more determined, less impulsive) when adolescent/adult have better physical (less likely to be overweight) and mental health (less addiction problems), earn more, are less likely to commit a crime, and were happier as adults (Moffitt 2011, Diamond 2014).

### 1.4 What are the connections between physical activity and cognitive processes?

With lack of physical health or fitness people may become poorer in reasoning and problem solving, worst in discipline and self-control, lose memory (Chaddock, Pontifex, Hollman & Kramer 2011). Evidences for a bidirectional relationship between physical (aerobic) activities and levels of EFs in children/adolescents has been provided by several authors and data are reviewed in Best (2010).

The relationship between EF and physical activities has been further addressed by Diamond (2012), (Diamond & Lee 2011) who showed that different sport activities produce different outcomes on EFs. The strongest effects are associated to Tae-kwon-Do (Lakes & Hoyt 2004) and weakest with aerobic training (Davis et al. 2011; Kamijo et al. 2011; Tuckman & Hinkle 1986) and yoga (Manjunath & Telles 2001). The reasons why some activities are more potent than other in modifying EF levels is still debated; it has been postulated that practicing dancing sports and movement with music make children happy and proud, address social, cognitive, emotional and physical needs and thus promote the best school outcomes (Diamond 2014).

### 1.5 What can parents and educators do?

The research data strengthen the relevance of physical activity in improving EFs, but also highlight that “quality” rather than “quantity” of physical activity is the real issue (Diamond 2014). Conditions that positively affect and optimize EFs and academic outcomes are the following (Diamond 2013): children must be passionate about the activity and the activity must energize the child to work harder, the educator should be enthusiastic and charismatic to galvanize children’s interest; the children must repeat the experiences, in similar but always more difficult and enthusiastic situations. On the contrary, stress, sadness, lack of physical health or fitness, loneliness impair EFs (Diamond 2014). It is important for the child to develop the belief, understanding that through effort he/she can succeed and avoid setbacks or failures. (Bandura 1994). In summary, educators should not focus narrowly on academics alone, but also address children emotional, social and physical needs (Diamond 2010, 2013, Diamond & Lee 2011).

## 2. Motivation

Despite all recommendations from international organization and the beneficial effects of physical activities on school readiness and on the future quality of life, preschoolers have very little activities based on movement and spend the largest part of their time at kindergarten and at home in sedentary behavior (Cardon, Labarque, Smits & De Boudeaudyij 2009). The beliefs of teachers and parents define their practices. In a previous research we analyzed the daily activities of six nurseries of a region of northern Italy, (156 children followed by 20 educators) and compared them with what the educators said about their beliefs and the activities organized for the children. The results demonstrated a great difference between what was perceived as relevant and what was performed, suggesting that a major limitation for adequate motor activity levels in nurseries is the lack of specific education by teachers (Tortella, Callegari, Tessaro, Fumagalli 2011). Increased education of the teachers on the issue of motor activities and experience improve children levels of physical activity (Dowda, Brown, Melder, Pfeiffer, O’Neill, Addy & al. 2009). Data in the literature also indicate that often the educators consider motor development and physical fitness less important for children than school readiness (Brown et al. 2009). Rarely teachers encourage children to be physically active and organize activities to increase physical play (Brown et al. 2009). Several authors (De Corby, Halas, Dixon, Wintrup, & Janzen 2005; Morgan & Bourke 2005) point out that teachers are likely to discourage children motor activities because of the fear of accidents, lack of interest, previous negative experiences, insufficient experience in the field of physical activity for preschoolers.

In general there is a common agreement in the literature about the relevance of encouraging the practice of physical activity in children and creating new opportunities involving both teachers and parents.

## 3. Methods

Context: a special event (3 hours), dedicated to physical activity for 3-6 years old children, was organized in a kindergarten in a city of Northern Italy. The parents were invited to observe their 45 sons/daughters during the event that was organ-

ized by 135 student of the high school (teacher curriculum) of the same institute. The students were divided in 12 groups, each organizing in a selected zone of the garden of the school activities related to either dexterity, mobility or balance. The 45 children were also divided in 12 groups, each one playing for 20 minutes in a zone and then moving to a next one till the end of the 3 hours.

Questionnaires were administered to the children parents (45) to investigate on their beliefs about the physical activity for children. Some parents suggested the questions of the questionnaire, highlighting what was important for them.

#### 4. Results

The questionnaires investigated: 1- education and occupation of the parents; 2- expectation and beliefs of parents about physical activities; 3- activities performed by the children; 4- Involvement of parents in child physical activities.

Mother education	%	Father education	%
Middle school	5.3	Middle school	10.3
High school	42.1	High school	41.0
University	50.0	University	48.7
Post Graduate	2.6	Post Graduate	0.0

Mother occupation	%	Father occupation	%
Housekeeper	2.7	Housekeeper	13.5
Employed (public)	24.3	Employed (public)	40.5
Employed (private)	45.9	Employed (private)	43.2
Self-employed	21.6	Self-employed	0.0
unemployed	5.5	unemployed	2.8

**Table 1** - Education and occupation of the parents

##### 4.1 Expectation and beliefs of parents about physical activities

Parents find very relevant for their children to practice physical activity (100% relevant/very relevant) and the majority of them (75%) considered that at least 60 to 120 minutes should be dedicated to physical activities every day (table 2). Concerning physical activities (PAs) performed at school, 45% of parents considered adequate an engagement of 2 hours/week and 36,4% of parents an engagement of 4 hours/week.

How is relevant for children under 6 years to practice physical activity	%	How long should the child under 6 y practice physical activity in a day (minutes)	%	How long should the child under 6 y practice physical activity in a kindergarten during a week (minutes)	%
very relevant	18,2	At least 30	15,9	At least 60	9,1
extremely relevant	81,8	At least 60	38,6	At least 120	45,5
		At least 120	36,4	At least 180	9,1
		At least 150	9,1	At least 240	36,3

**Table 2 - Parents beliefs about practice of physical activity by children under 6 years.**

The majority of the parents considered playing, socialization, movement control and body coordination the most relevant aspects of school PAs. Minor interest was devoted to the learning of a sport discipline and to the possible relaxing aspects of movement (Table 3).

Relevance of items concerning physical education (min 1- max 5)	1	2	3	4	5
Playing	0	0	11	23	66
Socialization	0	0	2	41	57
Movement control	0	4	8	36	52
Body coordination	0	0	12	36	52
Getting in touch with nature (if nor raining)	0	0	16	36	48
Discipline/self-control	0	7	18	32	43
Sense of rhythm and music	2	9	25	30	34
Learning a sport discipline	5	19	41	20	20
Relaxing	7	5	40	28	20

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**Table 3 - Data are % of responses**

For the majority of the parents fun and positive effects on growth were the item most expected from children PAs (table 4). Expectations were high also for the effects on socialization and discipline. The effects of personal feeling and self-esteem of the child were also positively considered. Parents did not think that PA induced hyperactivity, stress or nervousness nor that children get into competition with each others because of PAs.

Type of effect	Disagree in total	Disagree in part	Agree in part	Agree	Agree in total
Has fun	0	0	2	27	71
Grows better	0	0	4	30	66
Good for socialization	0	0	2	43	55
Becomes disciplined	0	0	7	42	51
Child is calm and sleeps well	0	2	19	35	44
Feels better	0	2	23	36	39
Acquires self-esteem	0	0	14	52	34
Expresses emotions freely	0	7	20	48	25
Learns to control emotions	2	2	11	61	24
Gets into competition with other children	9	14	34	34	9
Becomes hyperactive	76	21	0	0	3
Becomes stressed	65	26	9	0	0
Becomes nervous	72	25	3	0	0

**Table 4** - Parents expectations on effects that regular physical activities should elicit on child  
Data are % of responses

Almost all the parents (table 6) asserted that PA organized by school were good at teaching children to abide the rules and respect the roles and to learn the team spirit and to overcome obstacles (table 5). Few parent considered PA a tool for learning competitiveness and none a cause of aggressiveness, anger, sadness and tenderness.

Type of experience/reaction	% positive answers
Comply with the rules	86
Team spirit	80
Respect of the roles	77
Overcome obstacles	73
Joy	66
Meeting and knowing other children	66
Self-confidence	59
Know your own limits	55
Collaboration	50
Competitiveness	39
Overcome own limits	32
Altruism	16
Empathy	9
Fear	2
Aggressiveness	0
Anger	0
No special emotion	0
Sadness	0
Tenderness	0

**Table 5** - Parent expectations of experiences and reactions that the physical activities organized by the school should elicit in child.  
Data are % of responses

About the conditions that may interfere with participation of children to physical activities almost all the parents excluded fatigue and excess of other commitments (Table 6). More likely obstacles may originate from family organization. The majority of parents did not considered TV watching of playing electronic games a real obstacle to dedication to PAs, nor their cost or lack of space/opportunities.



Condition	Disagree in total	Disagree in part	Agree in part	Agree	Agree in total
Too tired	18	27	48	2	5
Children are already busy with many activities	73	18	11	0	0
Family organization does not allow regular physical activities	20	11	36	27	7
Physical activities are expensive	45	30	23	5	0
There are no places or structures for child physical activities	68	23	2	2	5
Child is not interested in physical activities	68	14	9	5	4
Electronic games and TV are preferred by children	50	14	20	9	7
Physical activities at school are enough; child must relax at home	70	30	0	0	0
My child does not like physical activities because I am sedentary	85	8	5	2	0
My child does not like physical activities because they do not have mates to play with.	77	15	3	0	0
I do not like that my son gets dirty as she plays	84	14	2	0	0
I do not like that my child gets dirty as he/she plays	89	9	2	0	0
I found difficult to stop the child watching TV or playing electronic games	70	23	5	2	0

**Table 6** - Parent opinion on conditions that hamper child physical activities.  
Data are % of responses

The majority part of parents (78%) (table 7) would like to be involved in events of organized motor activities or play with their children at least once a month, for 2 hours, but only a few of them (30%) would like to be involved by the school in projects of PA for their child (Table 7). Less than half (40%) of the parent expected the school to provide instructions to parents about PA with children. Only 29% wished the school to offer PA opportunities beyond the school day, probably because most of them (82%) found not difficult to organize physical activities outside the school. Almost all of the parents agreed with their partner on the relevance of PA for the child well-being and 2/3 of them considered him/her-self competent for helping child to be physically active.

Statement	Disagree in total	Disagree in part	Agree in part	Agree	Agree in total
We are parents well trained in helping child to be physically active	52	14	23	9	2
It is difficult to organize with my husband/wife the physical activities of the child outside the school	52	20	16	9	2
I and my husband/wife have different opinions on relevance of physical activities for our child	80	9	6	5	0
I wish the school may offer opportunities of children physical activities beyond the school day	18	30	23	20	9
I wish/expect the school to provide instructions to parents about organization of games aimed at improving physical activity levels of child	12	30	18	38	2
I would like to be involved by the school on physical activity projects for my child	11	25	34	16	14
I would like to be involved in events of organized motor activities/plays with my child at least once a month, for a couple of hours	0	10	12	2	76

**Table 7** - Relationship between parents and organization of physical activities for children  
NB: Data are % of responses

#### 4.2 Activities performed by the children

One third of the interviewed parents asserted that their children practice PA in playgrounds and sport clubs nearby home for more than 180 minutes during the week, and almost a similar amount of parents referred that children played physically active games only one hour or less during the week (Table 8).

How long in a week does your child practice physical activity in playgrounds, sport clubs, nearby home (minutes)	%
< 60	15.9
= 60	13.6
= 120	15.9
> 120	22.8
> 180	31.8
	100.0

**Table 8** - Physical activity practiced by children during the week in playgrounds, sport clubs, nearby home.

The major part of the parents (table 9) referred that their children watched television and pc for 60 minutes/week and 39% of them for 60 minutes on Saturdays and Sundays. The most part of the time dedicated to watching TV and PC is during week end.

How long does your child watch television, pc, in a week (minute)	%	How long does your child watch television and pc, on Saturdays and Sundays (minutes)	%
< 60	24.4	< 60	23.3
= 60	55.6	= 60	39.5
= 120	20.0	3= 120	27.9
> 120	0.0	> 120	7.0
= never	0.0	= never	2.3

**Table 9** - Time spent watching television or pc in a week or on Saturdays and Sundays.

### 4.3 Parenting: involvement of parents in child physical activities

Only one third of the parents spent 30 minutes per day walking with the child at least every other day (Table 10). A consistent fraction of the parents did not practice a sport discipline together with the child nor spent a lot of time watching the child playing. In most cases parents physically played with child at home or outside (during the good season) for 30 minutes once or twice a week.

Day(s) playing sport/physical activities with the child during the week	Never	1 d	2-3 d	4-5 d	5 d
Walking for at least 30 min	19	45	21	10	5
Physical games at home (playing with ball, running, dancing, etc) for at least 30 min	18	28	31	12	11
Physical games outside during the good seasons (playing with ball, running, etc) for at least 30	9	19	43	22	8
Practicing a sport discipline with own child for at least 30 min	57	35	3	5	0
Watching the child during a sport activity	36	40	17	7	0

**Table 10** - NB: Data are % of responses

## 5. Discussion

The most important aspects related to the physical activity of the children, are for their parents, in order of importance: to play, to coordinate the body, to get in touch with nature, to control physical movement, to develop the physical sense of rhythm and music, to learn a sport discipline, to relax, to grow better. As social aspects they consider important: to socialize, to learn discipline and self control, to comply with the rules, to learn team spirit, to respect the roles, to overcome obstacles, to meet and know other children, to learn to collaborate, altruism; c) As personal aspects they consider: to be fun, to acquire self esteem, to be calm and sleep well, to feel better, to express emotion freely, to learn to control emotions, to improve self confidence, to know and overcome own limits, to improve empathy, to overcome the fear.

All of the parents believe that to practice physical activity is very relevant for the children. The major part of them suggest to practice from 60 to 120 minutes

a day of activity but they also assert that their children should practice physical activity in kindergarten at least from 120 to 240 minutes a week. How much physical activity do the children practice? They really practice in playgrounds, sport clubs and nearby home, from 60 to more than 180 minutes physical activity a week.

The parents believe to be well trained in helping children to be physically active; they don't need instruction about physical activity from the school and they don't find it difficult to organize activities outside of school. Father and mother declare to be each others in agreement with the most important aspects of physical activity. The informal moment outside home, in the good season seem to be the best opportunity for practicing physical activity, together with their children.

Parents state that physical activity at school is not enough and that if the son gets dirty while he/she is playing, this is not a problem for them.. The major part of parents would like to be involved in events of organized motor activities or play with their children, at least once a month, for 2 hours, but only few of them would like to be involved by school on physical activity projects for their child and wish to get opportunity from the school.

They major part of them don't practice sport with the child, don't watch child playing, and walk at least only 30 minutes with the child, during a week.

Some condition that may hamper physical activity are for parents that the children are already busy with many activities, there are not places or structures for child physical activities, children are sometimes not interested in physical activities. They don't find physical activities for children expensive.

The results highlights that despite the parents believe physical activity for their children as very important there are some discrepancies between what declared and what practiced. The parents believe to be competent about physical activity but results are very far from the recommendation of the International organization for health. The children seem to move very less respect what recommended. NASPE, AHA, AAP, recommend at least 60 minutes of unstructured physical activity and 30-60 minutes daily structured physical activity of mild to moderate intensity, while the parents say that their children move from 60 to more than 180 minutes, in a week!

It would be very important furthermore to focalize with parents the importance of physical fitness and motor skills development (dexterity, mobility, balance), the need of repeated experiences, the importance of the enjoyment of their children, during the activity and the role of the adults. Parents and educators should be enthusiastic and charismatic to galvanize children's interest. They should encourage children to be physically active and organize activities to increase physical play, motivating the children. Some authors, (Adolph 2012 ) state that to distribute the time of physical activity is more effective for learning skills than massed practice, and children can utilize every moment, during the day, in kindergarten or at home, to move. It is necessary to promote opportunities for kindergartens and parents, to increase physical activity. Periodic events, like "physical activity days" for children are very positive to develop the passion and the enthusiasm of parents and teachers. If parents are motivated to practice physical activity with their children or to create occasion for them the children became also more motivated (Diamond 2013). Parents usually think that children are active at kindergarten (Brown 2009) and they often don't know what really children do. In the questionnaire there were no questions about the physical activity practised, during preschool time. The group of parents that help to organize the questionnaire didn't find a question about the physical activity at kindergarten. We don't know if it may depend on the fact that the parents didn't think

important what their children do at kindergarten, or if they didn't know what their children do. There is the common assumption that the children develop following a universal series of increasingly stages (Gesell 1946) but intercultural studies reveal that the development is related to the experiences, the effects of the socio-cultural context, the effects of the environment and of his/her personal characteristics (Hill & Hurtado 1996).

The present research highlights that the physical activity seems to be intended by parents as a "natural" activity, that doesn't need to be organized. It is therefore necessary to implement physical educational training to help parents and also preschool teachers to be more responsible of the children development.

As researchers highlight it is necessary that physical activity become a regular activity. The international association for Health recommend daily activity from all people from 0 to 100! Only a regular practice of physical activity can help children in their development! Parents and teachers must be responsible about their role in physical, cognitive, health development of their children. It is also necessary to create opportunity for appropriate physical education training programs for teachers and parents, to make them aware of the importance of physical activity for health, for physical, social, psychological and cognitive development, in the way to provide the right capabilities for all children. It is necessary to consider physical activity as a fundamental aspects of children development and it requires methodology, regularity, knowledge.

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