

Activities in the zone of proximal development between the development of motor skills and school readiness: studies in kindergartens

Attività in zona di sviluppo prossimale tra sviluppo di competenze motorie e preparazione scolastica: sperimentazione nelle scuole dell'infanzia

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ABSTRACT

The growing number of children with impairment in executive functions and the growing increasing of sedentary behavior, estimated to be a major culprit of obesity and metabolic diseases, call for intensive efforts for correction of these worldwide problems affecting the quality of life. Recent studies highlight that executive functions can be incremented early and during life and suggest that physical activity may be an important tool to reach this goal. Educator has thus a great responsibility and recent data indicate that kindergarten may represent a new and up-to-now little considered educational tool. To involve and share with teachers these new aspects of education, an action-research was carried out with 100 teachers of Treviso (Italy), 51 kindergartens. Teachers were given instructions by means of a book prepared for the project and containing suggestions for the organization of physical activity lessons in kindergartens. After the use of the book, which also included stimuli for evaluation of the activities and their impact on children, teacher were involved in discussions and focus groups from where important considerations emerged about education directed at fostering motor and cognitive development of pupils. Our study indicate that implementation of results of scientific studies in daily activities requires direct participation of educators starting from their knowledge and perception of the reality of the teaching environment.

L'aumento di bambini con disturbi nelle funzioni esecutive (FE) e di situazioni di sedentarietà, considerata concausa delle patologie metaboliche e dell'obesità che affliggono la qualità della vita delle nuove generazioni, rappresentano importanti stimoli per cercare di proporre soluzioni nuove ai processi educativi cui i bambini sono esposti. Recenti studi evidenziano che le FE possono essere sviluppate nell'infanzia attraverso specifici percorsi educativi e suggeriscono che l'attività fisica rappresenta un importante strumento a tal fine. Per favorire l'adozione di nuove attenzioni al modo di educare nelle scuole dell'infanzia è necessario coinvolgere gli insegnanti e con loro condividere i nuovi sviluppi della ricerca scientifica. A Treviso è stata realizzata una ricerca-azione che ha coinvolto 100 insegnanti, 51 scuole dell'infanzia e che si è basata sull'utilizzo di un libro appositamente scritto per aiutare e guidare gli educatori nella preparazione, realizzazione e valutazione di attività didattiche fondano sull'attività fisica dei piccoli allievi. Dopo la realizzazione del percorso formativo sono stati realizzati incontri e focus Group dai quali sono emerse alcune considerazioni importanti relative all'insegnamento finalizzato allo sviluppo motorio e cognitivo. Si rivela fondamentale una formazione alle novità concettuali che emergono dalle ricerche internazionali ma che parta dalla conoscenza e dalla percezione della realtà degli insegnanti stessi.¹

KEYWORDS

Zone of Proximal Development, Kindergarten, Physical Activity, Motor Skills, School Readiness.

Zona di Sviluppo Prossimale, Scuola dell'infanzia, Attività Fisica, Competenze Motorie, Preparazione Scolastica.

* Tortella P. is responsible for planning and executing the study, data collection, writing the paper. Fumagalli G. is responsible for planning the study, data analysis, writing the paper.

1. Introduction

A growing number of children appearing to be affected by executive-function disorders such as attention-deficit/Hyperactivity disorder (ADHD). These children do not show specific problems but are unable to display properly their capacities because of emotional, social, physical distress (Diamond, 2010; 2013; 2014). Several reasons may cause impairment in executive functions performance, such as: to be stressed, sad, lonely, limited sleeping time, poor nutrition, lack of exercise. Executive functions are a set of mental processes sustaining the capacity to concentrate, remember and pay attention which are critical for academic achievement (Diamond, 2006; Jacques & Marcovitch, 2010). Inhibitory control, working memory and cognitive flexibility are considered the three core executive functions (Diamond, 2013; Logue & Gould, 2014) required to build capacities such as reasoning, problem solving and planning (Collins & Kiechlin, 2012; Lunt et al., 2012). Evidences have been provided showing that different activities can positively interfere with development of children's executive functions (Diamond, 2012; Diamond & Lee, 2011); among these, physical activity appears to be relevant. Indeed a strong relationship has been shown to exist between practice of specific sports/forms of physical activity and improvement of executive function (Lakes & Hoyt, 2004); however generalization cannot be done as evidences linking levels of executive functions with aerobic capacities are poor and conflicting (Davis et al., 2011; Kamiyo et al. 2011). On the other hand physical activity is very important for children, because it can engage passionate interest thus stimulating repetition and iterative experiences that, after hours of practice, lead to the success. Physical activity also contributes to the control of physical and mental health and to the fight against obesity; its practice sustains school achievements and is positively related to physical fitness. It contributes to muscular and cardio-respiratory fitness improvement, bone and functional health; it reduces the risk of hypertension, coronary heart disease, stroke, diabetes, breast and colon cancer and depression (WHO, 2014).

Despite the strong evidences of these beneficial effects of physical activity, sedentary behavior is increasing in many countries and participates to the spread of obesity and of metabolic disorders that impair quality and duration of life (WHO, 2014).

2. Physical activity and motor competence

Motor competence is the child's ability to execute various motor acts requiring both gross and fine motor skills (Haga, 2008). Motor competence is fundamental for child engagement in physical activities (Hill, 2010; Stodden et al., 2008) and is considered (Stodden, 2008) a primary underlying mechanism in the promotion of physical activity. The fundamental motor skills can be categorized as: loco-motor skills, object control skills and balance (Haywood, Getchell, 2009). Children with low level of motor skills are not able to proficiently run, jump, catch, throw and have limited opportunities/interest to engage in physical activity (Stodden et al., 2008).

3. The problem

Children with a lower motor competence level face physiological, biomechanical and neuromuscular barriers in practicing physical activity. They perceive themselves less competent and will be less likely to participate in physical activities (Stodden et al., 2008). The common belief is that children “naturally” learn the fundamental motor skills (FMS), but several studies show that children who do not develop proficiency in FMS will not be motor competent when adults (Goodway & Branta, 2003, Goodway et al., 2003). Physical activity contributes to physical fitness, a property that is fundamental together with mental health for the development of executive functions. Diamond (2014) suggests that promotion of executive function development requires interaction between all these components, together with other aspects of the child, such as emotional and social needs. She also suggests that, for consideration about the benefits of appropriate levels of executive function and the methods to foster them, researchers should not limit their interest to academic achievements or school programs, but should have a broader view on all the aspects around the child, including motor competence. Other authors suggest that improvement in executive functions and academic achievement related to physical activity may not be due to a direct effects of the activity but other factors including: a) physiological mechanisms independent or dependent on aerobic fitness; b) psychological mechanisms independent of aerobic fitness (Etnier, 1997); c) the positive relationship existing between physical activity and academic achievement, d) the teacher and the student attitudes, including motivation; f) public policy (Shepard, 1997).

4. The conditions to improve executive functions and the proximal zone of development of Vygotsky

Diamond (2014) suggested that the condition to improve the executive functions are: discipline, private speech/self monitoring, well trained teachers, collaborations during activity, respect of the other's spaces, tools, rules; in addition, the activity must be continually increased, repeated, practiced, (increasingly) difficult and should include scaffolding to the children.

In this context, the implications for executive functions of Vygotsky's theory on the cognitive development are very important. Working in the proximal zone of development with scaffolding is the appropriate condition able to motivate children to do their best (Davis, et al., 2011; Diamond et al., 2007; Manjunath & Telles, 2001). Several studies showed that the best results were achieved when children were pushed at higher levels of their EF skills. By scaffolding executive functions and physical activities it is possible to enable children to increase their skills to levels that they were not able to reach by themselves, i.e. by practicing without scaffolding. For example, when children are practicing to walk along a narrow line, they practice motor control and focused attention; as the individual child learns the task, it is possible to add difficulties, such as walking faster, carrying something on the head, etc. (Diamond, 2014). Accordingly, we have shown in a previous study (Tortella et al. 2012b) that children performing difficult tasks (climbing walking on an unstable balance beam; Fig. 1) became able to execute the tasks when they were scaffolded by the teacher and not when they were left to play/try by themselves (Figures and 3).

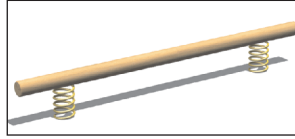


Fig. 1. Unstable elastic balance beam

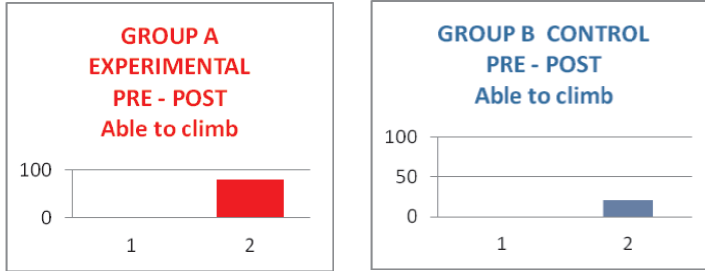


Fig. 2, Effects of scaffolding on the ability to climb on the unstable elastic beam

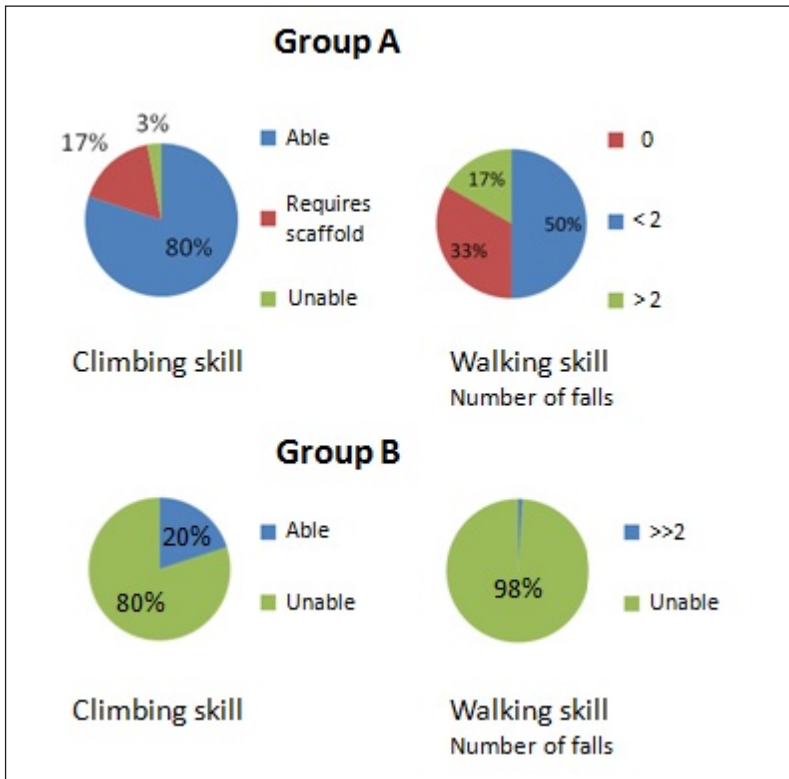


Fig. 3. The ability to climb and walk on the unstable beam in children scaffold by the teacher (group A) or unattended (Group B, free play). The measurements were taken at the end of a training periods consisting of 10 min sessions repeated once per week for 10 weeks. Data are from Tortella et al., 2014

This experiment clearly shows that teachers have the important role to personalize the activities and scaffold the children in these difficult tasks. The data are in line with observations carried out in different context by others (Diamond, 2014). Diamond (2013) highlights that children as well as teachers must be passionate and enthusiastic about the activities that they perform. Teachers need to be charismatic to galvanize children's interest. Children need to repeat several times the experiences in order to learn the skills, and they must come in different, difficult and enthusiastic situations. To increase motor skills and executive functions it is necessary for children to experience different conditions in the zone of proximal development (Vygotsky). If teachers do not provide supports (scaffolding), children cannot have a successful experience, feel embarrassed and get reprimanded (Diamond, 2014). Children need to be scaffolded to motivate them to practice the activity and to learn. With successful experience children develop pride and increased confidence on their own abilities. Diamond (2014) suggests that when children are supported by scaffolding they increase confidence in the possibility to do something in the future. Tortella (2014) highlights that when the child says "I did it by myself!" after being supported by scaffolding; he/she perceives personal competence even if he/she is not competent yet. This feeling increases the motivation to train and to learn. By scaffolding he/she discovers new capabilities for actions (affordances) that lead him/her to endure hardship and finally to learn.

It has been shown that different portions of the brain are involved at different moments of the learning process; indeed, prefrontal cortex appears to be involved during learning something difficult, especially in proximal zone of development when the child is struggling to recall and exercise his/her executive functions; when the task becomes familiar, the prefrontal cortex is no longer activated (Chein & Schneider, 2005; Diamond, 2013). Teachers should be aware that the experiences need to be continuously modified in order to obtain improvements in motor competences and executive functions and that children need to practice different skills, (training various executive functions and motor skills) to obtain substantial benefits. In this context, physical activity should be considered a favorite activity for children that can drive their interest and willingness to practice. To combine these methodological aspects with the new insights coming from the scientific research is therefore becoming a "must" and qualifying professional attitude for teachers and educators.

5. The design of the study

The aim of our study has been to realize an action- research involving teachers, children and parents and developing good practices to increase motor and cognitive skills in preschool children. Teachers from 51 kindergartens in Treviso (northern Italy) were recruited and assigned the task of organizing five structured physical activity lessons with their children. Since formal education in the field of motor activity is not included in the curriculum of the Italian preschool teachers/educators, we provided them two specific books. The first, "*Favorire la pratica dell'attività motoria*" (Tortella et al., 2013), i.e. "Implementing physical activity programs in kindergarten", contained basic information on the impact of appropriate physical activity and education on motor development and health as well as main rules for an appropriate insertion of physical activities in the standard curriculum defined in the school by the same teachers. It also contained practical example in the form of a fantasy story that the teacher could realize with

the children in 5 different lessons/days. For each of the 5 sessions of the story, goals and evaluation tools were clearly identified and the teacher was guided step by step in the production of the motor activity experience of the children. The second book, *“Attività fisica e funzioni esecutive nella scuola dell’infanzia”* (Tortella et al., 2014), i.e. “Physical activity and executive function in kindergarten”, followed the same organization used in the first book, but the focus was on significance and methods to exercise executive functions. Also in this case, the teachers were provided with basic knowledge and information aiming at the organization of 5 lessons where identified motor skills and executive functions were programmed, evaluated and monitored. Also in this case, a fantastic story was used to attract children interest.

The teachers were asked to read the books and to realize the five lessons indicated in the books. Both books encourage the teachers to work in the zone of proximal development and to focus the activity on defined goals, in accordance with the Italian Chart of activity in kindergartens and with the international recommendations on physical activity and health.



Fig. 4. Book A – “Favorire la pratica dell’attività motoria 3-6 anni” (2013); book B: “Attività fisica e funzioni esecutive nella scuola dell’infanzia” (2014).

To help the teachers in their efforts, they were invited to attend three training lessons about the use of the book(s). The first lesson was organized in November (2013 and 2014) in the form of a meeting with the authors of the books/researchers and main goals, organization and implementation of the project were described and discussed. The second lesson (February 2014 and 2015) was done at midway between the beginning and the conclusion of the project and provided opportunity for collaborative discussions between teachers and researchers. In the third training lesson (May 2014 and 2015) the teachers were asked to discuss their activities in the form of oral presentation supported by ppt slides; the audience included the other teachers participating to the study. During their activities the teachers were supported by the researcher by mean of a dedicated web site. At the end of the training meetings, two focus groups with teachers were realized (after each meeting). All the materials provided by teachers were analyzed by grounded Theory. The underlying question we investigated was: “Does an action-research on the implementation of a physical activity program for preschool children based on a specifically written manual(s) provide growth of knowledge and teaching competence in educators?”

6. Results

In the academic year 2013/14, thirty teachers participated actively to the whole project and conducted the five requested lessons in the kindergartens; the first book only was provided to the teachers. All of them produced the final presentations and the reports. In the second year (academic year 2014/15), seventy teachers joined the project; forty of them were provided with the first book, the others (consisting of teachers that already had the experience with the first book in the previous year) were provided with the second book.

The following aspects were highly considered by the teachers: a) motor activity was realized in a context of fantastic stories and this aspect appeared to be attracting and motivating for the children; some of the teachers changed the characters and replaced them with others already in use in the kindergartens; b) planning in advance the activities is very important to achieve goals; c) the assessment of the children is a good way to give value to what children are able to do, in accordance with Tessaro (1997); c) the children were deeply involved, interested and passionate in the organized activities; d) cooperative learning was a very important aspect of the activities; some teachers created new strategies to involve children in the activities, such as drawing a poster as a map of the story, production and use of posts representing animals to invite children to jump, run, crawl.

Some teachers were very motivated to learn more about physical activity and some of them were enthusiastic at the idea of experiencing new, unusual practices. Several teachers reported of difficulties in organizing new activities and in finding strategies, with problems arising mostly because of available dedicated materials, time and space. All teachers declared that physical activity programs required the presence of at least two educators for a standard class of 20 children and that their schools lacked adequate and dedicated room for the activities. It emerged a consideration of outdoor environment as a good opportunity for children to move and many teachers were reconsidering the potential role of the garden/open space of their school as opportunity for teaching.

The role of peers in child development, through the mechanisms of imitation and support, has been identified and underscored by teachers. Teachers recognized that many children had difficulties in motor skills and suggested the importance to support them by scaffolding and by encouraging them. The book *"Favorire la pratica dell'attività motoria 3-6 anni"* was considered a good support also by teachers that lacked knowledge on physical activity. Also the observational grids were considered very useful by the teachers. -

We analyzed (Grounded Theory) two focus groups, reports and presentations of the teachers and we built the following categories: i) strengths; ii) weakness; iii) most relevant difficulties for children; iv) issues learned by the teachers.

Table 1

CATEGORIES OF STATEMENTS FROM INTERVIEWS.

On gray lines the categories and in white the statements of the teachers

Strengths
The book helped to organize structured activities, as well as "metro" is a trace to follow
The book help to know new activities, unknown
The book help to know new activities for balance and mobility
The observation grids are very useful
Children were very enthusiastic
It emerged the perseverance of children
It emerged growing collaboration and cooperation between children
It emerged overcoming shyness in children
Teachers noticed more organizational capacity in children
The history of the gnomes is a tool for linguistic enrichment
Freedom in teaching is necessary to give personal contributions
The stimulation of creativity in movement is fundamental in finding new strategies for problem solving
Balance and mobility activities were practiced much more than usually
Weakness
Great book for 4-5 years old children, less for 3 years old
It was difficult to conduct activity alone. It was necessary to be at least two teachers
It was too little time for practice both motor activity and drawing, in the same day
It is important to consider the outdoor space
There are too many children in the classroom and it is difficult to organize the activities
It would be important to share impressions with other teachers
Small children find it difficult to participate in structured activities
The activities are suitable for children of the same age, in the same classrooms
Sometimes the spaces are inadequate
There is lack of specific materials
Relevant difficulties for children
Static and dynamic balance
Difficulty to execute unusual movements
Children are running in uncoordinated way
Struggling to move, to run, to crawl
Get tired physically soon
Difficulties in finding solutions
Children are not able to draw, sometimes they think to move and not to draw or they don't draw relevant things
Difficult in attacking adhesive type
Issues learned by the teachers
Structured activity allow children to learn more than during free play
Children have difficult in coordination
There is a prevalence of fine motor activities in the daily organization in the kindergarten
Utilize outdoor spaces in every moment of the day is important
The importance of motivate and encourage the children to provide their development
Some children need to be supported to increase their skills
It is important to stimulate creativity in children
Provide motor activity

The analysis was then expanded by including in the analysis the statements from focus groups, reports and presentations. Nine new categories emerged and were identified.

Table 2
 CATEGORIES OF STATEMENTS FROM INTERVIEWS, FOCUS GROUPS, REPORTS, PRESENTATIONS

On gray lines the categories and in white the statements of the teachers

BODY, MOVEMENT AND MOTOR ACTIVITY ARE IN RELATION TO COGNITIVE DEVELOPMENT
Body and movement are tools for cognitive development
Drawing is an important tool for cognitive development
Importance of creativity in motor activity
The history of the gnomes is a tool for linguistic enrichment
The stimulation of creativity in movement is fundamental in finding new strategies for problem solving
It is important to stimulate creativity in children
It emerged the perseverance of children
Stubbornness of children
THE IMPORTANCE OF ENCOURAGING AND SCAFFOLDING THE CHILDREN
Important role of peers in child development
It is necessary to encourage the children during the activity and give them enthusiasm and motivation
Chocolates are given as prizes to children
Teachers identify the need to support the children with difficulties
The importance of motivate and encourage the children to provide their development
Some children need to be supported to increase their skills
THE IMPORTANT ROLE OF EXTERNAL ENVIRONMENT AND UNCONVENTIONAL SPACES IN CHILD DEVELOPMENT
Reconsideration of the external environment and unconventional spaces
The importance of utilize non conventional space and time
It is important to consider the outdoor space
Sometimes the spaces are inadequate
Utilize outdoor spaces in every moment of the day is important
THE MANUAL PROVIDED TEACHERS TO REALIZE STRUCTURED ACTIVITIES NEVER DONE BEFORE
The book is great for children 4-5 years, it would be necessary to specify the different activities related to different ages
The manual allowed to realize structured activities never done before
The "Metro" was very useful as a trace of activities
The book help to know new activities for balance and mobility
The observation grids are very useful
Excellent observation grids with the possibility of addition of variants
Very nice the story of the book
Great book for 4-5 years old children, less for 3 years old
Free activity does not pursue goals of structured activity
There is lack of specific materials
Structured activity allow children to learn more than during free play
Provide motor activity
PHYSICAL ACTIVITY IS NOT BALANCED – TOO MUCH MANIPULATION AND LACK OF BALANCE AND MOBILITY
Prevalence activity of manipulation and little space given to balance and mobility
Balance and mobility activities were practiced much more than usually
New activities unknown
The book help to know new activities for balance and mobility
Static and dynamic balance
There is a prevalence of fine motor activities in the daily organization in the kindergarten
CHILDREN HAVE PROBLEMS WITH FUNDAMENTAL MOTOR SKILLS AND COORDINATION
Difficulty to execute unusual movements
Children are running in uncoordinated way
Struggling to move, to run, to crawl
Get tired physically soon
Difficulties in finding solutions
Children are not able to draw, sometimes they think to move and not to draw or they don't draw relevant things
Difficult in attacking adhesive type
Children have difficult in coordination

THE TEACHERS REALIZE THE IMPORTANCE OF TIME, COLLABORATION WITH COLLEGUES, TEACHING FREEDOM AND LOW NUMBER OF CHILDREN, TO WORK WELL
It is necessary to increase the time devoted to motor activity
Need to be at least in two teachers, during the activities
Sometimes difficulties by teachers to realize unusual activities
Freedom in teaching is necessary to give personal contributions
It was difficult to conduct activity alone. It was necessary to be at least two teachers
It was too little time for practice both motor activity and drawing, in the same day
There are too many children in the classroom and it is difficult to organize the activities
It would be important to share impressions with other teachers
CHILDREN ARE INVOLVED IN THE ACTIVITIES
Children were very enthusiastic
It emerged overcoming shyness in children
The activities are suitable for children of the same age, in the same classrooms
SOCIAL SKILLS
It emerged growing collaboration and cooperation between children
Teachers noticed more organizational capacity in children

By combining the two levels of analysis reported in tables 1 and 2, we identified the core categories that are included in table 3.

Table 3
THE CORE CATEGORIES (2)

CATEGORIES (2)	
Body, movement and motor activity are in relation to cognitive development	COGNITIVE PROCESSES (executive functions, language)
The importance of scaffolding the children	COGNITIVE PROCESSES (scaffold for children) –
The manual provided teachers to realize structured activities never done before	COGNITIVE PROCESSES (manual as scaffold for teachers)
The important role of external environment and unconventional spaces in child development	THE ROLE OF ENVIRONMENT, TOOLS, EXTERNAL ENVIRONMENT
Physical activity is not balanced – too much manipulation and too less balance and mobility	FUNDAMENTAL MOTOR SKILLS
Children have problems with fundamental motor skills and coordination	FUNDAMENTAL MOTOR SKILLS
The teachers realize the importance of the time in the success of the activities	CONSTRAINTS TIME
The teachers realize the importance of working in two teachers for the success of the activities	CONSTRAINTS HELP BY COLLEAGUE
The teachers realize the importance of freedom for the success of the activities	CONSTRAINTS FREEDOM
The teachers realize the importance of working with less children for the success of the activities	CONSTRAINTS LESS CHILDREN
Children are involved in the activities	EMOTIONAL PROCESSES (enjoy)
The importance of encouraging	EMOTIONAL PROCESSES (encouraging)
Social skills	SOCIAL SKILLS

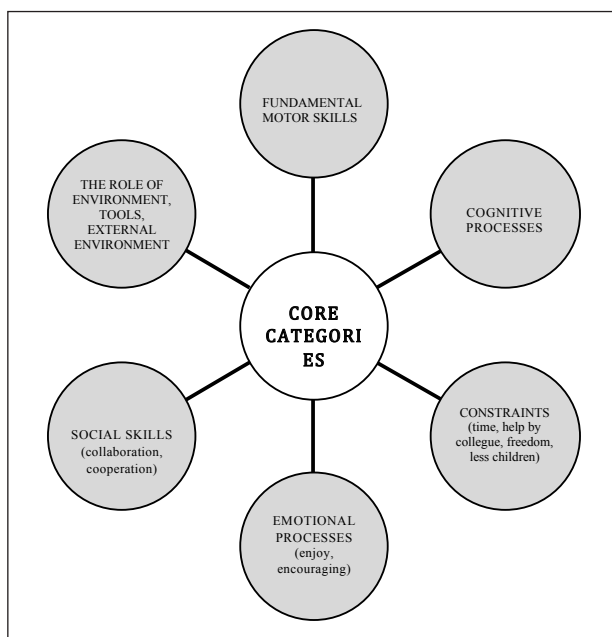


Fig. 5. Core categories

From the analysis of the focus groups, the presentations and the final reports produced by the teacher participation to the action-research, it emerged that the teachers considered physical activity in kindergarten an important tool to develop cognitive processes, fundamental motor skills, social skills, emotional processes. They also found some constraints such as the limited time available for physical activity, the need to be supported by other teachers during the execution of the physical activities (never work alone), the importance to feel themselves free to organize the activities and to be able to be creative, the need to reduce the numbers of children to work better. Teachers stated that the manual on physical activity (book A): 1) is a very useful tool for planning, executing and evaluating movement-based activities for 4-5 years old children; 2) gives information about structured activities never provided before; 3) describes new activities and provides practical examples for balance and mobility; 4) the observational grids are very useful to assess motor skills; 5) the fantasy story in the book is very nice; 6) provides clear indications on how to organize physical activities; h) reports scientific evidences disrupting common believes including that structured activities stimulate motor development at higher level than free play.

It is very interesting to notice that the core categories emerging from the analysis of teacher statements can be assigned to the three major items included in the Newell's model (1986) (see figure 5). This model highlights that there are three items/aspects interacting between each other and affecting motor development: individual constraints, environmental constraints and task constraints. The change one of these items has consequences on motor development.

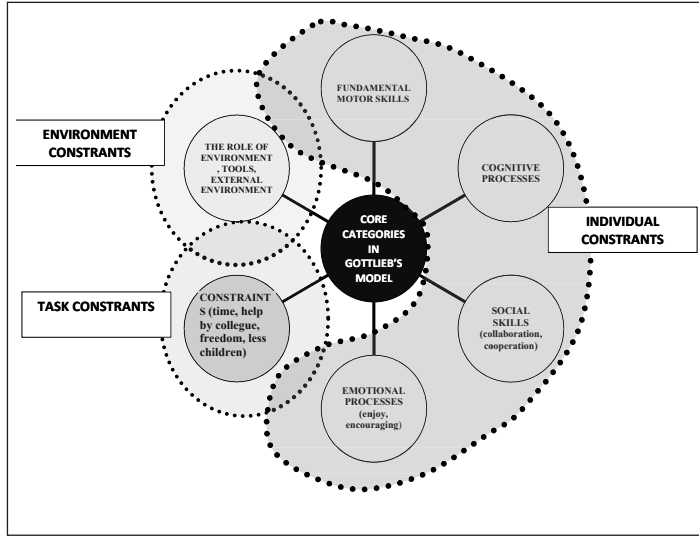


Fig. 6. Core categories of the study and implementation into the Newell's model

Table 6

ASPECTS HIGHLIGHTED BY THE TEACHERS RELEVANT FOR DEVELOPMENT OF EXECUTIVE FUNCTIONS (Diamond, 2015)

Important aspects for teachers
EMOTIONS
ENCOURAGEMENT
COLLABORATION BETWEEN CHILDREN
ENJOY
PRACTICE
SCAFFOLDING

The teachers unanimously agreed that: a) the prevalence of activities like drawing, and others involving fine motor skill, lead to a sedentary lifestyle; b) the outdoor environment can provide very good opportunities to improve the level of physical activity; c) structured activity are important for motor development; d) teachers should support children by scaffolding; e) it is important to provide enthusiasm to children with a quiet attitude; f) that both e and f ask for important modification of their teaching behavior and programs. These considerations indicate that the teachers have reached at the end of the study a wide perception of the potential relevance of the connection between physical activities and executive functions and of the need to joint these items in a common teaching program. They also converged on the consideration that appropriate scaffolding of the child must be placed on stage facilitate development of both physical competences and executive functions.

7. Conclusions

Although several evidences indicate that body and physical activities are intimately linked to cognitive development, little space is given to physical activity in Italian kindergarten reflecting low knowledge and consideration by Italian teachers on the role of physical activity in child development (Tortella, Tessaro, Fumagalli, 2012). Drawing and creativity are relevant aspects of the teaching programs and are considered activities fostering cognitive development. In terms of motor activities performed in Italian kindergartens, the focus is on fine motor skills and children are sedentary and their active time is much lower than recommended by the international health organisms and scientific associations (Tortella, Tessaro, Fumagalli, 2012).

At the end of our experimental study with kindergarten of the Treviso area, teacher perception of their mission concerning motor development of their pupils had changed substantially. The teachers unanimously agreed on the need to modify their teaching behavior and programs in order to introduce moments of physical activities in their daily programs. In addition, they also converged on the consideration that appropriate scaffolding of the child must be placed on stage facilitate development of both physical competences and executive functions. This indicates that the teachers have reached at the end of this action-research study a wider perception of the potential relevance of the connection between physical activities and executive functions and of the need to joint these items in a common teaching program.

The statements made by the teachers during interviews, focus groups and answering to questionnaires provide a new picture of their professional needs and highlight their interest toward new and evidence-based methods for improving the development of motor competences and executive functions of their pupils.

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