Physical Activities and Special Education. A Case-Study With Autism Spectrum Disorders Students

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ABSTRACT

Since Convention of 'Sport in the United Nations Convention on the Rights of Persons with Disabilities' (2007) elaborated a 'multi-faceted' framework for implementation, sports and physical activities - in the school context - has been used to promote social equality and self participation of students with disabilities (European Council, Erasmus+ 2014/2020). Among traditional school practices, sports and physical activities are often connected to leisure and expressivity activities, providing only the body-material component. However, the Italian latest curriculum reforms (2007 and 2012) have highlighted the social competences related to sports and physical activities, although about the support function of physical activity to learning processes, especially in case of disabilities, there is much more to discover.

The paper presents the design-research, methodology and early results of an exploratory case-study, accomplished at the University of Bari. According to neuro-didactics studies and using the heuristic tool of active and bodily *mediation*, aimed:

a) to investigate the mediation function of physical activities included within the interventions programs for student with Autism Spectrum Disorders (ASD) supporting the related learning processes;
b) more specifically, to test the efficiency of 'iconic visualizers' (Kozhevnikov et al., 2005) – as video-modeling and flashcards - supporting the didactical communication and the understanding of motor activities performance.

INTRODUCTION

Physical activity is a key determinant of health across the lifespan and it has been recognized as an important factor to the learnings of students (Kohl & Cook, 2013; Casolo, 2017). It is well-known the importance of sports and physical activities for the development of personality of children and adolescents (Stodden et al. 2008; Lubans, Foster, Biddle, 2008), the preservation and efficiency of integrity and psycho-physical balance in adulthood, the prevention of aging and maintenance of autonomy in the senility (ACSM, 1998).

Movement is the first instrument of knowledge and relationship that the person uses (Ripoll, 1991; Newell & Vaillancourt, 2001). Through the body perceptions and movements, the child begins a great process of identification with respect to the environment, goes progressively from dependence to autonomy, expresses its own needs, responses, emotions (Vayer & Touluse, 1982; Chunlei & Buchanan, 2014). Physical activity assumes the role of mediation for the emotional and cognitive development of children and young persons: through the performance of motor actions, reciprocal relationships are established between the motor, cognitive, emotional and social functions, so that the various motor experiences - through bodily expressiveness, play, and sport - become mediating factors for the development of mental processes, emotions, and interpersonal relationships (Colella, in Sibilio & D'Elia 2017).

Within a new 'paradigm' that looks at the relationship between physical and material (Thompson, 2005) and according to Embodied Cognition and Enactivism Science (Varela, Thompson, Rosch, 1992; Clark, 1997; Barsalou, 2008; Thompson, 2007) and looking on the second-generation cognitive sciences open to phenomenological reflections and neuroscience studies (Jouen et al., 2015), body and motor activities are considered as mediators between the *self* and the external reality, allowing the structuring of balanced relations between the areas of the person, the foundation for the promotion of individual health and well-being (Chunlei & Buchanan, 2014). The functionalistic approach and traditional distinction between perception, cognition and action were overcome and an idea of non-symbolic but very rooted in the sense-motor system cognition have been supported (Sibilio, 2013; Paternoster, 2010).

Linking traditional instances and innovation elements, a 'scientific acknowledgment' recognition of the body and movement function into the educational and didactic processes has been given (Sibilio, 2012, p.331). Since each motor and movement experiences promote multiple learning outcomes – from the cognitive, emotional and social development point of view, promotes the learning of topological concepts, problem solving, self-efficacy and social and relational skills (Lubans, Foster, Biddle, 2008; Colella, in Sibilio & D'Elia, 2017) - the

educational interventions - in formal as much as informal contexts, in normal and special needs - can not fail to consider the motor and physical activities (Bailey et al., 2006) in order to realize specific and 'personal' development (Perla, in Sibilio, 2017).

THE STUDY

Since Convention of 'Sport in the United Nations Convention on the Rights of Persons with Disabilities' (2007) elaborated a 'multi-faceted' framework for implementation addressed to students with disabilities in the school context, sports and physical activities has been used at first to promote social equality and self participation. In Italy, in accordance with European Council programs (Erasmus+ 2014/2020) and the latest curriculum reforms (DM 31 luglio 2007; DM 254/2012), among current educational practices, *in* and *out* of school, sports and physical activities are often connected to leisure and expressivity activities, providing mainly the body-material component and the social competences (Smith, 2002; Vazou et al., 2017).

According to neuro-didactics studies (Hebb, 1980; Kandel, Schwartz, Jessell, 2000; Sousa, 2010; Rivoltella, 2012), using the theoretical concept of *simplexitiy* (Berthoz, 2012; Sibilio, 2013) and an 'heuristic tool' of active and bodily *mediation* (Sibilio, 2011; Damiano, 2013), the exploratory case-study (Stake, 1995) is being realized at the University of Bari: the data collection has been carried out as an observatory study during the Master's internship (2013/2014); the analysis of data is still ongoing. Through a 'mixed-method design' (Creswell, 2003 – fig. 1) the study aimed:

a) to investigate the mediation function of physical activities included within the interventions programs for student with Autism Spectrum Disorders (ASD) supporting the related learning processes;
b) more specifically, to test the efficiency of 'iconic visualizers' (Kozhevnikov et al., 2005) – i.e. video-modeling and flashcards – used as didactical communication 'tools' in support of students' understanding and performance of motor activities.

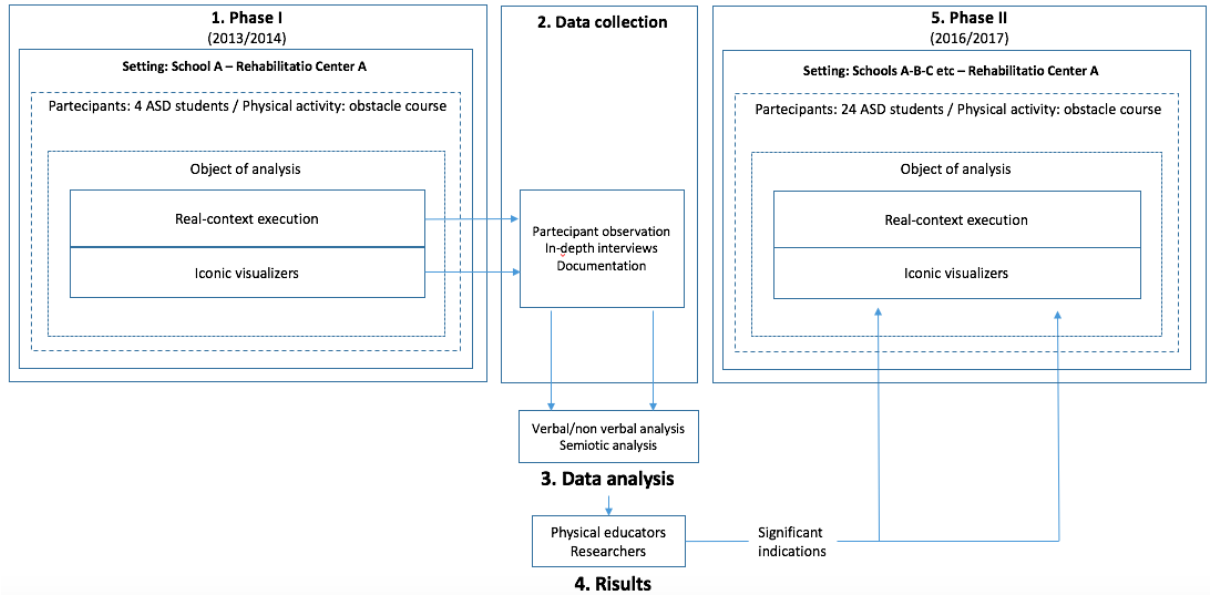


Fig. 1 – Design of research

Data collection and data analysis through a mixed method (participant observation of activities; in-depth interviews of physical educators; documentation) and a triangulation (Denzin, 2006) of verbal/non verbal and semiotic tokens (see fig. 1).

The background intervention program refers to TEACCH treatment (Mesibov, Shea, Schopler, 2004; Virsues-Ortega, Julio, Pastor-Barriuso, 2013) and, according to a 'personalized' approach (Perla, 2013; in Sibilio, 2017), it is implemented through the coordination of actions carried out at school and in the rehabilitation center, both attended by the ASD students involved in the study.

In the first exploratory phase of study, carried out in 2013/14, the study involved four ASD students, three male and one female, each of 9 years old, attended two different schools and the same physical activities program in the rehabilitation center. The prerequisites for participating in the study were previously being assessed at the same verbal languages and movement skills level (PVCL, Rustioni & Lancaster, 2007; Test of Gross Motor Development-2 - TGMD-2, Ulrich, 1985-2002; Burton, 1998) and history of acquiring skills with teaching procedures that included physical prompting.

The starting hypothesis is to demonstrate that through the use of 'iconic visualizers', within an appropriate

motor-educational intervention, it is possible for students with ASD to improve the performance of the exercise – i.e. the obstacle course -, observed by increasing the executive parameters and the summative assessment expressed by physical educators - not directly involved in the survey - at the end of a training program of 5 physical education lessons (at school) and 5 activities (in the rehabilitation center). The assessment tool was inspired by the Basic Movement Performance Profile - BMPP (Western Australia Department of Education, 2013), translated and adapted in the Italian version (see USR Reggio-Emilia, 2009). The experimental pair (EP) followed a structured protocol as:

1. Cognitive Activation Step (mnemonic and mime/movement revision of the program supported by 'icon visualizers')
2. Motor Activation Step (stretching exercises and moderate motor activity)
3. Training Step (three-times repetition of exercise, alternated with the companion and supported by 'icon visualizers')
4. Cool-down Step (stretching exercises, lashing and respiratory control)

Both experimental pair (EP) and the control pair (CP) performed the same number of lessons. The control pair (CP) attended only the following three steps: Motor Activation Step, Training Step without the support of 'icon visualizers' and Cool-down Step.

Although during the obstacles course activities, several mediators have been unavoidably used to enhance the didactical communication and the understanding of ASD students - adult/peer tutor modeling (Clinton, 2015), verbal prompt (Chabani & Hommel, 2014) – only the 'iconic visualizers' (Kozhevnikov, Hegarty, Mayer, 2002) has been analyzed. The typologies of these are various - gross motor movement cards (see fig. 3, a.), schoolbook images - taken by specific and professional tools or belonging to a personal physical educator 'thesaurus' (Agrati, 2017).

FINDINGS

The following results refer exclusively to a) the quantitative dimension, based on the executive parameters and the summative assessment expressed by physical educators; b) a specific aspect of qualitative dimension – the early semiotic analysis of 'iconic visualizers'. The whole study will be accomplished later, with the analysis of in-depth interviews of physical educator. The assessment of the basic movement performance focused on 4 of BMP skills: balance on a foot (BF), line walk (LW), forward roll (FR), run (R), jump for distance (JD).

Results concerning the quantitative dimension are elaborated in three steps and refers to each skill: a. score differences (numerical delta) of ratings pre-post of EP (ΔEP) and CP (ΔCP); b. increase of EP (ΔEP) net of 'exercise effect' - the increase of CP (ΔEP – ΔCP) – in order to evaluate the real 'experimental effect'; percent increase of EP net of the 'exercise effect'. Considering both pairs (n = 4, EP + CP), at the end of the analysis of ratings net of the 'exercise effect', an average increase 0.9 scores emerged in EP, respectively for BF (0.75 – 30%), LW (1.5 – 60%), FR (0.5 – 20%), R (1.75 – 70%), JD (0 – 0%).

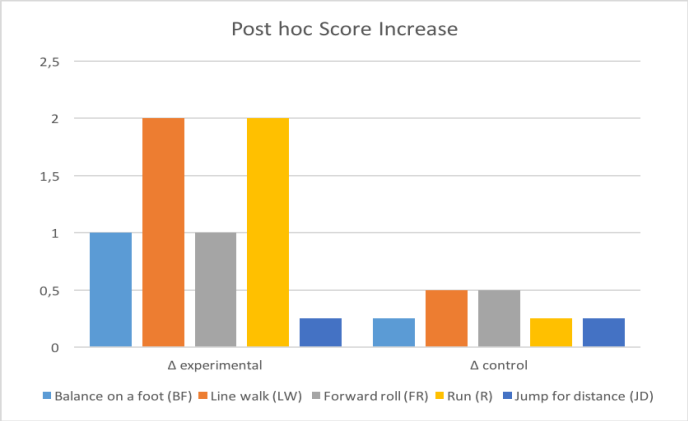


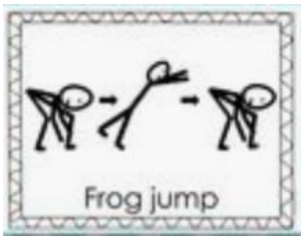
Fig. 2 – Post hoc score increase for each skill of training program

The Basic Movement Performance (2013), adapted in the Italian version, with respect to the sample tested, has proven to be a quite effective performance measurement method, quantifying both the overall result of the data and the skills that have been taken into consideration. Although the study, from the experimental point of view, has a limited number of students, as a critical element, however an indicative value of the 'experimental effect' (0.9 - 36%) has been obtained. Beyond the average increase, the diversification by skill – max. in 'run' (R), min. in 'jump for distance' (JP) – is to be note.

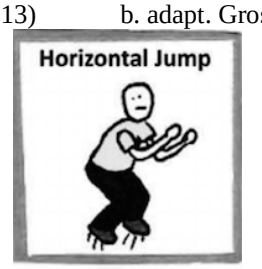
This quantitative data confirms with due 'caution' (Breslin & Rudisill, 2011) the efficiency of 'iconic visualizers' supporting of physical activities for ASD students. As studies with ASD early child (Bremer & Lloyd, 2016; Liu & Breslin, 2013), 'results indicated statistically significant differences between protocols,

while post hoc tests indicated that the picture task card condition produced significantly higher gross motor quotient scores than the traditional protocol' (Liu & Breslin, 2013, p. 347). Therefore, it would be interesting to carry out a study to verify the real differences in the use of iconic 'mediators' - as picture task card - due to the age of students (early childhood and childhood).
This suggests further research - broader samples, skills-specific analytics – in order to give more precise answers. The indicative results and previous studies (Agrati, 2016; 2017) induces the investigation into its qualitative dimension through the specific analysis of 'iconic mediators', used in supporting the physical activity programs of ASD students. This second step is taking place on a larger sample (24 ASD student – age: 7-11 - and 24 ASD adults – age: 18-30; involved in the same training program). The following semiotic analysis (Nikolajeva & Scott, 2013) has been carried out on the 'iconic visualizers', used in the training program, and it refers only to the icon of 'jump for distance' (JD), whose ability has not increased.
Comparing three 'iconic visualizers' - see fig. 3, a. used in the experiment; b. adapted from Gross Motor Movement Cards (AfA, 2017), c. used in the study of Breslin & Rudisill (2011) – graphical and textual differences can be distinguished.

a. used in the experiment (WADE, 2013)



b. adapt. Gross Motor Movement Cards (AfA, 2017)



c. adapt. Breslin & Rudisill (2011)

Fig. 3 – 'Icon visualizers' analyzed

The image a. is a 'picture' that reproduces a realistic situation - a jumping child - and it is articulated in three sub-pictures that express the effect of movement. The image c. is an 'icon' (Peirce, 1931-58; Eco, 1975) that represents an essential character performing a jump. It's articulated, as the image a., in three sequences and the effect of the movement is further highlighted by the directional arrows. The image c. is, also, an 'icon' that reproduces an essential character. It is not articulated in sequences. In the image a. there are no verbal elements, in b. 'Frog jump', in c. 'Horizontal Jump'.
The communicative effectiveness of these three images is not testable using only theoretical tools. For this reason, in order to verify if the different features of the 'iconic visualizers' have effects on the ASD students understanding and performance, in the second phase of this study a further experimental analysis will be carried out on them.

CONCLUSIONS

As known and widely accepted (Billingsley & Rome, 1983; Libby et al., 2008; McKay et al., 2014), according to the behavioral approach, there are four procedures for transferring stimulus control from response prompts to natural stimuli (see 'Prompt Hierarchy as Applied Behavior Analysis approach'). In general, in order to providing the performance of ASD student, this study is confirming that verbal prompts need to be integrated with images, in physical activity as well. Although this is known (Liu & Breslin, 2013), however, it would be useful to better analyze the iconic mediators in detail because - as emerging from the survey - their features may have an effect on the learning and performance of ASD students.
The idea of teaching as a 'complex adaptive system' (Sibilio, 2014) is once again confirmed: in order to meet individual differences and recognize the potential plasticity of the neurological system, teaching is 'adapted' to the personal forms of knowledge, skills, attitudes and behaviors (p. 78). From this perspective, on one hand, the teachers are called every day to explore the different and specific apprenticeships of students and to identify eventual methodological 'deviations' (Sibilio, 2017) that respond to different educational needs; on the other hand, the researchers should believe in an *in progress* knowledge and be always available to further deepen the obvious.

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