DOCUMENTS ON PHYSICAL EDUCATION AND SPORT IN MIDDLE SCHOOL IN ITALY: DIDACTICS ASPECTS, MOVEMENT THEORY AND LEARNING

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Review paper

Abstract

Physical education and sport in Italian school is in evolution because of the ministerial education document is continuously updated and the lower secondary school, common namely middle school, has been changed. In the same time, new discoveries on the neurological aspects of the brain and the mechanism of motor control opens a new scenario on education, didactics and motor learning. The study addresses the new scientific basis of movement and its related didactics, so the aim is to verify if there is the update on contents, didactics and teaching methods. It uses an integrated method that joins in a historical documentary approach and theoretical one on scientific paradigms. To conduct in an argumentative deductive approach to talk about new discoveries on motor control and learning to apply in ministerial documents. Results do not carry out any particular aspects connected to the new neurological theories applied motor control and learning. All ministerial documents does not provide any reference of motor imagery, open loop, closed loop and didactics of movement about cognitive, ecological-dinamic approach. In conclusions the data are in opposite way to update regulation documents according to new scientific evidences. It may be useful to deepen further the study and deliver the results to the governmental experts for the necessary updates to fill up the vacuum.

Keywords: closed and open loop, motor imagery, cognitive, ecological-dynamic approach, regulation papers

Introduction

This study aims to determine whether the new acquisitions in the field of research on movement and the consequent impact on the paradigms of learning and teaching have been considered in drafting the ministerial documents that regulate and direct the first cycle of education in Italy, with particular reference to first grade secondary education, commonly called lower school. In this section it analyzes the current state of the art of how and why the body and movement are central in the learning process, through methodological and didactic choices in teaching activities at whose foundation there is scientific evidence. "Conceptual knowledge is embodied, that is mapped in our sensory-motor system. This not just provides the the conceptual content, structure to characterizes the semantic content of concepts according to the way we function in the world with our bodies." (Gallese & Lakoff, 2005). Below is presented a brief summary of the main currents of thinking in the context of motor control and motor learning, in order to evaluate the resulting teaching methods, and so verify if the indications present in the educational documents that will be analyzed can be traced back to such theories. They are synthesized in Cognitive, Ecological and Dynamic approach. Humans have, in the brain, a series of motor programs, or sequences of commands that, in the central nervous system, coordinate the execution of movements. According to a first formulation, processing of information from sense organs and proprioceptors allows the system to correct the movement at execution time. The closed-loop motor control (Adams 1971) assumes that the movements are sufficiently slow to allow

correction during implementation, based on the data from the feedback. The longer the execution time, the wider the opportunity to use the motor control circuits based on feedback (Schmidt, Wrisberg 2000). In other word, when motion is quicker of nerve impulses conduction, the movement is not susceptible of correction in progress and is programmed completely in the central nervous system due to the inability of the brain to process information and data below the threshold of two hundred milliseconds (Open loop motor control, Schmidt 1985, Keele et al. 1986).

movement consists of developing cognitive structures (the motor programs) through information processing. These processes allow the opportunity to compare in real time (closed loop) or later (open loop) obtained results and expected results, triggering a process of adjustment and refinement of movement and of motor program. Its structure is such that allows the performer to adjust the movement in order to meet the changing needs of the environment. The ecological approach does not consider necessary to use prescribing mental structures: the action is directly available to those who act in their own environment, the selforganization that do not require the use of a motor program (Edelman, 1987). In this approach, learning is defined as an education of attention (Gibson, 1986). Learning means to optimize the processes of perception and develop the ability to dictate the specific stimuli. In the two approaches presented here, the perception of the context is different and the learning process is defined differently. In cognitive approach, motor learning means to stabilize an efficient motor program according to special processing information.

In ecological approach, motor learning is to seek the adaptability of the movement as resulting by the diversity of the environment and the specificity of the individual (Carnus & Marsualt 2003). The dynamic approach considers the evolution of the behaviour of complex systems, where a complex system is a set (the moving body) composed of multiple interacting factors (body segments). In the dynamic perspective learning is to build and stabilize a new state not included in the initial coordination dynamics of the system. (Federal Sports Commission CFS, 2001). The direct consequence of the cognitive theory in educational applications is a prescriptive approach, with a teacher who directs the structure of motor programs (with increasing complexity) and the optimization of their parameters. The aim of the exercises will be to stabilize and improve the motor program by reducing the variability in execution through the repetition method. Teaching, in ecological approach, is designed to stimulate the emergence of spontaneous solutions, heuristics to motor problems, taking advantage of variability in executive search process that implements a mobility solution that passes through the continuous variation of motor gestures. The knowledge of structural and functional organization of the motor system has evolved and deepened in recent years, gradually abandoning the idea of a brain where the processing of sensory information was entrusted to different and dedicated cortical areas, according to a model in which sensory and motor information are very interdependent. A central role in this reversal of perspectives is due to the discovery of mirror neurons, early in monkeys and later in humans. Open loop and closed loop are two of the most important theory of motor control and learning, nowadays it must includes a new theory that can better explain the motor learnigs.

It is motor imagery theory. Before to talk about it, it has to introduce some new neurological discoveries: Mirror neurons system. "Mirror neurons are for neuroscience what the DNA was for biology" (Vilayanur Ramachandran, in Iacoboni, 2008). Studies in the human brain have shown the existence of mirror neurons system similar to that discovered in monkeys while the "Group of Parma of Giacomo Rizzolatti" has noted that they responded both when the monkey performed directly the movement of reaching the food, either when was another individual to perform the action by recording the activity of certain neurons of motor area called F5 in grasping tasks in the brain of a monkey, a group of researchers (Rizzolatti, Fogassi & Gallese, 2001). "Whenever we see someone perform an action, in addition to activation of the visual areas, there is a concurrent activation of motor cortical circuits that are normally active during the execution of these actions. In other words, the observation of an action involves the simulation of the same. The fact that the motor system is active not only during the run, but also during observation of actions, suggests that exists a relationship between control and action representation "(Gallese, 1996).

The discovery of a same group of neurons involved in both perception and action dismisses the idea of specialized brain areas and implies interdependence between perception, cognition and motor system. The first phase of motor learning is characterized by imperfect movements, a high dependence on feedback and a large cognitive and attention load (Atkeson, 1989). The evolution and stabilization of learned movements is reflected in neurological and anatomical level, on a change in the brain areas recruited and activated neuronal circuits (Halsband, 2006). While the immediate repetition of an observed action is supported almost exclusively by the mirror neuron system, learning by imitation requires the intervention of the prefrontal lobe, particularly in the area 46 of Brodmann, and some areas of the cortex anterior mesial. The area 46, generally associated with functions related to working memory, in this case plays a role in combining elementary motor acts in more complex motor patterns. During the learning process, in fact, mirror neurons are responsible for the allocation of the observed action into individual pieces, which are then reassembled into a sequence so that appropriate action is reproduced as close as possible to that observed. So, it has to talk about on contents and didactics of movement in ministerial document. In Programs of '63 and '79, physical education in the peculiarity of its activities and its techniques helps to promote balanced ripening psycho-physical, intellectual and moral of pre-adolescent student and improve his integration into the society through the solicitation of a harmonious development of the body. In National Guidelines of 2004 with the Law 53/2003 and the decree entered in the pedagogical-didactic language new terms: personalized study plans (PSPs), personalized plans of Educational Activities (PPAE), Profile, cultural and professional education (PECUP), National Guidelines, Recommendations, civil coexistence, polyarchy, horizontal and vertical subsidiarity, Learning Units (AU). Although the targets are enriched with adjectives: general, specific learning (OSA); knowledge become declarative, conditional, procedural, while skills become "mainstreaming" and "specific". Appear terms such as portfolios, laboratory and "Larsa", prevailing teacher, the tutor, external evaluation (by INVaISI) and internal evaluation. These are terms that should be reported to the theory underlying the reform of the school, but also to methodologies by which to carry out the reform. Here are some significant excerpts from the section on physical education. "The specific learning objectives of the educational Secondary School of First Instance, in view of the maturation profile of the educational, cultural and professional of the student at the conclusion of the first cycle of specific education. uses learning objectives indicated for the first two years and the third class in the tables attached to design units of learning. These depart from suitable and meaningful educational goals for individual students, with defined learning standards, and are developed through appropriate paths in method and content, and evaluate at the end, both the level of knowledge and acquired skills, whether and how they have developed the personal skills of each student (Article 8 of Presidential Decree. 275/99). The specific objectives of learning indicated in the accompanying tables are sorted by subject, on the one hand, and 'educations' that are converging into their education to civil society, on the other. "

Table 1. Some information on movement learning

Consolidation of	Using effective capacity in
coordination skills.	normal execution
	(coupling and combination of
	movements,
	differentiation, balance,
	orientation, rhythm,
	reaction, transformation,)
Level of	- Use rational work plans for
development and	the increase in capacity
improvement of	conditional, according to the
the conditional	their levels of maturity,
capacity (strength,	development and
speed, endurance,	learning.
articular mobility).	
[]	[]

In the indication per il curriculum "Guidelines for the curriculum for kindergarten and the first cycle of education", issued by the Minister Fioroni by Ministerial Decree 31 July 200,750, cancels most of teaching methods proposed by the National Guidelines, built on basis of art. 8 of Presidential Decree 275/99 and enacted by Parliament in with law-delegates 53/03. Indications plot lines and criteria for the attainment of educational goals and learning objectives for the kindergarten and the first cycle, replacing the previously proposed transient indications to schools in recent years. The Fioroni Minister Indication said that "In respect for and valuing school autonomy, the indications from the framework for designing curriculum entrusted to the schools. Indications are an open text, which the professional community is called to take into context, by making specific choices about content, methods, organization and evaluation." The construction process of the curriculum cannot be separated by a critical reconsideration of the essential elements of the educational relationship. In essence, the curriculum must be built in the school, is not issued by the centre to be applied, allowing the "agreement between the central instance, regulative and uniform, and local instance, pragmatic and flexible. In this sense, the construction of the curriculum involves a consideration of the school as a place for research and educational innovation, in a dialectical relationship with the requests from the scientific, social and ethical community that characterize the "horizon of shared values represented at both central and local level. The aim is to identify if in ministerial documents on lower secondary school, namely middle school, on physical education and sport if there is the new scientific basis of movement and the relating didactics.

Methods

methodological approach is Integration of different types of research into a single model with an ecological model. In one way it is the historical and documentary research that analyzes the methodological and teaching contents of physical sport and motor activities in primary school and lower school obtained from laws and ministerial papers. In the other way it is the and argumentative research that theoretical analyzes methodological and didactic patterns of physical and sport activities according to the main pedagogical, psychological and physiological theories. Finally, comparing all the data to argumentative deductions.

Results

The programs for middle school, dated May 11, 1963, refers specifically to the premise that physical education programs indicates the general purpose of educational and methodological suggestions such as: teamwork for individualization of teaching, the prevalence of the use of the command by invitation and discretion in proposed order of exercises; clear preference for the use of natural movement and ample space to professionalism of the teacher in the search for variations of intensity, size, rhythm, performance, dynamics, succession and combination.

The Physical Education section of Middle School Programs of 1979 is longer than the past one and, for the first time, speaks on motor education in cognitive aspects connected to physical education and sport in the developmental process. It contains a strong appeal for a didactic guided by the free doing and acting and the provision of appropriate learning environments for a rich and extensive stimulation. The field of knowledge is divided by areas and the body and movement area is enhanced at least as other fields. The teacher's role is slightly active tending in some cases to director of operations. New programs have no more a list of exercises, but the general educational objectives, leaving to professionalism of the teacher, mediated by the collegial bodies, to define methods, routes, time and materials, as well as testing and evaluation. Teachers have to apply the procedures, methodologies, time and materials, evaluation and remain free of reference parameters. Documents don not have inside the new discoveries on motor control system and there are no scientific elements on neuroscience applied to movement and the learning process through the body. The document 2004, Attachment A - National Guideline for the Programs of studies of the first cycle of education National Guidelines for Personalized Programs of the Educational Activities in the first cycle of education, Specific Learning Objectives, Recommendation to put into practice the National Guidelines for Personalized Programs of the Educational Activities, is a very innovative regulation tool to teach properly to a new discoveries on individual learning process.

It takes in light the relation between the teaching and the learning in an unicum. The format is wrote in double column, where on the left there is specified knowledge and on the right related ability in motor and sports science, as a sort of a new scientific paradigm of physical education and sports in primary and lower school. Thus, it is a mere list of objectives to be achieved in the form of motor skills and there is no single reference to teaching. Basically, it does not refer to any element related to the theories of motor control or to the recent scientific discoveries. The document 2007, The Guidelines for the curriculum of the first cycle of education, resumes the contents of the document Guidelines for preschool, primary and lower school,. These contents are contextualized in a disciplinary process that goes from childhood to the end of the first education cycle. It widens the sense of continuity of teaching action without indicating specific teaching methods. Motor control does not indicate and it does not address to new scientific scenarios on movement in the light of the discovery of mirror neurons or the other motor control system theories.

The document 2009, Revision of the educational organization, regulated directions for the first cycle of the school recommends to trust in two last documents: 2007, the Guidelines for the curriculum of the first cycle of education and 2004, National Guideline for the Programs of studies of the first of education National Guidelines Personalized Programs of the Educational Activities in the first cycle of education, Specific Learning Objectives, Recommendation to put into practice the National Guidelines for Personalized Programs of the Educational Activities. It does not explain the innovation in new rules, but it postpones to a new experimental study the final revision and does not hint anything. Also in this document, there is not a content on the theories of motor control and, consequently, no one scientific specificity about body and movement as a cultural aspects. As for preschool regulation (Raiola, 2011a) and for primary school regulation (Raiola, 2011b) there are not elements and/or methods to establish the application of motor control system in its three scientific ways and forms: closed loop, open loop and motor imagery.

The big vacuum is the absolute absence of psychological and pedagogical aspects movement that could have the theoretical aspect of new discoveries. In the same way, it must to also. the of consider. contents sport coaches/trainers/technicians education on basis of movement and the related didactics. Particularly, due to volleyball is the most important sports game in lower secondary school, it is useful to know if there are specific knowledge as well as the ministerial documents (Raiola 2012c).

Discussion and conclusion

Physical activity forms the crux of any major physical education programs at school levels. Regular physical activity and the attitudes toward it can only be developed in the school years. As children make the transformation into adults, many developmental changes occur (Pethkar, Naik & Sonawane, 2011). The importance of an effective support to the development of the sensory-motor integration ability seems one of most important aim that every school system should follow. However, it may happens that the educators support the sensory-motor development of the student by obsolete methodologies, like the use of exercises based on the simple repetition of actions involving the visual and motor ability. This method is inefficient because "these abilities cannot be considered like a muscle to train but like a knowledge that must be taught (Beery, 2000)." In the analyzed documents do not appear to be guidelines which may be of guidance and support to teachers in their school activities. By results set forth above, appears as the documents are free of cultural references on learning motor and motor control, and this results in a total lack of knowledge of general and specific aspects of human movement, motor control and psychological aspects. The unique formulation and overall knowledge is useful for the holistic approach, but not realizes the goal of basic knowledge in a specific field (Raiola, 2011abc). The identification of a specific epistemological structure, and the resulting educational applications, constitutes an essential step if the physical education at school wants to see recognition of its autonomy and centrality. From the disciplinary structure, flows a deepening of the paradigm of the discipline respect to the structuring of a coherent theoretical framework and the definition of procedures and methodologies in education. "Amendments in the national curriculum and changes in physical education teaching methodology seem crucial. Apart from gaining competences pertaining to a particular graduate's profile, development of creative skills, and shaping the proper attitude and behaviour seem vital" (Buchta, 2011). A detailed review of the psycho-pedagogical principles at the basis of ministerial documents is needed, with the purpose to insert clear links to the theories on motor learning, motor control and movement. The review have to include the experimental triennial period, between 2009 to 2012, because also in documents related to first grade secondary school (and so in the whole first cycle of education between 6 to 14 years old) in the new version have to make another study to complete the last ones. Thus, it needs to deep scientifically the question to know the exact dimension to give a good response for the education path.

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Regulation references

- 1) Ministerial Decree DM 24 April 1963.
- 2) Ministerial Decree DM 9 February 1979.
- 3) Ministerial Decree D.M. 31 July 2007, Indicazioni per il Curriculo per il primo ciclio di istruzione, The Guidelines for the curriculum of the first cycle of education.
- 4) Legislative Decree DLGS no. 59 of 19 February 2004 Attachment A National Guideline for the Programs of studies of the first cycle of education National Guidelines for Personalized Programs of the Educational Activities in the first cycle of education, Specific Learning Objectives, Recommendation to put into practice the National Guidelines for Personalized Programs of the Educational Activities.
- 5) Decree of Republic President DPR no. 89 of 20 march 2009 Revisione dell'assetto ordinamentale didattico organizzativo del primo ciclo di istruzione. Revision of the educational organization regulated directions for the first cycle of the school.

DOKUMENTI O TJELESNOM ODGOJU I SPORTU SREDNJIH ŠKOLA U ITALIJI: DIDAKTIČKI ASPEKTI, TEORIJA GIBANJA I UČENJA

Sažetak

Tjelesni odgoj i sport u Italiji je u razvoju jer se ministarski edukacijski document stalno osvježava a niža škola drugog stupnja, obično zvana srednja škola, se mijenja. Istodobno, nova otkrića neuroloških aspekata mozga i mehanizma motorne kontrole otvaraju novi scenarij u edukaciji, didaktici i motoričkom učenju. Istraživanje adresira nove znanstvene temelje kretanja i s tim povezanu didaktiku, pa je dakle cilj verificirati osvježavanje sadržaja, didkatičkih metoda i metoda učenja. Koristi integriranu metodu koja se povezuje u povijesni dokumentalni pristup i teorijski utvrđuje jednu od znanstvenih paradigmi. Usmjeravanje u argumentirani deduktivni pristup radi rasprave o novim otkrićima motoričke kontrole i učenja i primjene u ministarskim dokumentima. Rezultati ne donose bilo kakav pojedinačni aspekt povezan s novim neurološkim teorijama primjene motoričke kontrole i učenja. Ministarski dokumenti ne sadrže nikakve reference motoričkih slika, otvorenih petlji i didaktike gibanja o kognitivnim, ekološko-dinamičkim pristupima. Zaključno, podaci su u kontradikciji s regulacijom osvježavanja dokumenata sukladno novim znanstvenim dokazima. Može biti od koristi produbiti buduću studiju i dostaviti rezultate vladinim ekspertima za neophodno osvježavanje kako bi se popunio vakuum.

Ključne riječi: otvorene/zatvorene petlje, slika gibanja, kognicija, dinamički pristup, regulacijski dokumenti

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