Assessing the Impact a Yearly Protocol on the Psychomotor and Affective Domain of Learning in Primary School

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ASSESSING THE IMPACT OF A YEARLY PROTOCOL ON THE PSYCHOMOTOR AND AFFECTIVE DOMAIN OF LEARNING IN PRIMARY SCHOOL

DOCTORAL DISSERTATION

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Sažetak

Posljednjih je godina sve veći fokus na razvoju tehničkih i taktičkih vještina te na zadovoljstvu učenika i njihovoj želji za sudjelovanjem. Dokazano je kako škole ne pružaju odgovarajuću potporu razvoju takvih sposobnosti tijekom odgojno-obrazovnog procesa.

Glavni cilj ovog istraživanja bio je procijeniti utjecaj Modela taktike igre (TGM) na taktičke vještine (u odnosu na invazivne sportske igre: nogomet i sportske igre koje uključuju mrežu: odbojka) te na afektivno područje učenja kod djece osnovnoškolskog uzrasta.

Uzorak ispitanika obuhvatio je 70 učenika četvrtih razreda osnovne škole (prosječna dob: 8,9 godina). Protokol je trajao 22 tjedna (2 sata tjedno).

Kako bi se analizirao utjecaj na taktičke vještine i afektivno područje učenja, korišteni su *Team Sport Assessment Procedure (TSAP)* i *Physical Activity Enjoyment Scale (PACES-IT)*.

ANOVA za ponovljena mjerenja (RM-ANOVA) za varijable TSAP otkrila je važan model u odnosu na utjecaj TGM-a na razvoj taktičkih vještina [nogomet: $F = 12,2$ ($p < 0,001$); odbojka: $F = 33,5$ ($p < 0,001$)]. Kada je riječ o afektivnoj domeni učenja, rezultati su potvrdili utjecaj na pozitivnu ljestvicu, kao što pokazuje rezultat dobiven provedbom testa pod nazivom Wilcoxon Signed Ranks Test [$z = -5,373$ ($p < 0,001$)].

Rezultati su prilično korisni kada je riječ o procjeni utjecaja pristupa usmjerenog na učenika u talijanskim osnovnim školama te kao smjernica za sastavljanje i procjenu kurikuluma tjelesne i zdravstvene kulture u osnovnoj školi.

Instrumenti i metode korišteni u ovom istraživanju mogli bi se lako integrirati u obrazovni sustav osnovnih škola, ali taj bi postupak zahtijevao prethodno specifično osposobljavanje novih učitelja tjelesne i zdravstvene kulture.

Ključne riječi: Model taktike igre, tjelesna i zdravstvena kultura, osnovna škola, taktičke vještine, zadovoljstvo.

Abstract

The focus on the development of technical and tactical skills and on the enjoyment and involvement of students has grown in the recent years. It has been shown how schools fail to provide adequate support to the development of such abilities during the teaching-learning processes.

The principal aim of this study was to estimate the effects of a Tactical Game Model (TGM) on tactical skills (in relation to an invasion game: football and a net game: volleyball) and on the affective domain of learning in primary-school children.

The sample of participants included 70 primary-school pupils attending the fourth grade (mean age: 8,9 years). The duration of the protocol was 22 weeks (2 lessons per week).

In order to analyse the impact on tactical skills and affective domain of learning, the Team Sport Assessment Procedure (TSAP) and the Physical Activity Enjoyment Scale (PACES-IT) were used.

Repeated Measure ANOVA (RM-ANOVA) on TSAP variables revealed a significant model regarding the effect of the TGM on the development of tactical skills [football: $F=12,2$ ($p<0.001$); volleyball: $F=33,5$ ($p<0.001$)]. Regarding the affective domain of learning, the results underlined an effect on the positive scale as shown by the result obtained from the Wilcoxon Signed Ranks Test [$z=-5,373$ ($p<0,001$)].

The results are rather useful when it comes to verifying the impact of a student-centred approach in Italian primary schools, and as a guideline on setting up and assessing a Physical Education curriculum in through primary school.

The instrument and methods used in this study could be easily integrated in the educational system of primary schools, but this process would require a previous specific training of new Physical Education teachers.

Keywords: Tactical Game Model, Physical Education, Primary School, Tactical Skills, Enjoyment.

1. Introduction

Physical education cannot be limited to improving just physical abilities, as it is concerned with a much broader range of skills, some of them emotional and social, as well as cognitive processes, motivation and moral concepts (Eurydice, 2013).

Fundamental Movement Skills (FMS) are related to physical activity and practising sport. The Centers for Disease Control and Prevention provided research directives in 1998 for better understanding of the impact of the aforementioned activities on health. Physical activity is linked to a good level of fundamental movement skills (Clark & Metcalfe, 2002; Stodden et al., 2008), and children, as well as adults, skilled in physical activity will be more active (Clark, 2005). The importance of FMS is supported by recent studies that investigate different aspects related to the teaching-learning process and the principal and valid assessment methods (Sgrò, Nicolosi, Schembri, Pavone, & Lipoma, 2015; Sgrò, Quinto, Pignato, & Lipoma, 2016; Sgrò, Pignato, & Lipoma, 2018).

In Italy, Physical Education lessons in primary schools are consistent with the European guidelines as highlighted by the Eurydice report, but there is still an issue of a teacher with adequate expertise as they were not planned accordingly on national level.

This previously mentioned circumstance has an impact on the development of motor skills in children (i.e. 5-10-year-olds) that, as shown in different previous studies, is low (Sgrò, Quinto, Messana, Pignato, & Lipoma, 2017; Tortella, Haga, Loras, Sigmundsson, & Fumagalli, 2016). Several authors underlined this evidence in their work, in fact the low level of the aforementioned abilities has a discernible impact on children in first grades of secondary school (Ceciliani, 2018).

The Italian National Olympic Committee (CONI) proposed and conducted a project to increase physical and sport skills development during last years. In fact, it was implemented as a yearly project that includes in its framework two Physical Education classes a week, with a specialist and graduated student of Physical Education present at all times.

This project was designed by following the “Teaching Games for Understanding” (Bunker & Thorpe, 1982) and its main goals were the

improvement of abilities and capabilities, and learning of educational values of sport (fun, loyalty, fair play, etc.).

A recent study underlined that the mentioned project failed to become best solution for an adequate development of physical and sport skills (Sgrò, Quinto, Platania, & Lipoma, 2018). The main aim of this study was to assess the effect of a student-centred approach based on a tactical game (Mitchell, Oslin, & Griffin, 2013) that could be useful to reach Physical Education objectives in primary school.

In the orientation of Physical Education as a subject, educational goals include not only the development of motor skills and sport abilities, but also motor literacy, autonomy, socialization and enjoyment. The problem of early start-up activity has always kept alive the interest of instructors and educators in the age of development. The developmental age includes different periods of development, but the most affected in the relationship between growth and physical activity are middle childhood and puberty, a period ranging from ages 5-6 years up to 13-15 years (Meinel, 2011).

Respecting sensitive period in child development, in which child's motor skills can be easily trained, there is a vast range of possibilities for motion activities including play, leisure, fun, and body training, all aiming to provide better basics and postural motor patterns, individual motor skills, and consequently both physical health and well-being in general.

Subsequently, activities that are typical of sports games, based on the real abilities of children, stimulate their interest, thus getting them closer and closer to doing sports. A sport-game (i.e. teaching a game for understanding) is a playful, multifaceted and customized activity that improves child's psychophysical abilities, using creative, organized and finalized skills, motor skills that lead the child to the acquisition of specific abilities (Almond, 2015; Hopper, 1998; Memmert et al., 2015; Stolz & Pill, 2014).

It is essential to emphasize that exasperated agonistic sports activities at unsuitable age result in anxiety, fear of failure, extreme empowerment, which can all lead the young to live sport with discomfort, prompting an absolute abandonment of sport.

In order to avoid this, a structured path of education to movement must be created from early childhood, which not only guarantees a child's physical

development, but also ensures a better and complete picture-structuring of the self-image.

Considering the situation of the Italian government regarding education, current study can help to understand how important it is that Physical Education teachers, who will work primary schools know innovative and scientific methods and tools to work not only on development of fundamental motor skills, but also on related aspects of tactics (and awareness of their role and movement) by making them fun and engaging at the same time.

1.1 Movement and sensitive phases

Movement skills are an essential element of a healthy child as children move all the time and are constantly active. Due to various movements and playful activities, the child, gradually becomes stronger and learns about the surrounding world at the same time. The child thus learns about the nearest and furthest surrounding objects by grabbing them, touching them, manipulating them, examining them, with the help of movement of the hand and the senses, and above all the sight, the touch and the sense of movement. Furthermore, children are able to differentiate them even further according to their properties, their shapes, quality of use, and their relationship in space and time (Meinel, 2011).

Therefore, the child needs movements coordination in order to solve certain problems, and the movement itself becomes the source of the cognitive process itself. Motor actions and the achievement of experience and knowledge through the senses are unique processes, and they are completely connected. Nevertheless, and knowledge through the senses is the first form of knowledge, it is the basis on which the perceptive and conceptual world of the child is built, as in turn becomes the prerequisite for a behaviour that must be increasingly adapted to objectives (Trinci & Donati, 2007).

The phases of human motor development in ontogenesis represent individual evolution of conditional and coordinative capacities of human movement and motor skills since the birth.

These periods are divided into:

1. Neonatal period: up to the 5th / 7th day of life;

2. Infancy and Toddlerhood: it goes from the 8th day of life up to the age of 2;

3. Early childhood or Age of play: it goes from 2 to 6 years;

4. Middle childhood: begins at 6 years and ends with the puberty period;

5. Puberty: lasts about 3 years;

6. Adolescence: lasts about 3 years and ends with pondo-statural growth;

7. Adulthood: lasts about 35 years and ends with menopause for women and at the age of 54 years old for men.

8. Old age: lasts about 20 years

There are ontogenetic periods in which a person can easily train specific motor skills or sporting tasks; these periods are called "sensitive phases". If the educator fails to train certain skills in the most suitable ontogenetic period, it will be more complex to do so at different times, by decreasing consequently the results achieved. A good deal of previous and current motor development research has described the temporal, spatial and sequential elements of specific movement patterns as they develop (Malina, Bouchard, & Bar-Or, 2004). The stages of these fundamental motor skills are reported in Figure 1.

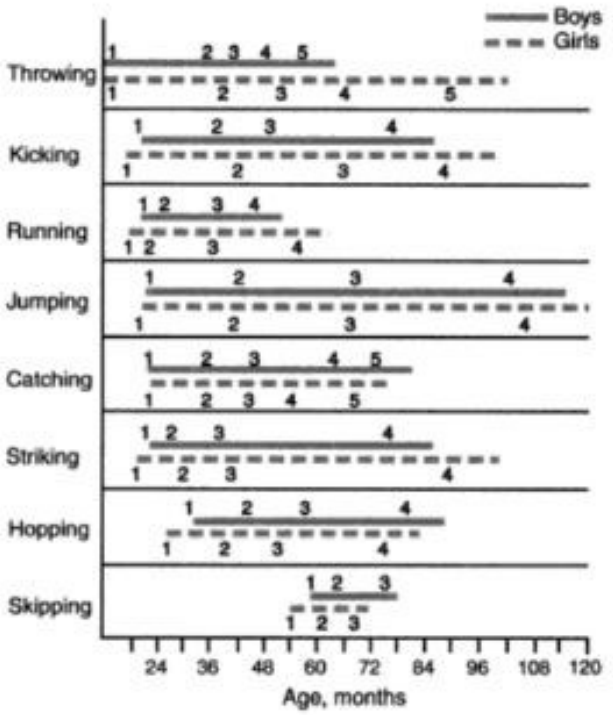

Figure 1. Ages at which 60% of boys and girls were able to perform several fundamental motor skills at specific development levels (Malina et. al., 2004)

Some phases of this method must be taken into consideration by stimulating these qualities with appropriate stimuli; otherwise, there is the risk of creating curricular voids that are almost impossible to fill by setting clear limits to future performance possibilities. During the first period, game is the most important activity both for the stimuli it offers in all aspects, and for the total emotional involvement of the child; monotonous exercises or those with unsuitable requests for the child's ability do not capture their attention, and are the first step towards the abandonment of these activities (Cutrufo, Pizzato, & Semensato, 2013).

1.2 Motor development during middle childhood

The sample chosen for the current study refers to the age of 8-9 while the motor development of middle childhood is described below.

1.2.1 Development of motor abilities

With the start of school attendance, the relationship between children and the surrounding environment changes considerably. During this period, children spend a lot of time studying and quite less time on free play, so it is very important that an adequate Physical Education instruction is provided (Lipoma, 2014).

Many children also participate in extracurricular sports activities, so both Physical Education carried out at school and extracurricular activity play an essential role in the motor development of children. With newly educated children, it can happen that, during a Physical Education lesson, they are very unruly if the intensity of their physical activity does not satisfy them, or if the teaching method is too monotonous (Canuti et al., 2007).

On the whole, it can be said that there is a continuous change in motor behaviour of children motor behaviour due to the overall educational process, and not only to the teaching of Physical Education. From an uncontrolled and partly not very rational mobility, one gradually passes to a very controlled, rational and adequate motor behaviour in various situations (Aaron, Storti, Robertson, Kriska, & LaPorte, 2002).

Children learn to contain their impulse, to move and to adapt to demands of order and discipline proper to teaching. Instead, the intense and outstanding joy of moving that occurs throughout the first school year can be seen in their free play activities (Knappe, 1964).

In newly schooled children, it has been noticed that they are interested in moving sports, and are also happy to face them. Most children, when they start school, already demonstrate their readiness to perform different activities. On the other hand, some pupils are completely uninterested in their behaviour, and they, for example, have poor aspiration to achieve certain results in competitions.

When starting school, a significant fluctuation in attention, or in the ability to concentrate on a certain task, is expected. Certainly, children get quickly excited about any kind of game or sport activity, and express this enthusiasm without inhibition, but, for example, enthusiasm and attention rapidly decrease if they are asked to repeat the same motor task over and over again, and the teaching is not a very varied activity (Carraro & Lanza, 2004; Carraro & Bertollo,

2005). However, adequate development at the motor and physical level cause rapid changes. As early as the second year, children at school are more open to sports performance, and they are also more constant and persevering in their aspiration to achieve results (Moritz, 1967).

Another trend in the evolution of movement at this age is closely related to the rapid increase of motor learning capacity, which is expressed, due to the teaching effect, in a noticeable increase in the differentiation between various forms of movement.

As previously mentioned, the process that allows motor and physical development is possible due to finding a solution to the problem that requires the use of different sports techniques. During this differentiation the range goes from the child's running movement of the pre-school age to fast-running techniques; from the still mixed leap between high jump and long jump of the child who starts school to high and long jumps, characterized by a certain purpose of movement.

Besides the accentuation on differentiation, which affects all the hereditary infant movements, certain changes in the execution of movements are also evident.

In a child who just starts school, the general structure and the rhythm of those sports movements not including the forms of movement used in everyday life, are still poorly developed. In general, they lack a clearly structured spatial, and above all dynamic, articulation.

A further evolution, in the execution of movements at this age, is in the increase of strength and speed, and it can already be seen very clearly in the forms of locomotor movements. If a comparison is made between the first, second and third school years, it is clear that the strength and speed of movements increase considerably, especially in second and third year. This trend can be distinctly seen even in measurable sports performance, for example, annual increases in results from the first to the third year in fast races over short distances, long jump, high jump and dexterity routes, are considerably higher than in the following school years.

This remarkable increase in strength rapidity affects both genders, but especially boys, and at the same time it is the aspect of the execution of

movements where the differences due to gender are more pronounced (Scotton & Comoglio, 2003).

1.2.2 Development of locomotor skills

As children grow, their motor skills improve more and more. They engage in group motor games that entertain them and that instil safety and assistance in interacting in compliance with the rules. But it is unusual for the child to tolerate being subjected to excessively demanding exercises, and it is also necessary to avoid the need for specific sporting activities prematurely, so as not to hinder a proportional and harmonious growth of the subject. Instead, children should be oriented towards different pre-sporting activities, which provides opportunity to compare with the peers, test themselves, have fun and engage (Bennett & Guralnick, 1991).

In this period, running is among the most practiced activities between children. In fact, it is a form of movement that is controlled much better than jumping or throwing.

Analysing running as movement at average or submaximal speed of children of this age, as a rule, it shows a good coordination and a loose, soft and harmonious motor process. The differences emerge clearly as soon as we move on to short distances and at the maximum possible speed. We move from a movement performed with an amazing energy, control, amplitude and security, to movements that are conspicuously lacking in energy, not very large and heavy. Not infrequently to all this are added contracted and wrong movements, above all of the arms, and a structure that is not very elastic and heavy on the step (Meinel, 2011).

Despite these identifiable differences, however, it is possible to demonstrate that during movement while running there are characteristics specific to the age, and specifics of the sexes. Among those typical of the age are the wrong position and a poor forward inclination of the bust. The movements of the upper limbs have, in part, a stabilizing function, and are not yet completely inserted into the movement of advancement. The arms are held close to the chest, and are accompanied by a forward and backward swing motion. These movements are relatively loose, but sometimes even uncontrolled and without direction. Generally, it can be established that in boys there is a slight advance in

development regarding a particular angle of the step, elevation of the thigh, amplitude of the work of the arms and detectable results. Until the third school year, considerable progress can be made in all characteristics of running, in which the girls recover from the level of development that can be demonstrated in the first school year. Individual and specific gender differences now become smaller (Houlihan & Green, 2010).

Jumps are also a type of movement that is very willingly performed by children of this age, but not as frequently as running. Especially children who live in the city have little chance of jumping. If they have the right stimuli, they jump off a height. While playing games and during daily activities, in general, they have no other opportunity to jump off a height or simply forward due to the lack of both space and opportunity. When starting school, it can be ascertained that there is a wide variety of jump forms, but they lack in constancy in the spatial and dynamic progression, and in results, typical of a consolidated movement (Humphrey, 2012).

Whether jumping on a height, or long jumping, almost exclusively, jumping movements with the feet together, feet shoulder-width apart, or jumps with the feet continuing to the running motion. In general, it can be said that the evolution of movements range from the jump with feet shoulder-width apart to the long jump with the feet together, and when untrained children start school, they are at the mere beginning of this evolution.

Rapid progress is achieved with adequate jumping exercises, especially in the second and third school. Children also quickly learn relatively difficult forms of movement such as the three-stroke hop, triple jump, twirl and mixed jumps, and exercise with great enthusiasm (Jenkins, 2005).

In this phase the development of the launching movement is characterized by notable individual differences, and above all, by specific differences between the two sexes, which concern both the evolution of a technique and that of launch performance. In the latter, the girls reach in the first school year only 60% of the performance obtained by children and these differences still increase until the third school year (Peters, 1965).

Blume (1966) has essentially identified three stages of development or learning. The earliest is characterized because the launch is performed during the running movement. In the second stage the run-up and launch are developed, and they are executed one after the other, while the penultimate step performed by the child is transformed and resembles a crossover step and generally its execution is connected to a hop. Moreover, a fluid passage from the run-up to the launch succeeds only rarely.

Also, the run-up and the throw are developed in the third stage, and they are executed one after the other, but only a crossed step is executed, which is no longer connected to a hop. The run-up and the launch are more fluidly connected with respect to the second stage, but nevertheless their execution is generally still difficult. Even the ability to catch on the fly, which refers mainly to a medium-sized rubber ball, develops very differently in the early years of school.

1.2.3 Development of manipulative skills

In general, it can be said that, when starting school, children are able to catch a ball without great problems if it is thrown at their chest height. If the passage is not too tense, balls are also thrown at the knee-hight and above the head; children generally react adequately to small inaccuracies in the passage, they anticipate the trajectory of the ball, and normally manage to catch it without problems. These evaluations seem to contradict the statements made at the beginning, but they are valid only and exclusively if the ball is passed directly and for the purpose to be caught.

If instead the level of development of this movement is referred to other game situations, the results are worse, and they are seen especially if, to be able to catch the ball, a rapid and diversified reaction is needed, such as in order to reach it, for example, some steps are required, or a movement of flexion or extension of the body, or even a jump.

Children in the first year usually have very little ability to do so but if systematic exercises and ball games are used regularly it is confirmed that children increasingly learn different abilities such as:

1) anticipating, correctly and quickly, in various ways, the trajectory of the ball;

2) catching, to wait for it, learning an effective, and always a more precise, grip movement (Bennett & Guralnick, 1991).

These abilities can be trained to the point that towards the end of the first year it becomes possible to practice, with fluidity and the necessary ability, all those ball games that presuppose skill required for the grip. When starting school, the development of strength skills is still relatively slow. In general, specific differences between the two sexes are not yet important (Meinel, 2011).

The strength of the lower-limb muscles is considerably greater than in those of the upper limbs or the abdomen, because in this case, the necessary stimuli for development are provided by the multiple and various movements of locomotion, performed above all in the form of running and jumping.

A particular characteristic of children in the first years at school is the rapid increase in learning ability, which however is manifested much more clearly only in the second and third year of school (Louw, 1998). It is essential to foster the increase: in the ability to concentrate, in perception and orientation. However, the progress of the child's physical development, like the growing motor experiences, is also important. These prerequisites for increasing motor learning capacity are mainly produced by school education, and they are important for motor learning because it is thus highly possible to correct primal movements.

The rapid development of motor learning skills is linked to the development of the ability to control and combine movements. In the first school year, however, it is still underdeveloped compared to the third, and most students, especially girls, still encounter many difficulties when faced with the request to organize and combine different movements.

In the first three school years the highest rates of increase for the entire school age can be established. It is worth noting that, although the performance of boys remains significantly higher, nevertheless girls recover a bit more slowly with respect to the most backward level of performance in the first school year (Thomas, 2000).

In this period certain abilities are developed, and it is essential to gradually consider the sensitive phases of development. Between 6 and 11 years of age it is necessary to consolidate, in the most articulated way possible, all the basic

motor patterns in order to refine the coordination and the ability to interpret the signals that reach the brain, and to plan appropriate responses that are implemented based on the purpose of the movement and specific environmental conditions. In children, gender differences in basic motor skills are typically the result of environmental influences. Indeed, when performance is assessed using process-oriented rather than product-oriented tools, the differences are attributable to social factors rather than to biological factors (Hardy, Reinten-Reynolds, Espinel, Zask, & Okely, 2012). The task, the individual, and the environment therefore play an important role in the motor performance (Gallahue, Ozmun, & Goodway, 2011; Valentini & Rudisill, 2004) and the superiority of the skill levels of males compared to females, with regard to the results achieved, can be explained by considering their lower personal barriers to engaging in physical activities during leisure (Reichert, Barros, Domingues, & Hallal, 2007). Therefore, gender-related trends can be a direct consequence of opportunities to participate in structured programmes offered differently to boys and girls (Spessato, Gabbard, & Valentini, 2013). Girls, for example, are less encouraged by family and friends to engage in physical activities and sports (Goellner, Votre, Moura ˜o, & Figueira, 2010; Silva, Gomes, & Goellner, 2008).

This evolutionary phase can be divided into two periods as described below.

The first period, between 6 and 8 years, is characterized by the stabilization of results acquired in the early childhood, and it is crucial to reinforce the space-time orientation of the body. Moreover, in this phase the child has an inadequate ability to understand and interpret rhythms, and above all a strong dispersion in correlation between rhythm of movements and sound (Thomas, 2000).

Rhythmic education uses the rhythms of galloping, running, walking and hopping as basic activities. In this phase the experience of the body is also privileged in relation to distances (near, far), speeds (fast, slow) and directions (right, left, up, down).

Among the exercises suggested to these children, we can list those related to dynamic coordination, giving particular importance to the mobility and motor

skills of the hand, to oculo-manual coordination, through throws and suggesting games including the manipulation of small objects. In the second period, between 8 and 11 years, there is a sudden increase in motor development.

In this phase, considered as the period of maximum growth in motor learning skills, there is an enhancement in strength, speed and resistance (Felfe, Lechner, & Steinmayr, 2016).

Contradictions can be found in the development of joint mobility, although, generally, there is a good mobility of the most important joints, the decrease can already be noticed, especially in the divergent movements of the coxo-femoral articulation and in the mobility in the dorsal direction of the shoulder joint. However, the ability to flex the hip, shoulder and spine joints increases (Rarick, 2012).

These conflicting trends make more and more necessary exercises directed at increasing joint mobility in those sports or in those sports disciplines that require high joint mobility, such as artistic gymnastics, rhythmic gymnastics, diving, skating, etc. At the beginning of school attendance, it is particularly important to take into account children's considerable need for movement. Therefore, they should have sufficient freedom of movement both at home and at school, and they should be encouraged to spend time outdoors, to play and move.

These are very important rules for health, normal motor and physical development, but not least for the child's mental well-being. Different disorders of child's behaviour, such as anxiety, excitability, restlessness, stubbornness, restlessness, can appear due to excessive parent control, not considering child's need to move.

School education should also be linked to physical activity. In fact, it is advisable to lighten the teaching, for example with gymnastic exercises, when the attention and work skills of children decrease, after a period of immobility (Rampa & Salvetti, 1993).

It has been known for years that a similar approach to teaching, especially in the early years of schooling, greatly influences behaviour, the joy of learning, and the child's state of well-being. It should also be emphasized that this

increases the effectiveness of teaching. Therefore, it is particularly important to resort to Physical Education as much as possible, and to persuade children to participate in extracurricular sport (Felfe, Lechner, & Steinmayr, 2016).

In motor teaching with children who start school, their strong drive to move, their need for imitation, their need for change must be taken into account, as their abilities to concentrate or pursue results are still limited. The best way to proceed is to carry out intense and varied motor teaching. The teacher should try to create movement tasks that are stimulating and highly motivating in order to awaken interest, attract attention and develop aspiration for reaching a result.

1.3 Teaching styles: Tactical Games Model-Educational Approach

Fundamental Movement Skills represent the baseline to support the growth of each child and the main learning goals of pre- and primary-school Physical Education curriculum (Sgrò et al., 2016; Sgrò et al., 2017). Recent data provided by the European Commission have pointed out that almost everywhere in Europe children fail to meet the recommended 60-min of moderate to vigorous physical activity everyday (WHO, 2018). Several reasons are indicated as causes of this issue, including time spent playing videogames, rather low availability of physical activity and sports fields and the level of impact of physical and sport education process during school time (Crane, Naylor, Cook, & Temple, 2015).

On the other hand, school is widely recognized as an important setting for supporting skills, knowledge and behaviour oriented to physical activity and sport during lifetime. In this respect, Physical Education (PE) classes require high-quality teaching-learning methods, more lessons per week and a strong relationship with extra-school physical activity and sports clubs for providing additional opportunities (Sgrò et al., 2019).

1.3.1 Teaching Styles

It is essential for a good PE teacher to be able to keep the attention of their pupils high and to make them as involved as possible. This allows students to learn not only concepts and motor skills, but also the processes that underlie the

latter. Eliminating the monotony of exercises is one of the fundamental characteristics that each lesson must have. Also, it is essential to set clear and understandable goals at the beginning of the lesson.

The spectrum of teaching styles was first designed by Mosston and Ashworth (1994) as they designed a cohesive framework to serve as a guide for Physical Education teachers. It consists of 11 different teaching styles, five teacher-cantered and six student-centered styles. Figure 2 reports all teaching styles suggested by the aforementioned authors (Mosston & Ashworth, 2002, 2008).

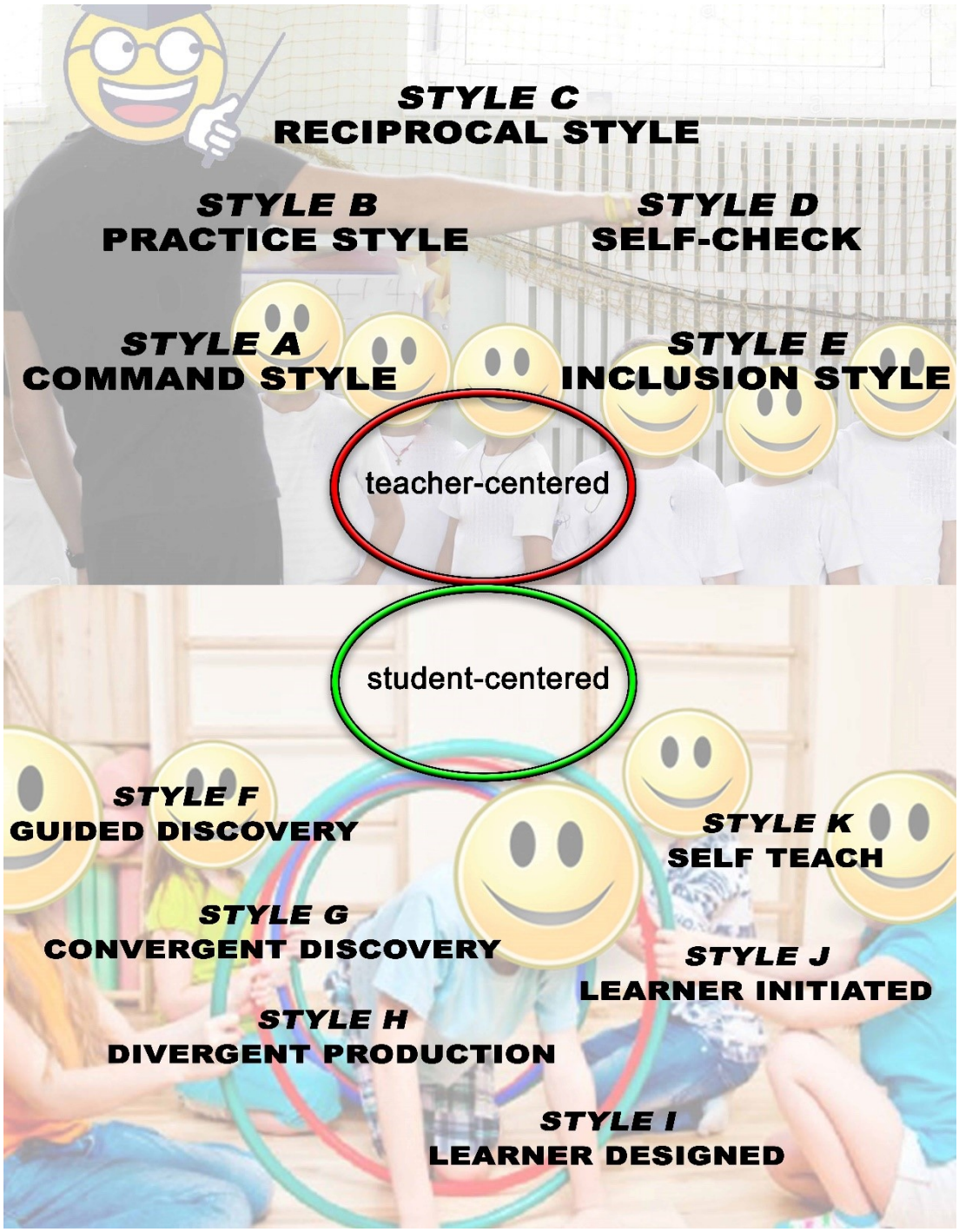

Figure 2. Teaching Styles

1.3.2 Tactical games educational approach

During the last years of Italian primary schools, Physical Education curricula provide a protocol based on the development of children skills through sport-game (i.e. teaching games for understanding) that are playful, multifaceted and customized activities that improve the child's psychophysical abilities, using

creative, fine and automatic skills, the motor skills that lead the child to the acquisition of specific abilities (Almond, 2015; Hopper, 1998; Memmert et al., 2015; Stolz & Pill, 2014).

Teaching Games for Understanding Model (TGfU) was originally proposed by Bunker & Thorpe (1982) as a six-step curricular model focused on teaching skills and understanding sport disciplines, but it lacked a pedagogical theoretical framework (Sgrò et al., 2015).

This model is compatible with the PE objectives and the learning process. In Teaching Games for Understanding, students acquire skills through sports game related movement, and then combining it with skills development. This model is based upon the Constructivist Learning Theory, and in fact the teacher teaches students how to perform different skills in a context.

Starting from this model, Oslin and Mitchel (2006) supported the Games-Centered Approaches (GCAs) that places the student in the middle of the learning experience which is focused on intellectual skills required to play a sports discipline. The students learned “why” an action/skill is required before “how” it is performed. In this process, they are guided to arrive at movement solutions with the help of questions asked by the teacher (for example: “Why did you use this skill/movement to reach that objective?”). These questions are useful because they provide development of awareness of what they are doing.

In this model, the assessment has a priority. The first assessment is through the perception of the student and is guided by teacher’s questions.

The second and equally important assessment moment is the one by the teacher. There are different assessment approaches, analysed in the following paragraph.

Recent studies showed that the regular participation in Physical Education has the potential to develop physically literate individuals who have the knowledge, skills, and confidence to engage in physical activity as an ongoing lifestyle choice (America, et al., 2014). Although, early school-based PE in the 19th century focused on calisthenics and gymnastic activities, currently it focuses on health-related fitness in most contemporary PE programmes seems to

undervalue the critical importance of developing skill-related fitness early in the life (Siedentop, 2004).

During these games, the teacher must organize the work plan, monitor and continuously check the results the child chieves. It is fundamental to be able to know how to observe the initial level of the individual or the group. Indeed, observation is an intentional process that produces effects (Castelli & Cei, 2007).

After a careful observation, the objectives to be achieved are established, and then follows the process of choosing the activities to be done by the children and the contents to be inserted. These activities are characterized by a task that requires cognitive and motor skills in which the determinant of success can be the decision on what to do or the quality of the movement.

Several studies addressed the characteristics of the aforementioned model from pedagogical and didactic perspectives (Gutiérrez, Fisette, Garcia-Lopez, & Contreras, 2014), but there is still no common consensus which supports an adequate design of developmentally appropriate curriculum materials (Butler, Oslin, Mitchell, & Griffin, 2008) or a proper definition of learning progression for teaching games and sports within the school context (Sgrò et al., 2019).

1.4 Video-Analysis of the assessment of movements in PE

The assessment methods are mainly based on the following two features: the used approach, discussed in the previous paragraphs, and the technological device used to assess movements.

In recent years, the use of innovative digital tools has been a central element of the life of every human being. Several aspects of the society, in its many facets and dimensions, have been significantly affected by this phenomenon. In the pedagogical debate that animated the last decade, particular attention was paid to the effects generated by technologies on the learning-teaching process, especially in terms of training generations that are increasingly defined as Digital Natives or Digital Natives (Kennedy, Judd, Churchward, Gray, & Krause, 2008).

In the school context that undoubtedly represent a crucial point for the formation of the above-stated generations, digital technologies have been treated both as a singular object of the study and as tools to support the overall teaching-learning process for different disciplines (Calvani, 2009).

When teaching Physical Education, the integration of technologies to support educational processes was suggested by the National Association for Sports and Physical Education (2009) already in 2009, regarding both the development of lectures and the evaluation of educational objectives specific to the discipline.

From a recent review (Sgrò, Coppola, Pignato, & Lipoma, 2019) it is possible to divide different technologies used in the school environment for evaluation into three categories: Video-shooting, Wearable Technology and Exergames. Figure 3 outlines the relationship between technologies used, the year of publication and the educational institution considered.

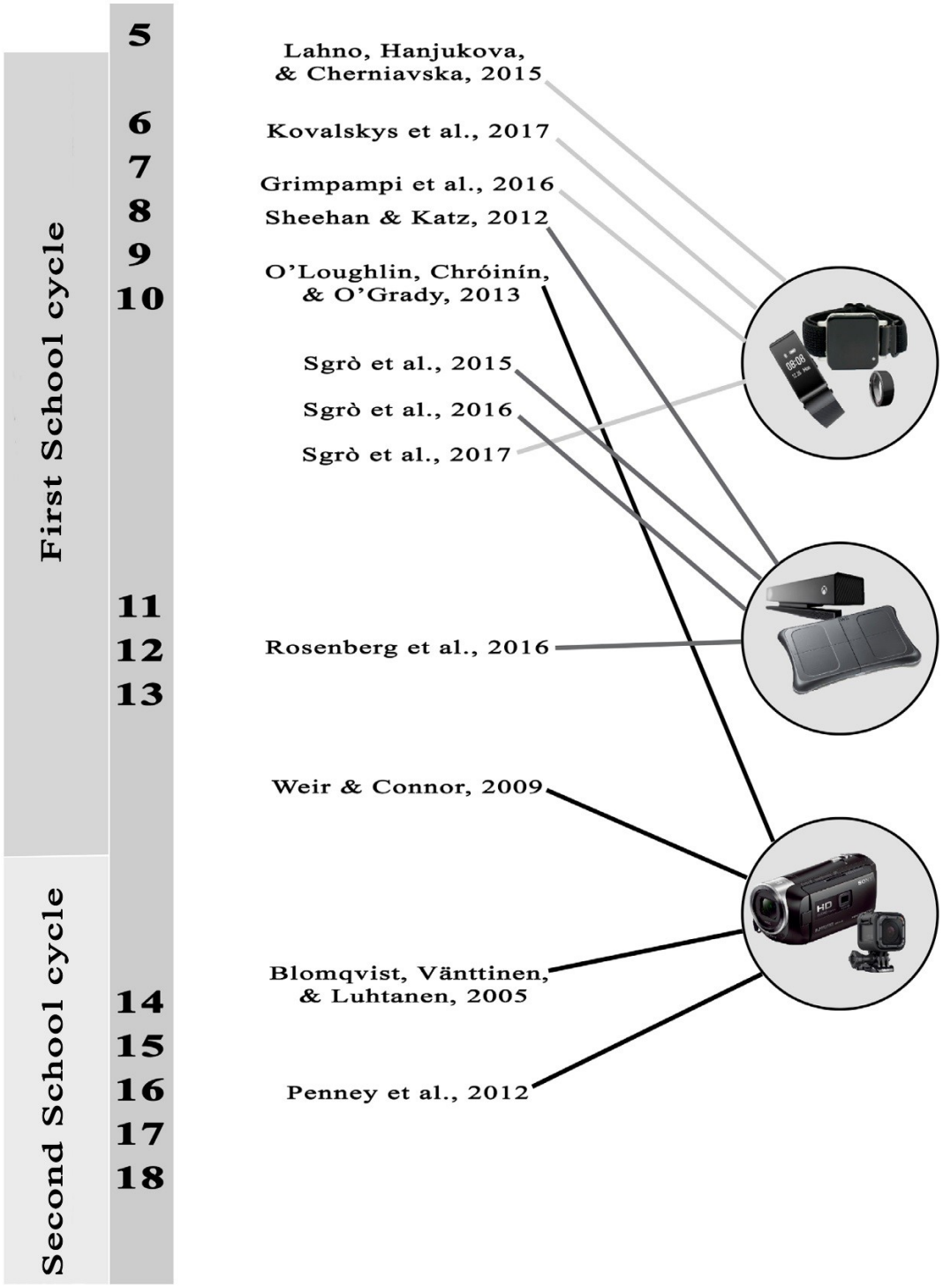

Figure 3. Graphic representation showing technologies used in relation to school grades

The video-shooting technology, also used in this study, is the most outdated among those discussed. By analysing the literature, interesting ideas on how video technology can have a positive impact on the teaching-learning process have emerged as among those are the observation of the correct

technique of a motor or sports gesture, increased motivation and involvement of students, a new type of teaching methodology, a more professional training for teachers and an increase in students' learning skills.

2. Aim and Hypotheses

2.1 Aim

The main aim of this study was to evaluate the effects of a 22-week protocol based on a student-centred sport education approach (i.e. Tactical Game Model) on tactical skills and affective domains of learning.

The Tactical Game Model approach is a student-centred approach based on active communication between the teacher and pupils and the focus is precisely on the latter.

2.2 Hypotheses

The hypotheses of this study are as follow:

H1: There is a positive effect of the TGM approach on tactical skills in primary-school pupils.

H2: There is an effect of the TGM approach on the affective domain of learning.

3. Method

3.1 Participants

Participants of this study were recruited from two southern Italian primary schools (five grades in total). There were overall 70 participants at the beginning of the research (male/female: 37/33, mean age: 8,9 ± 0,4years old; mean height: 1,42 ± 0,12 m; mean weight: 36,5 ± 10,1 kg and BMI: 20,38 ± 5,5 kg/m^2). Since they were minors, parents were asked to provide an informed consent for child's participation before the study began. In accordance with the Ethics Committee of the Kore University of Enna, an informed consent was compiled by both parents and students to ensure the confidentiality of personal data, and an alphanumeric identification code was assigned to each participant.

The inclusion/exclusion criteria were:

- all participants did not suffer from any serious neurological and/or musculoskeletal impairments that could limit their abilities.
- participation in a minimum of 75% of the protocol lessons.

All pupils involved in the study who were submitted to both measurements (pre-test and post-test) were included in the final statistics. Students not present at one of the two assessment sessions or who did not participate in gym activities due to health reasons were excluded from the statistics.

3.2 Experimental design

3.2.1 Measures

The TSAP (Performance Assessment in Team Sports) and the PACES-IT (Physical Activity Enjoyment Scale – the Italian version) scale were used for assessing developments related to tactical skill level and affective domain of learning, respectively.

The TSAP is a Game-Oriented Authentic Assessment Procedure suggested by Grehaigne and colleagues (1997).

The characteristics of this measurement methodology and evaluation of technical-tactical skills related to team sports games are as follows:

• Authenticity
• construct validity
• Ecological validity
• high level of reliability
• Integration in the teaching and learning processes.

The TSAP is an assessment instrument that reflects the student learning in relation to real-life applications and it was developed for use in formative and summative assessment scenarios in which tactical learning is the primary focus (Mitchell et al., 2013).

It can be used in different sports such as football, volleyball, European handball and basketball. For each of these sports there is a different number of players and the size of the playing field. In this study it was used to analyse two different sports: an invasion sport (football) and a net sport (volleyball).

- **Volleyball**: Four players against four players; the serve was considered a played ball; any ball sent to the opponents that produced a point caused a recapture of the serve, or was recovered only with difficulty by the opponents was considered an attack ball; one nonstop 10-minute match (approximately 7 minutes of effective play).
- **Football**: Five players (4 + 1) against five players (4 + 1) on a 50 m x 30 m pitch with 6 m x 2 m goals; regular football rules were applied with a few adjustments (e.g., "throw in" was done by foot, there was no "offside" for dead balls or "free-kicks," opponents were placed at 6 m; two 7-minute matches were played).

The expected performance indicators were divided into direct and indirect indicators. The direct indicators:

- conquering the ball (CB): a player is considered having conquered the ball if he or she intercepted it, stole it from an opponent, or recaptured it after an unsuccessful shot on goal or after a near loss to the other team;

- receiving the ball (RB): the player receives the ball from a partner and does not immediately lose control of it;
- playing a neutral ball (NB): a routine pass to a partner or any pass, which does not truly put the other team in jeopardy, is considered a neutral ball;
- losing the ball (LB): a player is considered having lost the ball when he or she loses it to the other team without having scored a goal;
- playing an offensive ball (OB): an offensive ball is a pass to a partner that puts pressure on the other team and, most often, leads to a shot on goal;
- executive a successful shot (SS): a shot is considered successful when it scores or possession of the ball is retained by one's team.

The indirect indicators:

- the number of attack balls (AB): an attack ball results from an offensive ball (OB) or from successful shot on goal (SS). AB = OB + SS;
- the volume of play (PB): the volume of play represents the number of times the player has gained possession on the ball (PB, for played balls). Therefore, PB is determined by summing the totals for CB and RB;
- Efficiency Index (EI): this index is calculated with the following formula: (CB+AB)/(10+LB).

The meaning of each of the previous indicators compared to the technical-tactical abilities of individual students/athletes is expressed in Table 1.

Table 1. Relationships between Observation Items and Types of Information Collected (Grehaigne et al., 1997)

Observation items	Information collected
Received balls (RB)	Involvement of the player in the team's play
Conquered balls (CB)	Defensive capacities of the player
Offensive balls (OB)	Player's capacity of making significant passes to his or her partners (offensive capacities)
Successful shots (SS)	Player's offensive capacities
Volume of play (PB)	General involvement of the player in the game
Lost balls (LB)	A small number reflects in good adaptation to the game

"*The Efficiency Index scale: To build this scale, we used samples totaling 302 senior high school students in different team sports, and we found that the efficiency index rarely exceeded 1.5. We have, therefore, chosen to keep the same scale for different sports (0 to 1.5, with 30 equal intervals). Should one student obtain an efficiency index value higher than 1.5, the 1.5 value is used. The Volume of Play scale: Since 90% of students usually had a volume of play of 30 balls or less, we have retained a scale ranging from 0 to 30, with 30 equal intervals. The Performance Score scale: This scale has been established on the basis of the following formula, which yields an equal weight to the efficiency index and to the volume of play: performance score = (efficiency index * 10) + (volume of play / 2). The scale ranges from 0 to 30, with 30 equal intervals*" (Grehaigne et al., 1997).

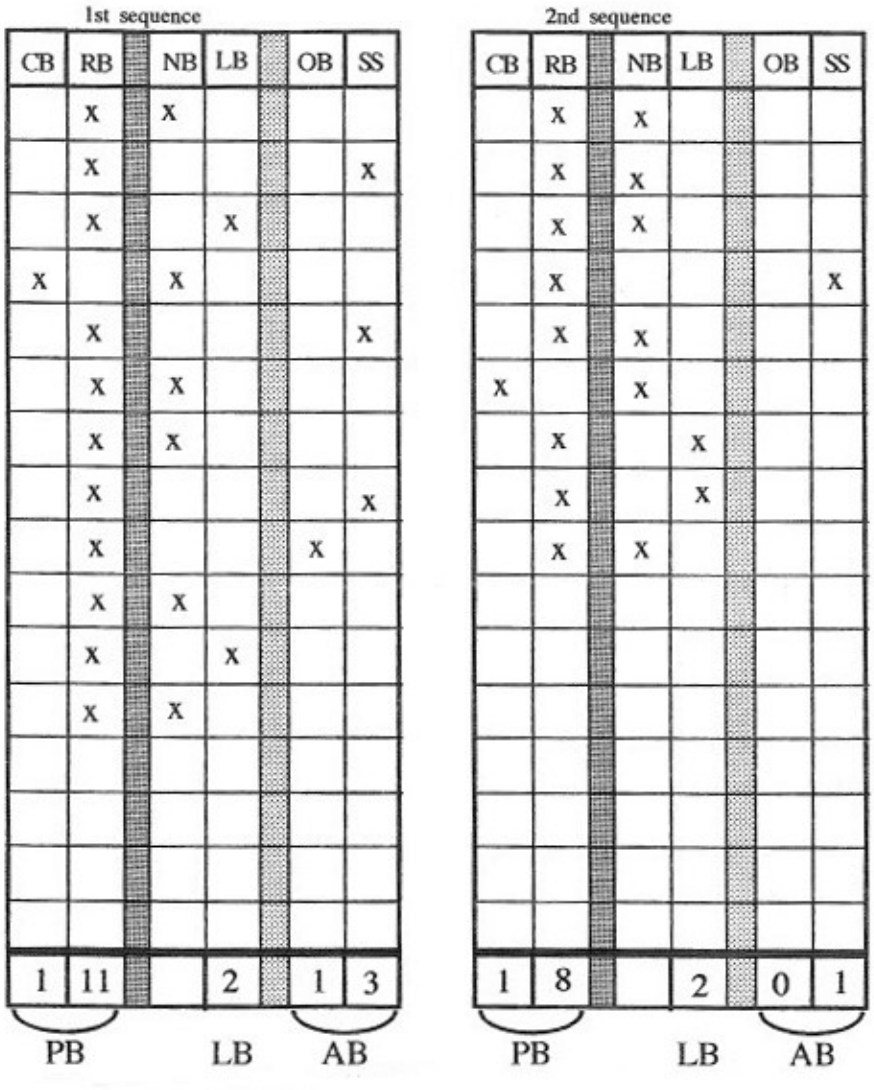

Figure 4. Example of data collection grids.

NOTE: CB: conquered ball; RB: received ball; NB: neutral ball; LB: lost ball; OB: offensive ball; SS: successful shot; PB: played ball; AB: attack balls.

Volume of play (VP): PB = CB+RB = 12

Efficiency Index (EI): EI = (CB+AB)/(10+LB) = 5/12= 0.41

Performance Score PS = (EI*10)+(VP/2) = 10.1

A nomogram and an example of illustrations of results obtained by one student in two matches are reported in Appendix 1.

Regarding the PACES questionnaire, it is important underline one of the principal elements that a teacher must considerered in the programme: the enjoyment that children/pupils have during the movement. "*Enjoyment is one of the main determinants of physical activity. Enjoyment and intrinsic motivation are strictly related: enjoyable experiences during physical activity increase intrinsic motivation, sustain positive attitudes and promote long-term adherence to the practice. In spite of this fact, only few studies focused on developing specific assessment instruments. A notable exception is the Physical Activity Enjoyment Scale (PACES) originally developed by Kendzierski and De Carlo in 1991 and revised by Motl et al. in 2001. The aims of this paper were to discuss the role of fun and enjoyment in physical activity and sport and to present the structure of the Italian version of PACES (PACES-It, Carraro, Young & Robazza, 2008). Moreover, information on the use of the instrument in different contexts were discussed*" (Carraro, 2012).

The PACES-C-It (Physical Activity Enjoyment Scale) is a 16-question scale which measures enjoyment regardless of results achieved, and the type of enjoyment (intrinsic or extrinsic). A previous research established its validity (Latorre Roman, García Pinillos, Navarro Martinez, & Izquierdo Rus, 2014).
The new version consists of 16 items with scores given on a 5-point Likert scale, ranging from 1 (disagree a lot) to 5 (agree a lot).

1. I enjoy it
2. I feel bored
3. I dislike it
4. I find it pleasurable
5. It's no fun at all
6. It gives me energy
7. It makes me depressed
8. It's very pleasant
9. My body feels good
10. I get something out of it
11. It's very exciting
12. It frustrates me
13. It's not at all interesting

14. It gives me a strong feeling of success
15. It feels good
16. I feel as though I would rather be doing something else

3.2.2 Procedures

This study included children attending the fourth grade of primary school and it was organized in two classes of physical activity per week. The protocol was conducted by an expert Physical Education teacher and it lasted 22 weeks. The teachers (Physical Education referents[1]) were preliminarily instructed both on the teaching style and on the protocol as well. During the activities the teachers collaborated between themselves in regards to the management of classes.

As far as assessment procedure was concerned, the guidelines of a previous work were followed (Grehaigne, Godbout, & Bouthier, 1997). On assessment days, two other PE graduate students participated in the process. One of these operators had been previously involved in taking anthropometric measurements of each participant, through a wall-mounted meter for the height and an electronic scale for the weight. These measures were used to estimate the Body Mass Index (BMI) in Kg/m^2 of each child.

The participants were chosen with a quasi-experimental approach. Since the objective of the project was developed in a formal educational context, one would opt to keep a class group intact in order to support an ecological research project (Harvey & Jarret, 2014).

After the second assessment session (post-treatment), each participant was assessed by two different operators but with similar level of expertise in the area in order to guarantee the reliability of results.

As regards the analysis of the effects of the protocol on tactical skills, after processing the data, the "performance score" was calculated for each student both in relation to the discipline of football or volleyball in two points of evaluation (pre-post-treatment).

[1] Physical Education referent teachers: Teachers in the Italian educational system who hold a degree in other subjects but are included in PE classes as PE teachers are not planned in primary schools on national level.

After entering the questionnaires (PACES) on an Excel spreadsheet, the positive and negative scales were calculated respectively.

3.2.3 Training programme

The protocol lasted 22 weeks with 2 classes each week lasting 1 hour, 40 classes of 1 hour in total were planned and carried out. The first and last week were dedicated to the initial and final evaluation phases.

Each lesson had the definition of the tactical problem, lesson focus, and an objective and the following framework: A) Game 1 (setup, goal, conditions and questions); B) Practice task (setup, goals, conditions, extension, cues); C) Game 2 (setup and goals); D) Closure. The first “Game” was used to introduce, through an addictive game, tactical problem of the lesson; instead, the second “Game” was use to reinforce the focus of the lesson. Practice task was focused on the development of movement and skills related to tactical problem of the lesson.

The structure of the first lesson for each of the sports disciplines (game-sport) was always modified following the guidelines of Mitchell and colleagues (2013). The structure of these lessons included Lead-in, Practical Activity, Game, and Closing. An example of individual lessons is described in the appendix. Table 2 shows lesson focus and tactical problem of each lesson per weeks.

Table 2. Skill focus and tactical problem of each lesson of the TGM protocol.

Lesson	Game	TS - lesson focus	TGM - tactical problem
1	**pre assessment**		
2	Basketball	Passing (Figure 5)	Foul shot
3	Basketball	Rebounding	Maintaining possession of the ball
4	Basketball	Dribbling	Attacking the basket
5	Basketball	Shooting	Defending space
6	Basketball	Round-up	Winning the ball
7	Soccer	Passing	Maintaining possession of the ball
8	Soccer	Dribbling	Attacking the goal
9	Soccer	Shooting	Defending space
10	Soccer	Trapping	Winning the ball
11	Soccer	Round-up	Free kick - attacking and defending
12	Handball	Passing (Figure 6)	Keeping possession of the ball
13	Handball	Catching	Penetrating the defense and attacking the goal
14	Handball	Throwing	Defending space
15	Handball	Shooting	Winning the ball
16	Handball	Round-up	Restarting from violations
17	Volleyball	Passing	Setting up an attack
18	Volleyball	Spiking	Winning a point
19	Volleyball	Digging	Attacking as a team
20	Volleyball	Serving and Crushing	Defending space on your own court
21	Volleyball	Round-up	Defending against attacks (Figure 8) - as a team
22	**post assessment**		

[2] In the first lesson, a simplification was used in case of difficulties during the serving. The pupils were allowed to use both hands to throw the ball over the net (Figure 8).

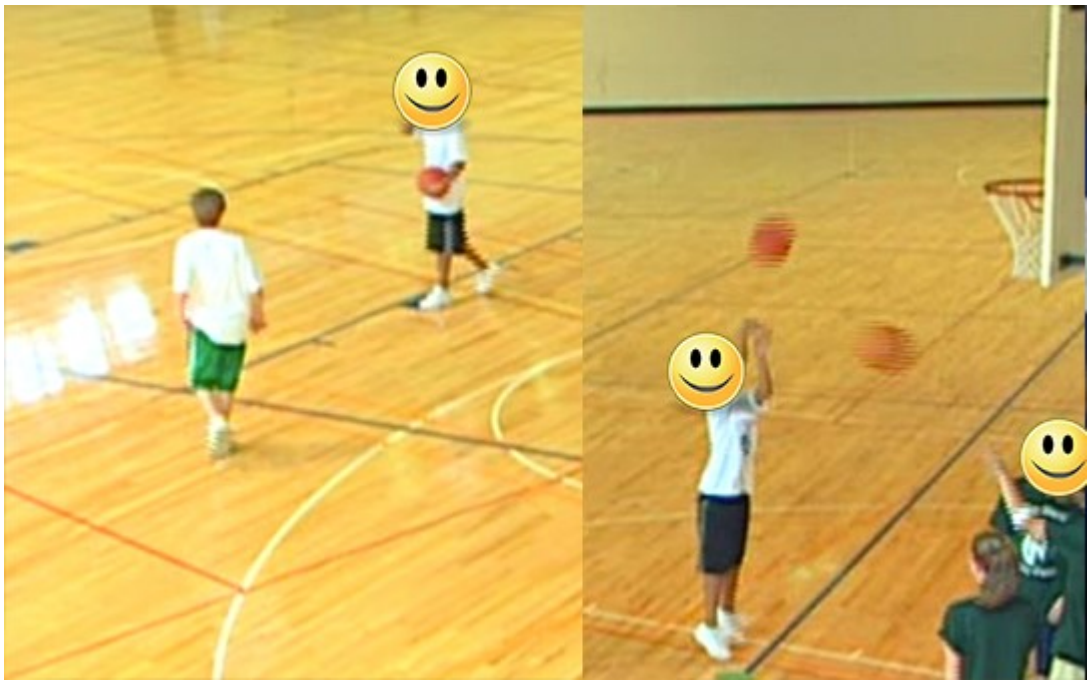

Figure 5. Passing and shooting.

Figure 6. Passing the with one hand and catching it with both hands.

Table 3. Tactical problem, game form and questions to improve the awareness.

Tactical Problem	Game Form	Question' example
Assessment (PRE)	4vs4 - 30 x 15 m	-
Maintaining possession of the ball	2vs2, 3vs3, 3vs2, 3vs4	Where should you be located to receive the pass?
Shooting on goal	2vs2, 3vs3, 3vs2, 3vs4, 4vs4	When should you shoot on goal? - How should you move your body to score?
Defending the goal	2vs2, 3vs3, 3vs2, 2vs4	Where should you be located to defend the goal?
Winning the ball	2vs2, 3vs3, 3vs2, 3vs4	Where should you be located to win ball possession when you are defending an attacker off-the-ball?
Attacking the goal	2vs2, 3vs3, 3vs2, 3vs4, 4vs4	Where should you be located to dribble the ball?
Assessment (POST)	4vs4 - 30 x 15 m	-

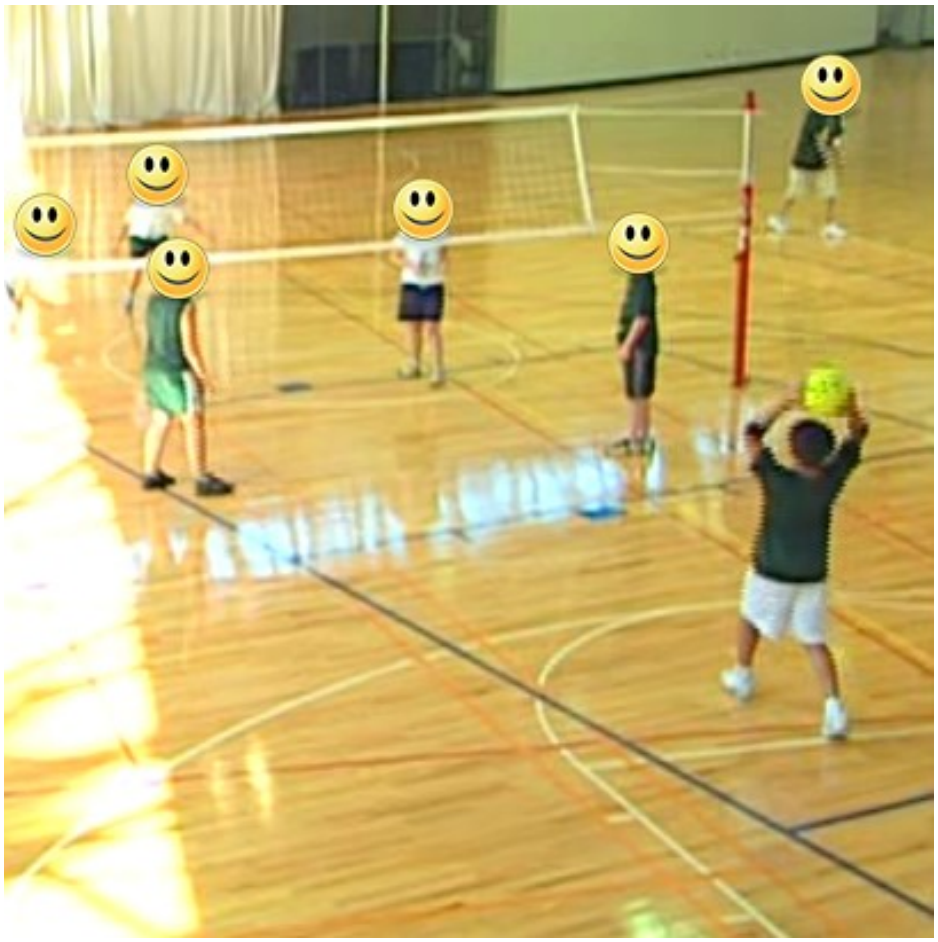

Figure 7. Pupils using both hands to throw the ball over the net during the first lesson.

Figure 8. Receiving the ball with forearm passing.

Table 4. Tactical problems, movements, and skills for elementary level (Mitchell et al., 2013).

Tactical problem	**Content**
Maintaining a rally	moving to catch, reading and anticipating
Setting up an attack	seeing court spaces, opening up to teammates
Winning a point	attacking spaces, making power versus accuracy decisions
Defending space	base positioning, covering the court as a team, sliding
Defending against attacks	backing up teammates, shifting to cover
Initiating play	receiving serve
Maintaining a rally	underhand trow, underhand strike
Setting up an attack	shots for depth, approach shot, drop shot, service, passing
Winning a point	downward hitting-volley, smash, spike
Defending against attacks	blocking downward hits
Keeping possession of the ball	supporting the ball carrier, passing and receiving the ball
Penetrating the defense and attacking the goal	using a target forward, moving with the ball, shooting, changing speed
Transitioning from defense to offense	moving to space, quick outlet pass
Defending space	guarding a position, footwork
Defending the goal	goalkeeping, positioning
Winning the ball	rebounding, tackling and stealing the ball
Beginning the game	supporting positions
Restarting from the sideline, from the end line, from the violations	putting the ball in play

3.2.4 Assessment

A video-shooting technology was used to acquire information about levels achieved by pupils. A three-camera system, including two action cameras (Go Pro Hero Black 7), was used. The two Go Pro were placed at the two diagonal corners of the gym and the video camera was placed on a tripod, to capture students' actions (Sony FDR-ax33b 4K). The three-camera system is shown in Figure 9.

The videos were later analysed, by means of the Longo-Match (LongoMatch - The Digital Coach, by Fluendo) software, by two analysts with similar level of expertise in the area in order to guarantee the reliability of results.

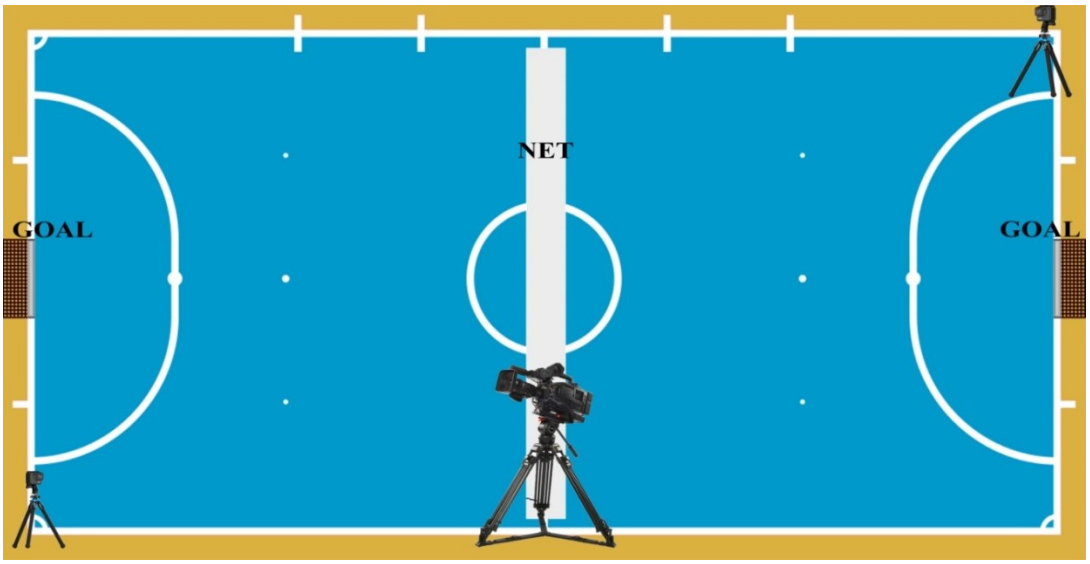

Figure 9. Three-camera system.

Regarding to the affective domain of learning, once all the questionnaires were transformed in a digital format, two-reference scales indicated in the questionnaire guidelines, were calculated. Two PACES scales refer to the positive enjoyment and negative enjoyment.

The positive enjoyment refers to aspects of pure fun and therefore is linked to the pleasure of movement/activity (the positive enjoyment scale) and to the pleasure caused by the result of performance and therefore pleasure linked to victory (the negative enjoyment scale).

3.3 Data processing

The technical-tactical skills investigated in the following work were extrapolated from the video analysis for two sports disciplines: football and volleyball (i.e. an invasion game and a net game).

As regards the timing and definition of the setting, the approach proposed by Grehaigne and colleagues (1997) was followed. The TSAP (Team Sport Assessment Performance) (Grehaigne, Godbout, & Bouthier, 1997) and the Italian version of the PACES-IT (Physical Activity Enjoyment Scale) questionnaire (Carraro, Young, & Robazza, 2008) were used to investigate the effect of the two different approaches. Collected data were analysed by two evaluators with the same level of expertise in the field of human movement evaluation.

The data analysed were related to the evaluation of performance deriving from the TSAP data (one variable for each game-sport) and two variables extrapolated from the analysis of the PACES questionnaire data (i.e. a positive scale and a negative scale).

Statistical analysis was performed by the use of SPSS Statistics V22.0 (SPSS Inc. Chicago, IL, USA) and included the following statistical tests:

- descriptive statistics
- normality assumption: Kolmogorov-Smirnov test and analysis of the outlier.
- the test-retest reliability was analysed by a two-way, random-effects, single measure Intra-class Correlation Coefficient (ICC) with 95% CI and the Standard Error Measurement (SEM) for testing the absolute reliability.
- RM-ANOVA was carried out to analyse if there was an effect of the TGM protocol on tactical skills or gender difference (p<0.05).
- partial eta squared to assess the power of the effect.

- Wilcoxon Signed Ranks Test (non-parametric statistical hypothesis test) was used to compare the effect of the TGM protocol on the affective domain of learning.

4. Results

For a better organization and understanding of the variables reported on the following pages, Table 5 shows codes assigned to each variable as well as the description of each variable.

Table 5. Description of variables used in statistics.

Variable	Description
S_Pre	Performance Score (TSAP) - Sport: Soccer - Time: Pre
S_Post	Performance Score (TSAP) - Sport: Soccer - Time: Post
V_Pre	Performance Score (TSAP) - Sport: Volleyball - Time: Pre
V_Post	Performance Score (TSAP) - Sport: Volleyball - Time: Pre
P_Pos_Pre	PACES - Positive Scale - Time: Pre
P_Neg_Pre	PACES - Negative Scale - Time: Pre
P_Pos_Post	PACES - Positive Scale - Time: Post
P_Neg_Post	PACES - Negative Scale - Time: Post

The Kolmogorov-Smirnov test, and skewness and kurtosis results show a normal distribution of the data with a skewness value of 0.64 (Standard Error 0.26), kurtosis -0.39 (Standard Error 0.5) and 0.08 ($df = 96$) with $p>0.05$ regarding TSAP variables.

As far as variables of the PACES questionnaire are concerned, they failed to follow a normal distribution and therefore non-parametric statistical tests were used for analyses of the data relating to the positive and negative scales respectively.

Table 6 shows descriptive statistics of the sample including the mean, minimum and maximum values and the standard deviation.

Table 6. Descriptive statistics of the dataset.

Variable	***N***	***Minimum***	***Maximum***	***Mean***	***Std. Deviation***
S_Pre	62	4,8	27,9	13,116	6,490
S_Post	62	4,5	30,2	14,992	7,526
V_Pre	62	4,8	22,2	10,926	4,364
V_Post	62	4,5	28,5	13,915	5,839
P_Pos_Pre	62	2,6	4,8	3,934	,567
P_Neg_Pre	62	1,0	2,5	1,315	,433
P_Pos_Post	62	3,3	5,0	4,342	,457
P_Neg_Post	62	1,0	2,1	1,355	,373

The assessment of the data was carried out by two evaluators with a similar level of expertise in the field of human movement evaluation, and through the Intra-Class Correlation Coefficient (ICC) it was possible to evaluate the reliability. Furthermore, the Standard Error of Measurement (SEM) was calculated for assessment of the absolute reliability.

These results are reported in Table 7.

Table 7. Intra-Class Correlation Coefficient (ICC) (95% CI) and SEM.

		Intraclass Correlation	95% Confidence Interval		F Test with True Value 0				SEM
			Lower Bound	Upper Bound	Value	df1	df2	Sig	
Performance Score Game: Soccer Time: Pre	Single Measures	.998	,996	,999	823,561	61	61	0,000	0.07
	Average Measures	.999	,998	,999	823,561	61	61	0,000	
Performance Score Game: Soccer Time: Post	Single Measures	.993	,988	,996	274,502	61	61	0,000	0.08
	Average Measures	.996	,994	,998	274,502	61	61	0,000	
Performance Score Game: Volleyball Time: Pre	Single Measures	.998	,997	,999	1097,609	61	61	0,000	0.05
	Average Measures	.999	,998	,999	1097,609	61	61	0,000	
Performance Score Game: Volleyball Time: Post	Single Measures	.986	,977	,992	145,483	61	61	0,000	0.06
	Average Measures	.993	,989	,996	145,483	61	61	0,000	

The Interclass correlation coefficient with a confidence interval of 95% showed an excellent data reliability. The limited values of SEM indicated a high level of score accuracy.

RM-ANOVA was carried out to analyse if there was an effect of the TGM protocol on tactical skills and gender differences (p<0.05), and partial eta squared was used to evaluate the power of the effect. Tables 8 and 9 report results of the multivariate test and the between-subjects effects test respectively.

Table 8. Multivariate tests.

	Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Treatment Effect Game: Soccer Time: Pre-Post	Time	Wilks' Lambda	,831	12.209	1,000	60,000	**,001**	**,169**	12,209	,930
	Time * Gender	Wilks' Lambda	,990	.624	1,000	60,000	**,433**	,010	,624	,122
Treatment Effect Game: Volleyball Time: Pre-Post	Time	Wilks' Lambda	,642	33.474	1,000	60,000	**,000**	**,358**	33,474	1,000
	Time * Gender	Wilks' Lambda	,999	.068	1,000	60,000	**,795**	,001	,068	,058

Table 9. Tests of the between-subjects effects.

	Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Treatment Effect Game: Soccer Time: Pre-Post	Intercept	24634,793	1	24634,793	284,355	**,000**	**,826**	284,355	1,000
	Gender	277,241	1	277,241	3,200	**,079**	,051	3,200	,421
	Error	5198,042	60	86,634					
Treatment Effect Game: Volleyaball Time: Pre-Post	Intercept	19141,238	1	19141,238	420,238	**,000**	**,875**	420,238	1,000
	Gender	13,558	1	13,558	,298	**,587**	,005	,298	,084
	Error	2732,917	60	45,549					

Tables 10 to 12, Figure 10 as well as Figures 13 to 15, and Figure 11 show the estimated marginal means for football and volleyball respectively.

Table 10. Estimated marginal means – Gender - Game: Football.

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	UpperBound
Male	15,598	1,202	13,195	18,002
Female	12,606	1,163	10,279	14,934

Table 11. Estimated marginal means – Time - Game: Football.

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	UpperBound
1	13,158	,815	11,528	14,787
2	15,047	,939	13,169	16,925

NOTE: Time 1 = Pre-treatment; Time 2 = Post-treatment.

Table 12. Estimated marginal means – Gender * Time - Game: Football.

Gender * Time		Mean	Std. Error	95% Confidence Interval	
				Lower Bound	UpperBound
Male	1	14,440	1,171	12,098	16,782
	2	16,757	1,349	14,059	19,455
Female	1	11,875	1,134	9,608	14,142
	2	13,338	1,306	10,725	15,950

NOTE: Time 1 = Pre-treatment; Time 2 = Post -treatment.

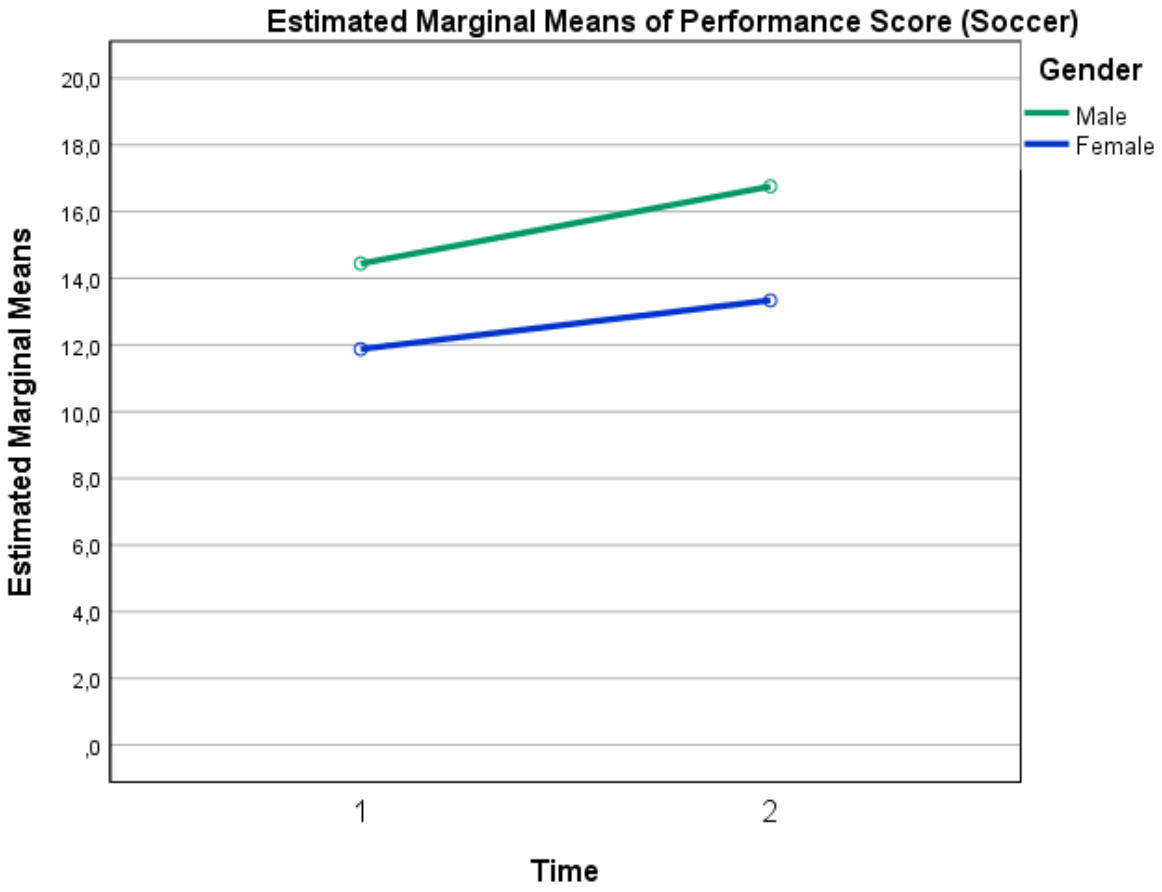

Figure 10. Estimated Marginal Means of performance score in Football.

Table 13. Estimated marginal means – Gender – Game: Volleyball.

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	UpperBound
Male	12,762	0,871	11,019	14,505
Female	12,100	0,844	10,413	13,787

Table 14. Estimated marginal means – Time – Game: Volleyball.

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	UpperBound
1	10,939	,557	9,825	12,052
2	13,923	,747	12,428	15,418

NOTE: Time 1 = Pre-treatment; Time 2 = Post-treatment.

Table 15. Estimated marginal means – Gender * Time – Game: Volleyball

Gender * Time		Mean	Std. Error	95% Confidence Interval	
				Lower Bound	UpperBound
Male	1	11,337	0,800	9,736	12,937
	2	14,187	1,074	12,039	16,334
Female	1	10,541	0,775	8,991	12,090
	2	13,659	1,040	11,580	15,739

NOTE: Time 1 = Pre-treatment; Time 2 = Post-treatment.

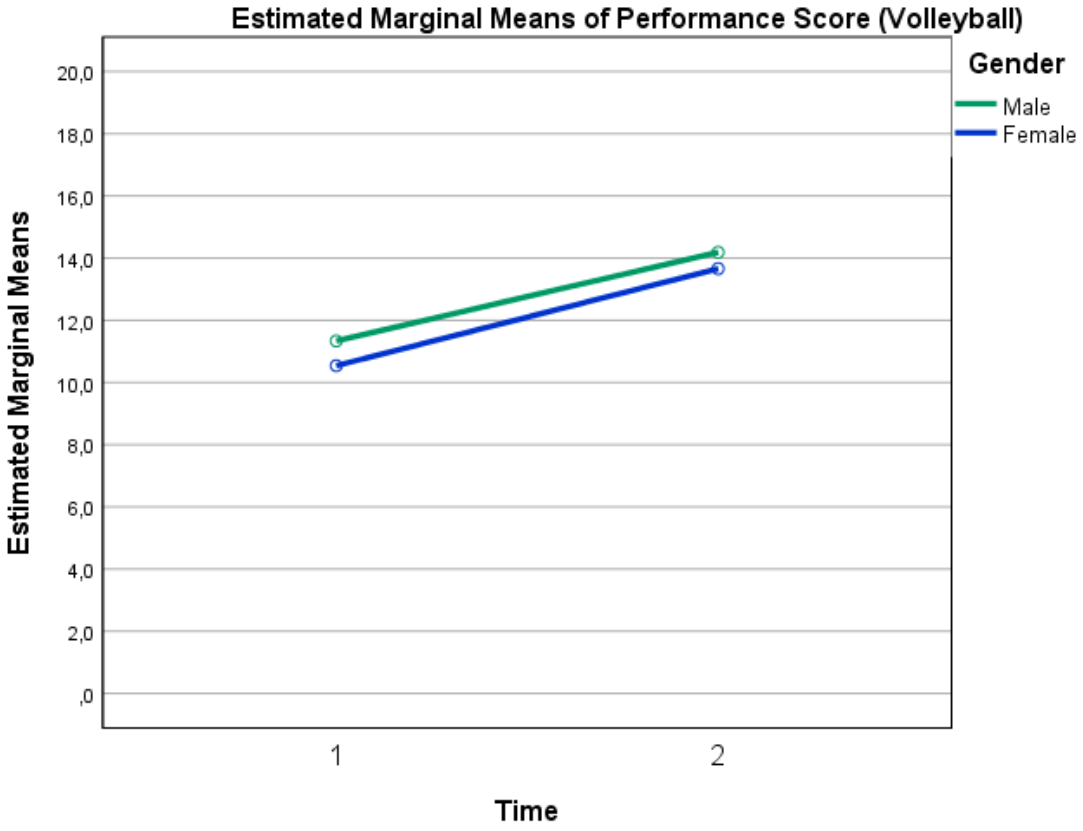

Figure 11. Estimated Marginal Means of performance score in Volleyball.

The results of a RM-ANOVA showed a positive effect of the TGM protocol on the tactical skills both for invasion game (soccer) and net game (volleyball). The found difference was F=12,2 (p<0.001) and F=33,5 (p<0.000) for football and volleyball respectively. There was no statistical significance regarding gender differences or in the time*gender which indicated that the protocol had the same impact regardless of the gender. The value of the Partial Eta Squared indicated a good power of the effect of the protocol. Finally, the graphs show the impact of the protocol on tactical skills and a positive effect for both genders.

Regarding data calculated by the use of the questionnaires (PACES), they were not distributed normally (Kolmogorov-Smirnov p> 0.05) and therefore the Wilcoxon non-parametric test was used after calculating the ranks relative to the two scales of the questionnaire (a positive scale and a negative scale).

The results are reported in Tables 16 and 17.

Table 16. Ranks.

		N	MeanRank	Sum of Ranks
P_Pos_Pre - P_Pos_Post	Negative Ranks	10	16,300	163,000
	Positive Ranks	48	32,250	1548,000
	Ties	4		
	Total	62		
P_Neg_Pre - P_Neg_Post	Negative Ranks	17	19,290	328,000
	Positive Ranks	22	20,550	452,000
	Ties	23		
	Total	62		

Table 17. Wilcoxon Signed Rank Test.

	P_Pos_Pre - P_Pos_Post	P_Neg_Pre - P_Neg_Post
Z	-5.373	-.868
Asymp. Sig. (2-tailed)	,000	,386

The results of the Wilcoxon Signed-Rank Test showed a protocol effect ($z = -5.4$ with $p<0.001$) on the positive scale of the questionnaire and not a difference on the negative one. The positive effect on the positive scale indicated that the 22-week protocol had an effect on the affective domain of learning as the enjoyment felt by the pupils increased at the end of the protocol. While the absence of differences in the negative scale could be due to a lack of the effect, or to an already very low starting value of this scale.

5. Discussion

The aim of this study was to analyse the effects produced by the application of a motor activity protocol, following the Tactical Game Model (TGM) approach, on the skill levels of the psychomotor domain, and the related influences on the socio-affective domain in a sample of pre-adolescent boys aged between 9 and 10 years.

The motor protocol based on the use of 4 different team sports, including volleyball and football with the function of analysing the results, had as its objective the evaluation of the improvement of various skills related to two domains and was applied to supplement the curricular Physical Education activities for a duration of 22 weeks with a frequency of two lessons per week.

The participants were four-graders from two primary schools in Enna. Five classes participated in total and all students were involved in a pre-post experimental research design.

In this study, an approach that can be defined as multi-sport, was used since through games (i.e. game-sport, TGfU), the foundations were laid for fundamental skills of four sports (football, volleyball, basketball and handball).

The multi-sport approach has been the subject of several studies. In a study by Pesce and colleagues (2013) it emerged that the multi-sports approach in Physical Education induced improvements in aerobic fitness and kinaesthetic differentiation capacity, as well as small but significant improvements in task orientation, ego orientation and social self-efficacy, when compared to traditional Physical Education taught by a teacher of other subjects. In a study by Moynihan and McMahon (2014), however, psychosocial and academic impact of an early-morning, multi-sports programme on students in their first year of second-level education was assessed. The results showed that a well-designed multi-sport and recreational programme, carried out by coaches trained in a school context, can improve the psychosocial and academic development of children.

The process of assessing the relative level of development of psychomotor domain skills took place through the use of the Team Sport Assessment Procedure (TSAP), an assessment system designed by Grehaigne and colleagues (Grehaigne, Godbout and Bouthier, 1997). Analysis of the psychometric characteristics of the TSAP applied to assessment in basketball,

football, handball, volleyball and rugby has shown that this is a valid assessment procedure (Nadeau, Richard & Godbout, 2008). Furthermore, the TSAP is considered accessible and supplemented by the authors and Physical Education teachers previouslz consulted on this topic, making it possible to use this tool, with a moderate to good level of accuracy, by students aged 10-13 (Richard, Godbout & Gréhaigne, 2000).

The information provided by the variables, the performance indicators and the performance score are merged into a component taken as a reference for the purpose of the pre-post comparison: the overall performance or performance score. Abilities analysed in relation to the psychomotor domain were investigated through a 2D video-analysis evaluation, by the use of two wide-angle cameras located diagonallyon the playing field, and an HD camera located laterally with a shooting axis perpendicular to the playing field.

The TSAP was used in an article by Sgrò, Pignato and Lipoma (2018) with the aim of assessing gender differences in volleyball practice, even if the sample used was of a higher average age (12, 95). In this study, the results showed that boys had a higher efficiency index than girls. The TSAP was also used in a study by Catarino, Carvalho and Gonçalves (2017) where it was assessed as an evaluation tool in terms of reliability between operators and ease of use with excellent results. In another study of Otero-Saborido, Gonzalez-jurado, and Lluch (2015), on the other hand, the TSAP was used to evaluate invasion sports players, in this case basketball. The specific objectives were to determine the degree of agreement between the expert observers, inter-observer reliability (internal consistency) and intra-observer reliability (temporal reliability). The results showed that the TSAP is an excellent evaluation tool to be used in primary school as well.

In a study by Ungurean (2018) a protocol based on mini-volley was applied a sample with same characteristics of the current study. The results of the mentioned study showed statistically significant improvements, but not for all classes. Popelka (2013) analysed two different protocols related to the sport of volleyball, and both tactical and technical skills were applied on a sample of 23 pupils with the aim to evaluate their improvements. The results showed that the two protocols had similar results, but also showed that the tactical approach had

a greater impact on acquiring knowledge about tactical components of the game and their applications within the game.

The sport of volleyball was also studied in a research by Chatzipanteli and colleagues (2016). In this article the TGM was used with remarkable results and the sample included children slightly older than participants in this research (11-12 years), but the evaluations were based on metacognitive behaviour.

The study also had the objective of verifying the impact of this teaching model on the affective domain of the subjects involved, in terms of satisfaction and pleasure in carrying out motor practice. The process of evaluating the affective domain took place through the use of the Physical Activity Enjoyment Scale or PACES, in a revised Italian version, consisting of 16 items (9 positive and 7 negative) with scores given on a Likert scale, from 1 (strongly disagree) to 5 (strongly agree).

From the analysis of the scientific literature that took place after determining the objective of the research, the choice of subjects included in this research emerged, which was by no means accidental. Even if the motor skills evolve in a different form from subject to subject, since each is a unique and unrepeatable entity and faces existence in an original and completely individual way, "*it is necessary to know the general characteristics and development of a man, in relation to various age groups*" (Ceciliani A., 2001), in order to apply the proposed protocol in a best way. The motor, cognitive and socio-affective behaviour that characterizes the child in the period on which the project was focused, that is to say the age of nine (primary school, fourth grade), emerged both from experience and from what was written by well respeected authors such as Gesell, Bernstein, Wallon and many others.

From the psychomotor point of view, what Wallon (1958) calls double lateralization, has finished by now. This involves greater caution and precision in movements, better maintenance of a better maintenance in respect to the position in space, and therefore a better response to a certain type of specific exercise, and discreet execution of the combined movements. The child knows how to move in space in different directions, orienting themselves with respect to fixed spatial references and the movements of their companions, controlling simple general motor skills performed with body weight only, controlling specific motor skills in raw form (grasping, relaunching, passing, dribbling), having a better, even

if not perfect, self-knowledge in space and time (body scheme). At this point children have better balance and move with more precision. Therefore, if the ability to connect and combine multiple elements in different games was previously required, at this age it is possible to implement more complex exercises and activities

From the point of view of cognitive development, understood as the progressive evolution of intellectual abilities that vary throughout life, by changing and perfecting, this age allows the child to acquire information from the surrounding environment to store them through mental representations, and use them in subsequent moments of their own motor experience (Piaget, 1971). But the operative limit of this period remains the need for concrete support: the child cannot yet reason by starting from verbal utterances alone. Due to this particular aspect, the author believes it is essential to emphasize the importance of the TGM approach in this aspect.

From a socio-relational point of view, the body is a fundamental element through which the child, at this tender age, establishes relationships with the outside world and constitutes personal and social identity. The relational aspect in a nine-year-old child refers to the overcoming of egocentrism and the creation of a multitude of interpersonal relationships. The author agrees in recognizing play as the most important role in the formation of social sense in the child. Both the observations of Gesell (1950) and the didactic uses of Bruner (1967) indicate the game as the best tool for implementing social adaptation.

The assumption of the current research project is certainty that the TGM emphasizes what Perkins (1999) defined as the three fundamental principles of educational constructivism: active student, social student, and creative student. There is research literature supporting the principle that the Tactical Game Model has an impact on the development of the psychomotor domain of learning in students.

Although in Italy there is limited empirical evidence of the effects of the TGM on PETE students[3], from an international point of view an enormous amount of research has been conducted on the subject. In fact, the tactical approach to play has been shown to be one of the teaching models that provides effective

[3] PETE (Physical Education Teacher Education Programme).

learning experiences (Dyson et al., 2004, McNeill & Fry, 2010). According to the qualitative analysis of the data regarding the experimentation carried out by Ferudun Dorak and colleagues (2018), the TGM learning method provided developmental outcomes, both in psychomotor and cognitive field. Furthermore, in the field of game performance, it was established that the tactical approach to play was more effective than the direct learning model. However, it is believed that the tactical approach to play can be an effective method for learning team sports in which the tactical solutions and the decision-making period on the field are rather short (Chatzipanteli et al., 2016).

In relation to the objective of the current study, in the previously-mentioned setting (Nevett, Rovegno, Babiarz, & McCaughtry, 2001) found that offensive skills in students improve significantly when teachers use the TGM teaching model. Lee and Ward (2009) found that tactic-focused education, compared to traditional education, significantly improves supportive movements in female and low-skilled students. In a study by Michael Hodges et al (2018), students significantly increased their GPP in all areas (VP, EI, PS), meeting the learning component of tactical-motor literacy standards.

This fundamental assumption not only concerns the psychophysical aspect, as Kirk and Macdonald (1998) stated in fact that "the social and cultural situation of the teaching environment contributes significantly to what is learned and how learning occurs". Empirical results also indicated that the TGM increases students' perception of Physical Education engagement and increases their level of enjoyment (Alison & Thorpe, 1997; Berkowitz, 1996; Wright, McNeill, & Fry, 2009) versus a traditional one. Furthermore, this research and the experience of others indicate that students find a tactical approach to the quantum motivation and that teachers prefer it (Berkowitz, 1996).

All of the mentioned fits in perfectly with the data, reported by Gray, Sproule and Morgan (2009) who presented a number of findings supporting the potential of play-cantered teaching strategies to promote a task-oriented motivational climate in students. As previously demonstrated by several authors, intrinsically motivated individuals show interest and experience enjoyment in an activity (Deci and Ryan 1985; Pelletier et al. 1995; Ntoumanis 2001), and adhere to participation better than extrinsically motivated individuals (Ryan et al. 1997). Furthermore, Wright, McNeill and Fry (2009) noted that pupils enjoyed playing in

authentic gaming settings. Similar results were achieved by Fernández-Río et al. (2017) showing an increase in intrinsic motivation, autonomy, competence, interest, responsibility and social relationships and cooperative learning of students after motor experience via the GCA.

Spittle and Byrne (2009), who conducted a study on a group of Australian boys and girls, also indicated that the group on which the GCA was applied, was more capable of maintaining higher levels of intrinsic motivation than group with the traditional approach. These findings concur with results obtained in previous research (Alexander et al., 1998; Browne et al., 2004; Wallhead & Ntoumanis, 2004), in which participants reported experiencing greater excitement and enjoyment after a GCA unit. These results coincide with the work of Gray, Sproule and Morgan (2009), who compared the effects of one methodological approach based on games and another based on the development of basketball skills. In both cases, the motivational climate was higher in the experimental group.

This fact is in accordance with the results of González-Cutre et al. (2011), who manipulated the target areas through different motivational variables. Their study showed an increase in the perception of task involvement within the experimental group and a decrease in ego involvement. Furthermore, Báguena, Sevil, Julián, Murillo and García (2014) highlighted a greater perception of involvement in tasks among those students who had implemented a volleyball unit through an approach linked to the TGfU model and specific strategies of the target areas. Their results are in accordance with those obtained in this study. A recently conducted study examining the effects of the GCA on fun, motivation, perceived exertion was carried out by Sgrò, Barca, Schembri and Lipoma (2020). Students in the intervention group reported improvements in the climate perception of their task, orientation to approach to mastery, intrinsic motivation and enjoyment.

In the light of the previously mentioned researches, a clear agreement is noted with what was obtained in the current study. From the analysis of the pre-post results, the presence of a significant effect of the conveyed motor protocol emerged, relative to both domains analysed, suggesting also a greater involvement and interest in the proposed disciplines, as well as a greater sense of team and support towards a common goal, and a significantly increased level of performance.

The achieved results support previous studies that have identified the Tactical Games Model (TGM) as an effective method for increasing student participation. More importantly, they provide new insights into student motivation to get involved and stay engaged during the TGM sequence of learning situations.

The obtained research results showed a higher level of interest / enjoyment of students in the activity after the implementation of the TGM unit. Further support for the findings is provided by research by Hohengasser (2014). The focus of the mentioned study was to examine the motivational climate and enjoyment which resulted from an educational approach that included a hybrid of teaching games for understanding (TGfU) and Sports Education Models (SEM). The study results indicated a high motivational climate of post-test mastery and a high level of enjoyment of post-test physical activity. In terms of analysis using the PACES, exposure of students to a motivational climate of mastery through a TGfU-SEM hybrid class structure had a positive influence on the student levels of enjoyment in a physical activity.

The use of a hybrid model was suggested as an excellent way to engage students and influence their levels of enjoyment (Hastie & Curtner-Smith, 2006). These results reinforce the same basic idea: the students found the GCA model most interesting. They enjoyed the same activity more when it was taught by using the GCA. In this regard, it is considered possible to argue that the educational action of the experimental protocol was found to be effective since, right from the planning stages of the same, as the tendency was to ensure maximum coherence and fidelity with the approach of situated learning and the relative principles of authenticity, social interaction and complexity used. Therefore, the overall structure of the teaching-learning process, on which the experimental protocol was based, was supported by scientific evidence and proved to be, consistently, effective for the improvement of the skill levels investigated. The formed hypothesis was proven to be true. A tactical play approach with an emphasis on cooperative performance provides an active and purposeful learning environment for students. Furthermore, Smith and colleagues (2015) found that primary-school teachers using the TGM significantly improved physical activity (PA) levels of students.

The main limitation of this study lies in its focus on what the player does with the ball in offense and their lack of specific attention to movement without

the ball. Through the use of the TSAP, the movements without the ball and the decisions made were not measured directly, as the observer and the player could deduce these movements. Tools that can accurately and authentically measure individual player behaviour off the ball[4] are much more complicated to design and apply, and would likely be impractical for teachers.

They would certainly be more difficult to use as a peer rating and although this is a limitation of the TSAP, it provides indirect information on the player's movement off the ball. Also deducing behaviour based on the observation of different behaviour has a constructivist connotation since it forces the observer and the player to discuss and reflect on what really happened or what could have caused this process (Catarino et al., 2017).

The author is well aware that a pre-post experimental research project without a control group determines a series of intervening variables that cannot be reduced. Although this could result in a lower statistical validity of results obtained, the ethical and ecological approach of the role of a teacher in the context of Physical Education should be taken into account. Moreover, in line with the results of the applied protocol, it would have been ethically incorrect not to have allowed all the students to profit from the benefits achieved. However, in the author’s opinion, having the possibility of comparison is a better and fairer process in research.

Although the research has considerably increased knowledge in this sector, the growing cultural problem connected to the role of physical and motor education within the Italian training system has revealed, among other issues, that the means and methods currently in use during PE classes s arouse little interest in students and, therefore, seem to be ineffective from a training point of view "(Sgrò et al., 2017). In the teaching process that has been analysed to date, it is an indisputable fact that the “Direct teaching model is one of the most used didactic approaches in Physical Education” (Pritchard, Hawkins, Wiegand, & Metzler, 2008). In a logic of propensity and contextualization of the results obtained, Kirk (2005) argued that tactical approaches to teaching games can become "a traditional practice" in the context of Physical Education and youth sports programmes.

[4] Tools that can accurately and authentically measure the lack of ball possession per individual players.

In order for all that has been exposed to remain not just mere research but dispositional methodology the author agrees with Kirk (2005) that proponents of tactical approaches must focus on conceptualizing a model for teaching tactical games and basing educational resources on this formalized approach.

Conscious of the importance and practicability of the proposed model, and evaluating the results obtained and the experience of many other researchers, it can be concluded that there is a need for a change in the connotation and beliefs concerning motor learning and teaching. Accordingly, it results that "the teacher is the most important element in any process aimed at changing a didactic approach" (Hall & Hord, 2001).

6. Conclusion

6.1 Review of hypothesis

The suggested 22-week protocol in the current study showed an impact on the development of tactical skills as hypothesized in the first of the two hypotheses. As for the second hypothesis, the protocol seems to have also had an effect on the positive scale of enjoyment and therefore the proposed activity has increased the level of pleasure and fun experienced by the students during the conducted activities.

More specifically, regarding the first hypothesis, it can be stated:

***H1**: There's a positive effect of the TGM approach on the tactical skills in primary-school pupils.*

The variables used followed a normal distribution and satisfactory metric characteristics. The values of the Kolmogorov-Smirnov test and the analysis of asymmetry and kurtosis (skewness' value of 0.64 (Standard Error 0.26), kurtosis -0.39 (Standard Error 0.5) and 0.08 (df = 96) with p> 0.05)) confirmed the possibility of using parametric tests for subsequent analyses.

The values of the correlation coefficient (r) between the test-retest method to determine the reliability (95% CI) of the applied variables varied from 0.97 – 1, and in addition, the very low values of SEM indicated a high level of accuracy and an excellent data reliability. The results obtained from the multivariate test (RM-ANOVA) conducted to verify the first hypothesis showed higher values regarding the effects of the protocol on the variable related to the performance in volleyball (F = 33.47, p<0.000) compared to soccer which however showed a statistically significant difference in the pre-post test (F = 12.21, p<0.001). Given the results, it can be concluded that the first hypothesis is accepted.

Regarding the second hypothesis, it can be stated:

***H2**: There's an effect of the TGM approach on the affective domain of learning.*

The variables used did not follow a normal distribution (Kolmogorov-Smirnov test $p>0.05$) and the high values resulting from the analysis of asymmetry and kurtosis confirm the need to use non-parametric tests for subsequent analyses.

The results obtained from the Wilcoxon non-parametric test conducted to verify the second hypothesis showed a positive effect on the positive scale of the PACES questionnaire ($Z = -5.37$, $Sig<0.000$) which turned into an increase in enjoyment experienced by boys and therefore a positive effect of the protocol through the TGM. As far as the negative scale is concerned, the values of the Wilcoxon Signed Ranks test indicated a non-statistically significant effect of the TGM protocol ($Z = -0.87$, $Sig>0.05$). The absence of an impact on the negative scale might have been due to an already very low level of this scale. Given the results, it can be concluded that the second hypothesis is partially accepted as it influenced the level of enjoyment (PACES' positive scale) without decreasing the level of the negative scale.

The results of the current study are part of a broad background concerning the teaching of Physical Education in Italian primary school.

Today Physical Education (PE) is taught in many forms and variations, however, the use of a direct style or a traditional method is very common (Hastie, 2003). In this approach, described as based on technical skill, the lesson begins with a demonstration and explanation of the teacher, followed by guided exercises, and ends with a game that offers students the opportunity to apply the skills learned. Based on the concept that the technique must be learned before playing, traditional approaches focus on mastering it outside of the game context. This is typically achieved through direct instruction as an error correction process until the technique is considered good enough to play. In essence, the directing method or technical teaching emphasizes the mastery of the technique in an isolated way. But when the focus is on tactical understanding, decision making

and the execution of appropriate skills within the game, new teaching approaches are clearly needed (Light & Fawns, 2003).

According to a constructivist perspective, knowing the game does not mean having knowledge of the game in the broad sense but, rather, implementing knowledge in the game: “knowledge-in-action” (Bunker & Thorpe, 1982). In their work they underline that students unsuccessfully transferred the skills taught during the practice segment and later into the game. They also found that underperforming students were more likely to demonstrate hesitation in playing activities if they demonstrated poor performance in exercises. As a result, Bunker and Thorpe created Teaching Games for Understanding (TGfU) with the aim of increasing the understanding of the game, tactical awareness, and developing student appreciation of the game.

Student-centred teaching approaches (i.e. GCA) are in stark contrast to traditional and technique-cantered approaches to teaching Physical Education. The TGfU teaching model offers freedom to the teacher during education and facilitates learning to students. Many researchers explained: "The task of the teacher in the TGfU is to present a game that children can access with some of the already developed skills and that improvement can be achieved through understanding what the game is about" (Werner, Thorpe, & Bunker, 1996). The TGfU model created a path for the development of other game-based educational models such as the Sport Education Model (Siedentop, 1994) and the Tactical Games Model (Mitchell et al., 2013).

The TGM didactic approach differs slightly from the TGfU model. However, the overall goal remains the same, and that is to facilitate the development of a sense of play by placing students within a modified tactical game and in small teams. As a result, students have the opportunity to share ideas collectively and publicly, solve genuine problems, and possibly increase further their learning of the game. Accordingly, the TGM approach focuses on the game as a whole and uses a student-cantered and inquiry-based pedagogy, where the teacher works as a learning facilitator rather than as an instructor who transmits knowledge.

The results of the current study, which considered the use of the tactical game model (a student-centred approach), have a good impact on the tactical skill development and on the affective domain of learning.

To date, in fact, there has been a reduction in physical activity in industrialized countries not including exclusively the adult population, but extends to younger generations as well, starting from the preschool age, and determines a trend of involution of physical efficiency in children, which is a real alarm.

Probably, children, while growing up, move away from free play and turn more to technology and videogames, becoming thus less and less interested in interacting with others and preferring screens to a game with the ball or a running in the open air.

In this scenario, therefore, Physical Education teachers can act as the first line of defence in the initial identification of motor and coordination damage based on the performance and scores obtained in the TGM and, given the evidence, it would be appropriate that the school, together with families, encourage participation suggest in motor and sport activities and the observance of the most correct indications for a healthy and active lifestyle. International guidelines in fact suggest moderate to vigorous physical activity for at least 60 minutes a day (Strong et al., 2005) and, considering that the level of physical activity in children, predicts the level of activity of adults (Telama et al., 2005), it becomes necessary to create the foundations of a healthy and active lifestyle from childhood. Only with this approach it becomes possible to contrast the current trends of lack of motion (Ketelhut & Bittmann, 2001) that have already been registered since kindergarten (Reilly et al., 2004).

6.2 Limitations and future directions of the research

Currently, as previously mentioned, there is no Physical Education graduated teacher in Italian primary schools, who deals with the teaching of physical education in primary school; and this teaching is assigned to teachers who very often do not have the necessary knowledge to guarantee an adequate development of children/pupils. As underlined by the Eurydice report, the structures and tools available are currently insufficient in most Italian primary schools.

The current study shows how a graduate and prepared teacher can use the Tactical Game Model to implement functional programmes both in terms of

the acquisition of technical fundamentals of certain disciplines and activities that have an impact on the affective domain of learning. However, the sample of this research represents the main limitation of the latter as it does not allow a generalization of the results obtained.

Future research will be conducted to evaluate whether the results can be extended to a larger sample.

6.3 Professional and scientific contribution of the research

Scientific literature shows that there is a decline in the level of motor skills of children (Sgrò et al., 2017). This issue, as is known, poses interesting prospects for further studies on which scientific research and the community of practice can continue to work on. In this sense, possible reasons connected with the decline of the previously-mentioned abilities on one side concern the interests of children (i.e. games for smartphones, PlayStation, Xbox, etc.), which very often are aimed at activities not including movement, and on the other hand they seem to concern teaching methods of Physical Education in primary school.

As indicated by the Eurydice report (2013), referent teachers are almost always generalists, that is, they are not adequately prepared in terms of methodologies, tools and functional teaching styles for the development of motor skills. The teaching of Physical Education, and consequently each lesson, should have as its fundamental requirement an adequate methodological approach as regards to the related teaching-learning processes (Sgrò, Quinto, Platania, & Lipoma, 2019).

In this setting the results obtained are useful for three main reasons:

1) knowing the tactical game model and understanding its positive effect on the tactical skill development and on the affective domain of learning in 9-year old pupils;
2) providing more data to international literature;
3) providing Physical Education teachers with both tools and methodologies that can be used in their classes.

Estimating the impact of a different approach (currently not used in Italian primary school) and as a hint to how to design and assess a curriculum in Physical Education classes during primary school is really important, especially

considering the direction in which the Italian government is moving towards teaching Physical Education in primary school. The government is trying to organize itself to allow teachers with a degree in Sports Sciences to become teachers of Physical Education in Italian primary schools.

In conclusion, the instrument and methods used in this study could be easily integrated in primary schools, but this process would require a previous and specific training of the new Physical Education teachers during their university education.

7. References

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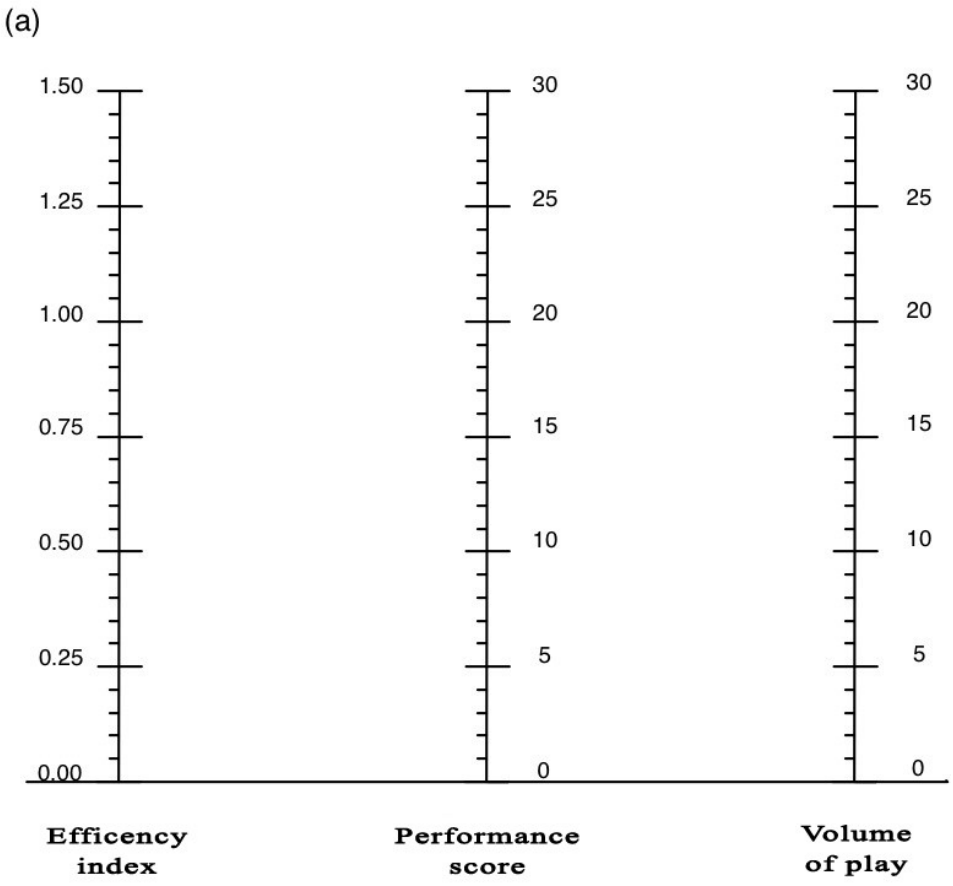
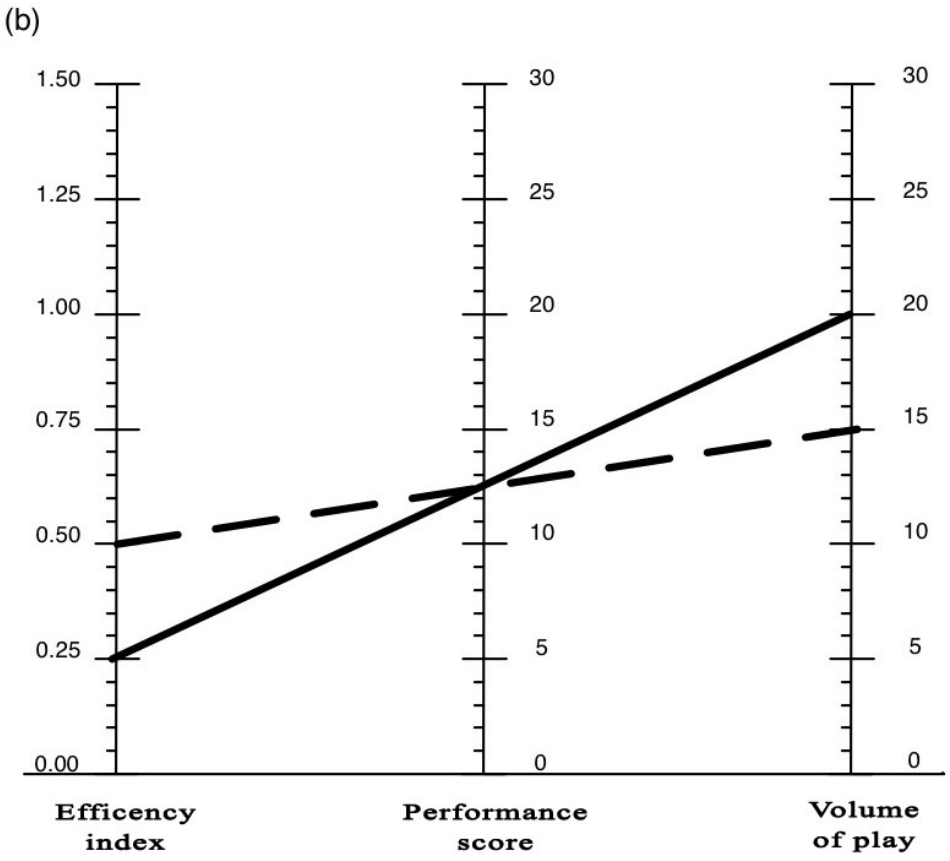
8. Appendix



a) Nomogram for assessing performance in team sports.



b) Example of illustrations of results obtained by one student in two matches.

PACES-C-It

(Moore et al., 2010; Carraro et al. in press)

DURANTE LA LEZIONE DI EDUCAZIONE FISICA DI OGGI IO:

	sono in completo disaccordo	sono in disaccordo	sono incerto	sono d'accordo	sono completamente d'accordo
1. mi sono divertito	1	2	3	4	5
2. mi sono annoiato	1	2	3	4	5
3. non mi è piaciuto	1	2	3	4	5
4. l'ho trovato piacevole	1	2	3	4	5
5. non mi sono divertito per niente	1	2	3	4	5
6. mi ha dato energia	1	2	3	4	5
7. mi ha fatto sentire triste	1	2	3	4	5
8. è stato molto piacevole	1	2	3	4	5
9. il mio corpo si è sentito bene	1	2	3	4	5
10. ho ottenuto qualcosa	1	2	3	4	5
11. è stato molto eccitante	1	2	3	4	5
12. è stato deludente	1	2	3	4	5
13. non è stato per niente interessante	1	2	3	4	5
14. mi ha dato una forte sensazione di successo	1	2	3	4	5
15. mi ha fatto sentire bene	1	2	3	4	5
16. mi sono sentito come se preferissi fare qualcos'altro	1	2	3	4	5

Italian version of the PACES questionnaire.

Example of a lessons with TGM setting[5]

Tactical problems: Playing the game and keeping possession.
Game: Handball (sponge ball)
Focus of the lesson: Passing and moving in a 3vs3 game.
Targets: In a 3vs3 game pass the ball to try and maintain its possession.

START

Warm-up (running and general activation exercises)

GAME 1

Pass and move or 2vs1 at home court.

Goal: Make four passes in a row.

Conditions:

1. The defender must try to get the ball.
2. Players use a warm (arm's length) defence; slapping the ball out of others' hands is not permitted.

GAME 2

3vs3 possession game (four passes in a row earns 1 point)
Goal: keep the ball.
Conditions:

1. Players may not move with the ball.
2. Players use a warm defense.
3. Use the usual boundaries and restart rules.

[5] Example shown on the 2013 version of the text written by Griffin, Mitchell, & Oslin (1997).

CLOSING

Discussion and questions regarding any possible problems that might have emerged during the lesson (Figure 4).

Figure 4. Final discussion to improve the development of the pupils' awareness.

Q: How can you get the ball past the defence?
A: Pass the ball between 2 defenders.

Q: What was the safest choice when passing the ball?
Pass it on to your closest or farthest companion?
A: To the closest one.

1st Lesson Structure

Tactical problems: playing the game and keeping possession of the ball.
Game: handball, using a 10 cm diameter ball.
Focus of the lesson: court, team organization and passing.
Targets: to be able to identify the game areas and to complete the successful steps in order keep the ball and play in a specific area.

LEAD-IN

1. Students enter the gym and, while sitting in a circle, listen to the teacher's explanation about what they are going to do.
2. The lesson begins by introducing students to the game areas (4 areas marked with different coloured adhesive tape). In the warm-up phase, students run to their assigned area (5 students in 3 areas, 4 students in one) but they change it whenever the teacher calls on them, in order to make the warming up more effective.

PRACTICAL ACTIVITY

Passing the ball between 5 players for three teams and 4 players for a team.

During this phase the gym was divided into different areas marked with coloured adhesive tape. During the following activities, cones were used to simplify the technique (especially with the net games) as shown in Figure 5.

Figure 5. Cones and ropes used to make learning and developing technical skills easier.

Goal: Make 10, 15 or 20 consecutive passes without dropping the ball.

Conditions: players may not move with the ball.

Variants:

1) Students can make the transition by moving to their own field area.
2) If their skill allows, students play 4vs1 and 3vs1 with the aim of scoring 8 goals.
3) If their ability warrants it, students play 2vs1 with a goal of eight passes in a row and then a switch (the defender must go to the ball). They use cold (standing) going to warm (arm's length) defence.

GAME

Students play a 5vs5 possession game and obtain 6 points every 6 consecutive passes.

Objective: To keep the ball.

Conditions:

1. Players cannot move with the ball.
2. Players perform a warm (arm's length) defence.
3. Players make a throw-in of the ball from the out-of-bounds line.

CLOSING

Discussion and questions regarding game areas.

Q: What did you do in your team to keep the ball for 6 consecutive passes?

A: I passed the ball to my teammate.

Q: Where is the best place to pass the ball?

A: In the centre of the field.