The effect of IAAF Kids Athletics on the physical fitness and motivation of elementary school students in track and field

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Abstract:

The purpose of this study was to investigate the effect of IAAF Kids' Athletics on motivation, physical fitness and track and field event performance of children (11-12 years old). The IAAF Kids' Athletics is a track and field teaching program that was developed by the IAAF (International Association of Athletics Federation). In total 215 elementary students participated in the study. IAAF Kids' Athletics was implemented in an experimental group and the traditional skill teaching method for track and field was used in the control group. The experiment was conducted in an elementary school environment for twelve weeks. The Perceived Locus of Causality, the Perceived Enjoyment and Effort subscales of the Intrinsic Motivation Inventory, and the questionnaire which measured the intention to continue practicing track and field, were administered to the students before and after the experiment. Pre- and post-experimental physical fitness and track and field event performance measurements were recorded. Split plot ANOVAs were used to estimate the time and group interaction effect on each variable. The students in the IAAF Kids' Athletics group improved perceived effort and intention to continue practicing track and field more than those who were exposed to the skill learning method. They also regulated their motivation for track and field to a more self-determined direction, by improving the identified regulation. The same positive results were revealed for most of the physical fitness and event performance variables. In conclusion, the IAAF Kids' Athletics program can motivate elementary school students to learn track and field, by helping them to realize the importance of this sport and at the same time it can help them to improve their physical fitness and their track and field performance.

Keywords: athletics, physical education, self-determination, games centered approach.

Introduction

In the domain of teaching in physical education, motivation has been found to be a key factor influencing students' interest, their learning behavior, and intention to exercise and practice sports in the future (Chen, 2001; Standage, Duda, & Ntoumanis, 2003). Personal and environmental factors are responsible for positive motivational experiences in physical education (Chen, 2001). The students' predisposition towards exercise and sports in combination with the contextual structure and teaching strategies, used in physical education settings, determine the students' engagement in the lesson, their motivation to exercise, and their intention to practice sports in the future (Standage et al., 2003).

The Self-determination Theory

The self-determination theory suggests that in learning environments the type of motivation which generates individual's participation in an activity, is regulated by internal or external reasons (Deci & Ryan, 1985, 2000). It posits that self-determined or autonomous motivation lies on a continuum, subdivided into three categories: intrinsic, extrinsic and amotivation. Intrinsic motivation represents the individual's participation in an activity, driven by inherent satisfaction and pleasure. Identified regulation lies adjacent to intrinsic motivation. It represents the most autonomous form of external regulation, reflecting engagement in an activity, which is considered important to individual's personal goals and values. Introjected regulation represents a non-self-determined form of motivation, as an individual's behavior is extrinsically governed. External regulation represents the least self-determined type of extrinsic motivation and refers to behaviors carried out in order to gain an external reward or avoid negative consequences. Amotivation represents a relative absence of motivation and lack of intention. The level of self-determined motivation has been found to be affected by the social context (Ryan & Deci, 2000; Reeve, Deci, & Ryan, 2004).

In the context of physical education a higher self-determined motivation level is significantly associated with an autonomy supportive learning environment (Perlman, 2013; Standage et al., 2003). Such an environment is decided by the autonomy support, structure, and involvement support provided to students (Reeve et al., 2004). Autonomy support refers to the pedagogical strategies used to create a student-centered

environment, facilitating the freedom of action and making choices, as well as the support of self-initiation. Structure refers to the provision of an interesting lesson content. This includes challenging and relevant activities which attract the students' curiosity and offer meaningful and clear goals and choices. Involvement refers to the teacher's affection and encouragement to participate (Ntoumanis, 2001). Students' autonomous motivation (self-determined) thrives under conditions in which structure and autonomy support is provided (Reeve et al., 2004).

Several studies have shown that intrinsic motivation and higher levels of self-determined motivation (autonomous motivation) are positively associated with desirable psychological outcomes, such as: (a) enjoyment, satisfaction, and interest (Standage, Duda, & Ntoumanis, 2005; Vallerand, 1997); (b) effort (Ntoumanis, 2001; Pellier, Fortier, Vallerand, Tuson, Briere, & Blais, 1995); and (c) persistence, and intention to participate in sports (Ntoumanis, 2001; Standage et al., 2005). Several investigations in physical education settings revealed that a higher self-determined profile (higher scores in intrinsic and self-determined motivation) is correlated with higher physical fitness measures in physical education, including endurance, and strength (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008; Shen, McCaughy, Martin, & Fahlman, 2009).

The Games Centered Approach

The games centered approach is a pedagogical method of teaching in physical education, where playing

IAAF Kids' Athletics	Traditional Teaching Method
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a game is the central organizational feature of the lesson. It includes various game approach versions, such as Teaching Games for Understanding, Play Practice, Game sense, and others (Miller, 2015). Primarily it focuses on the ability to understand the usefulness of the skills required to play a game, or participate in a certain kind of sport. In essence the goal of using this method is to connect more effectively the learners and their skills to the demands of a certain sport or game via a process that recognizes the inherent connection between cognition and performance (Kirk & MacPhail, 2002; Miller, 2015). It lies in contradiction with the traditional skill teaching approach, in which students' technical skills are considered as central and without their development the involvement in the sport or game play is viewed as limited. This method emphasizes learning the skills of a sport by primarily playing modified games. The technical skills, learnt in a simplified and modified structure, are progressively placed in increasingly more competitive and challenging environments, where the students are required to combine technical and cognitive skills into more dynamic forms (Kirk et al., 2002). The games approach method facilitates the structural design of an autonomy supportive environment, where learning is achieved by offering students the freedom to experiment, explore, and discover the required skills, and by promoting learning responsibility (Deen, 2015). It gives students the opportunity to interact and cooperate with each other, to have fun and learn at the same time, without receiving detailed instructions and guidance by their educators. It attempts to create situations that capture the enjoyment of pick-up games and challenges, which are very common in children's play. However, these learning situations are carefully structured to create challenging and enjoyable practices that motivate children to play their way to understanding and competence. Positive affective outcomes for perceived competence, perceived enjoyment-interest, and perceived effort-usefulness have been revealed to be associated with the use of a game centered approach (Miller, 2015). Several studies have reported a positive association between this teaching method and intrinsic motivation in elementary and secondary physical education contexts (Jones, Marshall, & Peters, 2010; Perlman, 2013).

The IAAF Kids Athletics Program

The IAAF Kids' Athletics (Gozzol, Simonhamed, & Elhebil, 2006) is a program especially designed by the International Association of Athletics Federation (IAAF) to promote and expand Track and Field in schools and sport clubs. The program offers children (7 to 12 years old) the opportunity to experience, practice, and learn a variety of track and field skills, as well as to improve their physical fitness (speed, strength, endurance, agility, flexibility, coordination), while playing simplified track and field games. The objectives of the program are to: (a) motivate children to learn and practice track and field, by increasing their interest in Athletics; (b) increase their intention to participate in organized track and field events in the future; (c) create a solid foundation for the improvement of the children's physical fitness; (d) improve social interaction and positive peer relationships between children by introducing a variety of team events (i.e., Relays and various point collecting team events); and (e) increase their physical activity and establish a long life participation in sports.

Learning skills by using modified playful activities (individual adventures and team games).	Learning skills by using special exercises (special technical and ancillary exercises).
Teaching progression from modified games to competitive team games.	Teaching progression from special to competitive exercises.

The children are free to experience modified activities and discover by themselves the usefulness of the event skills.	The children are guided to understand and learn the event skills.
The children practice in mixed teams.	The children practice individually
The instructor's involvement is rarely required.	The instructor's presence and his/her involvement is necessary.
The exercises are done for their own sake.	The exercises are performed to achieve a certain goal.
Team event competition.	Individual competition.

Table 1. Teaching Approach Differences Between the IAAF Kids' Athletics Program and the Traditional Repetitive Skill Method of Teaching Track and Field.

The program consists of a competitive and an instructional part. The instructional handbook is about teaching the techniques of the basic track and field events and certain skills considered as the most significant parts of the overall technique. In addition, it contributes to the development of the basic physical fitness components. Its construction is based on the games centered approach (Miller, 2015). Various modified preparatory drills and competitive games (individual and team games) are introduced to teach the most significant parts of the track and field event techniques and several others are used to improve agility, coordination, speed, strength and endurance (Gozzol et al., 2006). The suggested teaching strategy initially emphasizes the use of certain playful exercises (adventures), or modified preparatory exercises presented in various forms (variety of conditions), before moving into more challenging and competitive team games (adventurous, collecting bonus and relay games), that require the skills previously learnt. This method is in contrast with the traditional repetitive skill teaching method, which primarily focuses on teaching the certain event skills (use of specific exercises), before moving into practicing the event (table 1). In alignment with the games centered approach, the variety of playful exercises and adventurous games are expected to create an environment that facilitates positive outcomes in children's affection (i.e., to feel the enjoyment that makes track and field interesting, to feel competent and successful by practicing drills that fit to their current abilities, and realize the importance of the event skills that will finally help them to put more effort) (Miller, 2015), in their performance (i.e., physical fitness and event performance), and their intention to continue practicing track and field in the future.

In particular, the teaching handbook includes twenty four teaching subjects overall. Eight subjects aim at teaching the techniques and skills of the basic events. Seven subjects aim at the development of the specific physical abilities (explosive leg and arm strength, sprinting ability). Five subjects aim at the development of basic physical fitness components (speed, agility, flexibility, coordination, strength, and endurance). Four subjects aim at improving the event techniques (using more specific drills) and the specific physical abilities simultaneously. Five educational cards are recommended for teaching each subject. The five cards represent different training situations, with the same teaching objective. They focus on drills and games with a different level of difficulty. It is up to the instructor to select the most appropriate and challenging situation, that corresponds to the level of his students. Every educational card includes: (a) a description of the drill or game; (b) the most important instructions that should be given to the students; (c) what to expect from the beginners; (d) the required equipment; and (e) the teaching progression from simplified games and exercises to modified competitive games, including the previously learnt skills.

The competition handbook provides information about the age groups and the type of events suggested for each group, about the materials and the necessary equipment to be used, as well as the location and duration of the events (Gozzol, Locatelli, Massin, & Wangemann, 2002). It also gives a detailed description of the modified events that are specially designed to fit each age group, as well as an appropriate scoring system for each event. The large numbers of children competing at the same time, as well as the mixed groups, and the adventurous character of the events, fulfill the pedagogical requirements of offering equal participation opportunities, of gender equality, and enjoyment.

The structure (games approach) of the IAAF Kids' Athletics program lies in contradiction with the traditional repetitive skill teaching method (table 1). Within the framework of the self-determination theory, it is expected to develop a supportive pedagogical context. This context should help children to develop more self-determined types of motivation in learning and practicing track and field at school and improve their affection. The literature review showed that the IAAF Kids' Athletics program has never been studied before in an elementary school environment. There is no evidence that the contextual structure introduced by the program can motivate students to practice track and field in physical education and enhance their physical fitness. The purpose of this study was to apply the program in a physical education setting (11-12 years old students), and

investigate the following hypotheses: (a) the program develops more autonomous (self-determined) forms of motivation when teaching track and field to students of this age, (b) the IAAF Kids' Athletics program, with an extended use of various playful modified activities, enhances the students' Enjoyment-Interest and Effort-Importance, more than the traditional repetitive skill teaching method, (c) it improves the students' intention to practice track and field in the future, and (d) it improves their basic physical fitness components and their event performance more than the traditional teaching method.

Materials and Methods

Participants

The original sample consisted of 232 students (109 boys and 123 girls), with a mean age of 11.61 (0.49). They attended five elementary schools of a northern Greece region. After informing all elementary public schools in the region about the purpose of the study, five schools accepted to participate. Fifth and sixth grade students were informed in detail by their principals and Physical Education teachers about the study. Initially, 232 willingly accepted to participate and they provided their parent's written consent. There were three inclusion criteria: (a) the students had to be healthy. Those who were exempted from Physical Education were not permitted to participate; (b) sixth class students should not be more than 12 years old; and (c) they should not have a background of involvement in track and field. Seventeen students were not included in the data, resulting in a final sample of 215 individuals (116 girls and 99 boys). The intervention was carried out by the five school physical educators (one educator for each school). Each one of them had more than fifteen years of working experience in elementary schools and three educators were qualified to teach track and field in sport clubs.

Instruments

Motivation. The Perceived Locus of Causality (PLOC) scale, developed by Goudas, Biddle, & Fox (1994), was used to measure the different types of motivational regulation. Students were asked to respond to four items for each one of the five subscales, using the stem "I take part in the PE class....." Example items are "Because it's fun" (Intrinsic motivation), "Because I want to learn sport skills" (Identified Regulation), "Because I want the teacher to think I'm a good student" (Introjected Regulation), "Because I'll get into trouble if I don't" (External Regulation), and "but I really don't know why" (Amotivation). The Self-determination index was calculated by giving each subscale a specific weight according to its respective place in the self-determination continuum (i.e., +3, +2, -1, -2, and -3, respectively, for Intrinsic motivation, Identified regulation, Introjected regulation, External regulation, and Amotivation scales). The weighted scores of each subscale were added to produce a single index (Wilson, Sabiston, Mack, & Blanchard, 2012). Responses were made on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This questionnaire has been established as valid and reliable for students in Greece (Goudas, Dermizaki, & Bagiatis, 2000).

Perceived effort and enjoyment. Two subscales of Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) were used to measure the motivational responses of Enjoyment/Interest and Effort/Importance. The students responded to 10 items on a five point scale ranging from 1 (absolutely disagree) to 5 (absolutely agree). The validity of these scales in a Greek physical education context have been evaluated and found to be consistent (Papaioannou & McDonald, 1993).

Intentions. Two questions were used to measure the students' intentions to participate in athletics over the next twelve months. The questions were "I intend to during the next twelve months", (impossible = 1, possible = 7) and "I'm determined to..... during the next twelve months" (impossible = 1, possible = 7). This questionnaire has been shown to be reliable and valid for physical education in Greece (Papaioannou & Theodorakis, 1996).

Physical Fitness.

Eurofit Battery. The following tests from the Eurofit Battery (Council of European Committee for Development of Sport, 1988) were used to measure the students' Physical fitness components of flexibility, lower body explosive strength, running speed, agility, and endurance: (a) the Sit and reach (flexibility), (b) the Standing broad jump (lower body explosive strength), (c) the 10×5m shuttle run (running speed and agility), and (d) the 20m shuttle run (endurance). The Eurofit is a valid method to evaluate fitness components for preadolescents and adolescents (Malina & Katzmarzyk, 2006). Data was obtained using the procedures described in the Eurofit Test Handbook (Council of European Committee for Development of Sport, 1988). A brief description of the test follows below:

Sit and Reach. The sit and reach test was used to assess flexibility of the spine and posterior leg muscles. Each student had to reach as far as possible from a sitting position. Their knees were kept straight and they rested their bare feet vertically against a box 30 cm in height. To perform the test, the students leaned forward with straight arms and reached over the top surface of the box. The distance between toes and finger was measured. Positive values were recorded if the students were able to reach further than their toes, negative values were recorded if the students were unable to reach their toes, and a zero value was given when students just touched their toes. They made two attempts and the best was recorded to the nearest 0.10 cm.

10×5m shuttle run. Two lines were drawn 5 m apart. The students had to run forward as quickly as possible, pivot on the far line, and return to the starting line. This had to be repeated five times in total. The time required to complete the test was recorded to the nearest 0.10 sec. After two trials the best was recorded.

Standing broad jump. The students had to stand behind the starting line. They were instructed to push off vigorously and jump as far as possible. They had to land with the feet together and stay upright. The test was repeated twice, and the best score was retained to the nearest 0.10 m, as the distance between toes at take-off and heels at landing or whichever body part landed nearest to the take-off spot.

20m shuttle run. This is a standard test of cardio-respiratory fitness, developed by Leger, Mercier, Gaboury, and Lambert (1988). In brief, 5 to 10 students started running up and down a 20m track at an initial speed of 8.5 km/h, which gets progressively faster (.50 km/h every minute), in accordance with a pace dictated by a sound signal on an audio tape. Several shuttle runs make up each stage of the test, and students were instructed to keep pace with the signals for as long as possible. The number of stages fully completed, were recorded for each student. They had only one trial.

T-test Agility Drill. The T-Test was developed by Seminick (1990) to measure agility. Students had to reach and touch a series of cones placed in a T shape, by running and sliding. Three cones were placed 4.55m apart from each other on a straight line (A, B, C) and a 4th cone D was placed 9.15m from the middle cone B, so that the four cones formed a T shape. They stood behind the cone D at the base of the T shape. After the signal, students had to run and touch the middle cone B. After reaching it, they side shuffled to cone A without crossing their feet. After touching this cone, they side-shuffled to their right to cone C, side-shuffled back to the middle cone, and then ran backwards to the starting position. The time to complete this test was recorded with a digital stopwatch. Each student made two attempts and the best was recorded to the nearest 0.10 sec. The T-Test has been established as a valid and reliable method to measure linear to lateral agility (Pauole, Madole, Garhammer, Lacourse, & Rozenek, 2000). It has been previously used to measure children's agility (Jakovljevic, Karalejic, Pajic, Macura, & Erculj, 2012).

Event performance. Five track and field disciplines were used to evaluate the effect of the program on event performance:

Sprint 50 m. Students had to run individually 50 m as fast as possible to the finish line. They started their run from a standing position. Two trials were performed and the fastest was recorded to the nearest 0.10 sec.

Long jump. Accuracy in hitting the board was not required. The students stepped in a take-off zone (80 cm) after a run up approach of 15m and landed into the sand pit. The distance between toes at take-off and heels at landing or whichever body part landed nearest to the take-off spot was measured. They made two attempts and the best was recorded to the nearest 0.10m.

High jump (scissors style). The students took a short run up on a curve (8 strides) and stepped diagonally to the bar. They were allowed up to three attempts to clear the height in order to continue.

Shot put. The students threw the shot from a power position with their opposite shoulder facing the throwing direction (without gliding). They made two trials and the best to the nearest 0.10m was recorded.

Single-handed overhead softball throw (0.2 kg ball): The students were allowed to run up to a line and throw the ball with one hand over their head (javelin throw technique) without crossing the line. The best out of two trials was recorded to the nearest 0.10m.

Procedures

Experimental design. Three training meetings were carried out. The researchers presented to the physical educators the objectives of the intervention and the teaching protocols for both groups (the IAAF Kids' Athletics experimental group and the control group which delivered the traditional track and field teaching method). They emphasized the teaching instructions of the playful activities, the preparatory exercises, the games of the IAAF Kids' Athletics (Gozzol et al., 2006), and the games approach strategy. They stressed the differences between the IAAF Kids' Athletics method (based on the games approach) and the repetitive skill teaching method (Table 1). The physical educators were also thoroughly informed about the content of the questionnaires and they were given instructions on the process of measuring the physical fitness parameters. It was originally planned that each physical educator would carry out the program of both groups in his school. However, one educator reported that he was incapable of delivering the IAAF Kids' Athletics. Eventually he was assigned to implement the program of the control group to both of his school's classes. The rest of the educators implemented both programs after randomly dividing their classes into both groups (experimental and control group). The fourteen classes that took part in the experiment were consisted of 215 students. These classes were finally assigned to the experimental (6 classes which had 44 boys and 62 girls overall) and control (8 classes which had 55 boys and 54 girls) groups. The schools' outdoor sports facilities were used to conduct the experiment. All schools were fully equipped to carry out the intervention program for both groups, successfully.

The IAAF Kids' Athletics. The IAAF Kids' Athletics program was used to teach track and field to 106 students (6 classes) of the experimental group. The experiment lasted for twelve weeks. During this period of time, twenty four physical education sessions were carried out (two physical education sessions in a week). All sessions were the same length in time (45 min). Four lessons were dedicated to each event. These events were

the sprints and relays, the long jump, the high jump, the shot put, and the single-handed overhead softball throw (javelin throw). In the first two lessons of each event, a variety of suggested playful preparatory exercises, modified team games, and simplified activities (adventurous) were selected and used to teach students the fundamental skills of the event (Table 2). During these sessions the students executed their drills in groups and practiced simultaneously.

Table 2. Differences Between the two Intervention Group Programs in the Type of Lesson Content Implemented

Group	Type of Content	%
IAAF Kids' Athletics	MPEGTFS	50
	SETSOCC	10
	MCG	40
Control group	MPEGTFS	10
	SETSOCC	80
	MCG	10

Note. MPEGTFS = Modified preparatory exercises and games teaching fundamental event skills; SETSOCC = Special exercises and drills teaching skills out of competitive context; MCG = modified competitive games.

In particular, the preparatory exercises used to teach the sprinting technique were adventurous playful drills that included slalom, sprinting on the curb, short distance runs which emphasized the stride length and frequency, short runs clearing low hurdles and various obstacles (on a straight lane and on the curb), and acceleration runs from various starting positions (Gozzol et al., 2006). When the students realized the importance of the required sprinting skills (i.e., the relaxed, powerful and coordinated leg and arm movements, running on the ball of the foot, the sideward body lean when sprinting on the curb, the forward body lean during acceleration, the quick clearance over the hurdles and the rigorous contacts on the ball of the feet) they executed modified team games, applying the skills they learned, either separately, or in combination. The preparatory exercises to teach the relay events included, either adventurous running games, where they placed and received objects (i.e., tennis balls, foam rings, etc.) from a certain spot, or passing and receiving relay games between partners who ran in opposite directions and met in a defined area. When they realized the importance of synchronization in delivering and receiving the baton with the least loss of speed, they moved into team relay games (i.e., shuttle, circular relays, etc.). The original long jump lessons included adventurous and preparatory drills, such as lateral low barrier jumps on both feet and a forward movement, jumps over low obstacles on both feet following various routes, rope jumping, stride horizontal jumps on one foot over low obstacles, placed on a circular and a straight route, hopping on each foot, hopping and stepping in various patterns, and others. When the students understood how important the coordinated leg and arm action as well as the active foot plant and fast take off were, in order to produce an effective jump, they played modified team games (i.e., collecting points) (Gozzol et al., 2006). Similar exercises were used to teach the high jump. For the two throwing events, various games were used, (in which) where the students threw lighter throwing equipment (i.e., foam javelin, mini balls, medicine balls, rings, etc.), aiming at targets or long distances. When they realized the importance of the coordinated movement of the feet, legs, hips, and arm, in order to throw further, they played team throwing games (i.e., collecting points and relays).

In the last two teaching sessions of each event, after the students had discovered the usefulness of these skills and after enjoying various preparatory games, modified competitive team games and events in a more challenging context were introduced (Gozzol et al., 2006) (Table 2). For example they played modified competitive team games (i.e., competition of collecting points between teams), such as short distance sprint races clearing low hurdles, long jumps into the sand pit with a very short run up and take off from low boxes, standing triple jumps into the sandpit, and throwing lighter equipment, etc.

In the last four sessions of the intervention, the students participated in intramural multi-event competitions, according to the recommendations of the competition handbook (Gozzol et al., 2002). The classes, practicing the IAAF Kids' Athletics in each school, competed against each other as separate teams. The events they participated in were the slalom shuttle relay run, the long jump, the foam javelin throw, the shot put, and the circular relay. The students added points to their teams' score according to their individual performance in each

event (long jump, foam javelin throw and shot put) and for their team's victory in the relays. Average scores were estimated for each event, because the classes had an uneven number of students. The team that achieved the highest overall score was announced the winner of the competition. In schools with only one class practicing the IAAF Kids' Athletics, the students were divided into two teams.

The repetitive skill teaching method. The 109 students (eight classes) of the control group were taught track and field following the instructions of the Physical Education curriculum for elementary schools (Digelidis, Theodorakis, Zetou, & Dimas, 2006). The curriculum recommends a more traditional teaching approach. According to its recommendations, the events are taught within a 6-week period, by repeatedly using special drills in a non competitive context, emphasizing specific parts of the discipline's technique (Table 2). In the present study though, an equal number of physical education sessions (24 sessions) with the experimental group were used, to teach the same track and field events. All sessions were the same length in time with the experimental group and they were held twice a week. The students were taught the same events with those of the experimental group (i.e., sprinting and relays, long jump, high jump, shot put, and single-handed overhead softball throw-javelin). Four lessons were dedicated to teach each event.

The sprinting and relay events were taught by using special technical and ancillary exercises in a non competitive context. They mainly focused on specific aspects of the sprinting techniques (i.e., starts from various positions, crouch starts, exercises which stressed the feet, leg and arm action, the stride frequency and length, acceleration runs that were used to teach the forward lean body position, etc.) and technical aspects of passing and receiving the baton in an exchange zone. Only a small part of the lessons was dedicated to modified competitive relay games (Table 2). Special technical exercises and drills were used to teach the long jump. They mainly emphasized the run up approach, the run up and foot placement, and the take off and flight (for both the stride long jump and hang style). The same method was used to teach the scissors style high jump. Special technical exercises were applied to teach the shot put (i.e., showing how to hold the shot, pushing the shot up from a standing and a squat position, facing the throwing direction, and with the back in the throwing direction, gliding exercises and throwing after gliding). For the javelin throw (overhead softball throw) special technical exercises were used to teach the run up strides, the standing overhead throw (i.e., the release was performed from an easy straddle position, from a stride position, where the shoulder axis was square to throwing direction) and the overhead throw after a short approach with a three and five stride pattern. Overall, at the end of the experiment the same amount of sprints, relay runs, jumps, and throws were recorded in both groups. The differences between the two groups in the type of exercises and drills used are shown in table 2. An intramural competition, using the individual track and field type of competition was carried out during the last four sessions of the experiment. The students participated individually in all events except of the relays.

Data Collection. The students' participation in the study was confidential. The research was approved by the institution's review board. It was also approved by the district's committee of education. Personal information was secured, according to the ethical principles of the Helsinki declaration. Upon the opening of the school year and after providing their parents' consent, the students completed the Perceived Locus of Causality (PLOC) scale, the Perceived Enjoyment and Effort subscales of Intrinsic Motivation Inventory (IMI), and their Intention to get involved with track and field over the next twelve months. Both written and oral instructions were given to the students, regarding the completion of the questionnaires. They were assured about the confidentiality of the responses and were encouraged to ask any questions regarding the understanding of the items. In the following sessions the students were shortly prepared and they practiced upon the physical fitness and the track and field tests, that they were about to take part in. The whole testing procedure lasted for two weeks. Extra hours were provided by the school boards, to complete the pre-intervention and post-intervention tests. In both situations and prior to the tests, the students of both groups were encouraged to do their best. They made two attempts in each test and the best result was recorded. The place, time, instruments, and the procedures were identical in both pre and post-intervention measurements. The post-intervention tests were undertaken right after the completion of the experiment and the questionnaires were once more administered prior to the physical fitness and track and field tests.

The researchers were authorized to enter the school premises and helped the instructors to carry out the testing procedures successfully. They visited the schools regularly. The Educators recorded (wrote down) their lessons in detail and met with the researchers once a week. They informed them about the progress of the experiment and received the required updated feedback to continue the intervention. In case of missed classes they were given extra hours by the school board to make up for their missing hours. By the end of the intervention, the Educators from both groups managed to do the same number of lessons.

Data Analysis

The analyses were carried out using the statistical software package SPSS 22. Internal consistency of the self-determination and the IMI subscales, as well as the Intention questionnaire scales were estimated with the Cronbach alpha coefficients. Two by two repeated measure ANOVAs (Split plot ANOVAs) were used to estimate the time and group interaction effects on each psychometric, physical fitness and event performance variable. In other words they were used to find out the differences between the two groups in these variables after the experiment and identify those that were due to the intervention effect. One way ANCOVAs were

conducted to examine whether the pre-experimental physical fitness and event performance measures influenced the post-experimental differences between the two groups. These analyses were carried out for pre-experimental measures, found to be significantly different between the two groups.

IAAF Kids Athletics Group	Control Group
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Results

The descriptive statistics as well as the results of the two by two repeated measure ANOVAs are presented in table 3. The mean values and standard deviations for all variables are depicted in the table. The Cronbach alpha coefficients revealed a satisfactory internal consistency for the five subscales of the self-determination questionnaire ($\alpha=0.74$ for Intrinsic motivation, $\alpha=0.72$ for Identified regulation, $\alpha=0.75$ for Introjected regulation, $\alpha=0.75$ for External regulation and $\alpha=0.80$ for Amotivation), for the IMI subscales ($\alpha=0.77$ for Enjoyment/Interest and $\alpha=0.79$ for Effort/Importance) and for Intention ($\alpha=0.96$).

Intra-class Correlation Coefficients as indicators of non-independence were calculated, to estimate the degree of variance in the psychometric measures, among members of a group, in relation to the corresponding measures of non group members. The results for the pre and post-intervention measures showed non-significant ICCs for the psychometric variables, indicating that members from the same group were more dissimilar from each other, than non group members (Table 3). Further analyses used the individual as the unit of analysis, according to Kenny and LaVoie (1985).

Group by Time Interaction Effects on Motivation

The repeated measures analyses of variance for the motivational type variables, revealed a time and group significant interaction effect on intrinsic motivation (figure 1a) and identified regulation (figure 1b) (Wilk's $\lambda=0.96$, $F(1,213)=8.80$, $p<0.01$, $\eta^2=0.04$ for intrinsic motivation and Wilk's $\lambda=0.97$, $F(1,213)=6.95$, $p<0.01$, $\eta^2=0.03$, for identified regulation) (Table 3). For the same variables a significant main effect was indicated when controlling for group ($F(1,213)=15.14$, $p<0.001$, $\eta^2=0.07$, for intrinsic motivation and $F(1,213)=8.70$, $p<0.05$, $\eta^2=0.04$, for identified regulation). There was no main effect for time ($F(1,213)=0.84$, $p=0.36$, $\eta^2=0.004$ for intrinsic motivation and $F(1,213)=2.70$, $p=0.10$, $\eta^2=0.01$ for identified regulation). Paired-sample t-tests revealed that the group differences after the experiment were due to a significant decrease of

Table 3. Descriptive Statistics (Mean and Standard Deviations), Repeated Measure ANOVAs (Time by Group Interaction Effects), ICCs as Measures of Non-independence, and Cronbach Alphas of the Psychometric Variables.

	M	SD	M	SD						
Intrinsic motivation 1	4.04	0.68	4.46	0.55	-0.43	0.96	8.80	0.00	0.04	0.74
Intrinsic motivation 2	4.13	0.72	4.29	0.58	-0.09					0.73
Identified Regulation 1	4.05	0.66	4.37	0.57	-0.52	0.97	6.94	0.01	0.03	0.72
Identified Regulation 2	4.24	0.59	4.32	0.55	-0.12					0.71
Introjected Regulation 1	2.89	0.88	2.97	0.87	-0.20	1.00	0.01	0.95	0.00	0.75
Introjected Regulation 2	3.00	0.87	3.09	0.95	0.04					0.74
External Regulation 1	2.76	1.04	2.73	0.94	0.01	1.00	0.10	0.75	0.00	0.75
External Regulation 2	2.62	0.97	2.54	0.98	-0.67					0.77
Amotivation 1	2.05	0.90	1.84	0.88	-0.28	0.99	1.20	0.28	0.01	0.80
Amotivation 2	1.94	0.90	1.85	0.92	-0.01					0.81
Enjoyment/Interest 1	3.66	0.40	3.75	0.40	-0.02	1.00	0.43	0.51	0.00	0.77
Enjoyment/Interest 2	3.67	0.44	3.72	0.56	0.10					0.76
Effort/ Importance 1	3.27	0.61	3.45	0.73	0.03	0.97	5.1	0.03	0.02	0.79
Effort/ Importance 1	3.48	0.53	3.40	0.70	0.16					0.80
Intention 1	3.91	2.06	4.88	1.75	-0.40	0.75	70.70	0.00	0.25	0.96
Intention 2	5.03	1.92	4.44	1.83	-0.48					0.94
Self-determination index 1	5.66	5.11	8.18	5.46	-0.25	0.97	6.03	0.02	0.07	-
Self-determination index 2	6.81	5.50	7.80	4.91	-0.03					-
Sit and Reach 1 (cm)	11.28	6.93	14.22	7.19	-	0.90	25.02	0.00	0.11	-
Sit and Reach 2 (cm)	13.94	7.19	13.94	7.00	-					-
TTest 1 (sec)	17.03	2.37	16.81	2.62	-	0.83	42.94	0.00	0.17	-

TTest 2 (sec)	15.27	1.38	16.54	2.62	-					-
Standing Broad Jump 1 (m)	1.33	0.20	1.41	0.29	-	0.99	0.92	0.35	.004	-
Standing Broad Jump 2 (m)	1.41	0.20	1.46	0.28	-					-
Shuttle Run 10×5m 1 (sec)	23.77	1.53	22.35	1.63	-	0.71	88.34	0.00	0.29	-
Shuttle Run 10×5m 2 (sec)	21.73	1.79	22.29	1.74	-					-
Shuttle Run 20m 1 (s)	21.66	10.7	27.17	14.6	-	0.83	42.96	0.00	0.17	-
Shuttle Run 20m 2 (s)	30.63	13.4	28.11	15.5	-					-
Sprint 50m 1 (sec)	10.35	1.04	9.84	1.28	-	0.85	36.93	0.00	0.15	-
Sprint 50m 2 (sec)	9.40	0.73	9.68	0.93	-					-
Long Jump 1 (m)	2.35	0.54	2.34	0.54	-	0.84	39.67	0.00	0.16	-
Long Jump 2 (m)	2.78	0.50	2.48	0.51	-					-
Shot put 1(m)	5.75	1.70	6.54	2.33	-	0.92	18.4	0.00	0.08	-
Shot put 2 (m)	6.90	1.32	6.89	2.48	-					-
High Jump 1(cm)	0.82	0.16	.78	0.14	-	1.00	0.09	0.77	0.00	-
High Jump2(cm)	0.87	0.14	.84	0.11	-					-
Singlehanded overhead throw 1(m)	14.50	5.61	18.21	6.57	-	0.86	34.3	0.00	0.14	-
Singlehanded overhead throw 2(m)	17.01	5.31	17.85	6.62	-					-

Note.1 = pre-experimental measurements; 2 = post-experimental measurements; m = meters; cm = centimeters; sec = seconds; s = stages (number of stages); *M* = mean; *S* = standard deviation; λ = Wilkie's Lamda; *a* = Cronbach alphas; *ICC* = Intraclass Correlation Coefficient.

intrinsic motivation in the control group ($t(1,108)=3.05$, $p<0.01$), in combination with a non significant increase of the IAAF Kids' Athletics group ($t(1,105)=1.3$, $p=0.19$) and a significant increase for identified regulation in the IAAF Kids' Athletics group ($t(1,105)=2.9$, $p<0.05$) compared with the control group ($t(1,108)=0.74$, $p=0.46$).

Fig.1. Group and time interaction effect on the following psychometric variables: (a) Intrinsic motivation, (b) Identified regulation, (c) Self-determination index, (d) Enjoyment, (e) Effort/importance, and (f) Intention

There was no indication of time and group interaction effect for the rest of the motivational type variables (Wilk's $\lambda=1.0$, $F(1,213)=0.005$, $p=0.95$, $\eta^2=0.00$ for introjected regulation, Wilk's $\lambda=1.0$, $F(1,213)=0.10$, $p=0.75$, $\eta^2=0.00$, for external regulation and Wilk's $\lambda=0.99$, $F(1,213)=1.2$, $p=0.28$, $\eta^2=0.006$, for amotivation) (Table 3).

There was a time and group significant interaction effect on the self-determination index (Wilk's $\lambda=0.97$, $F(1,213)=6.03$, $p<0.01$, $\eta^2=0.07$) (Table 3). The paired-sample t-tests revealed that the group differences after the experiment were due to a significant improvement of the self-determination index for the IAAF Kids' Athletics group ($t(1,108)=2.63$, $p<0.05$), in comparison with the control group ($t(1,105)=0.86$, $p=0.39$). These differences are clearly shown in figure 1c.

Group by Time Interaction Effects on Perceived Effort and Enjoyment

A significant time and group interaction effect was found for perceived effort/importance (Wilk's $\lambda=0.97$, $F(1,213)=5.10$, $p<0.05$, $\eta^2=0.02$) (Table 3). The interaction effect is clearly depicted in figure 1e. It proves that there are differences in perceived effort/importance between the two groups, after the intervention, caused by a significant improvement in the IAAF Kids' Athletics group, in contrast with the control group. A significant interaction was not revealed for enjoyment/interest (figure 1d) (Wilk's $\lambda=1.00$, $F(1,213)=0.43$, $p=0.51$, $\eta^2=0.002$) (Table 3).

Group by Time Interaction Effects on Intention

The analysis also showed a strong time and group interaction effect on intention (Wilk's $\lambda=0.75$, $F(1,213)=70.70$, $p<0.001$, $\eta^2=0.25$) (Table 3). Figure 1f provides a clear picture of a significant improvement in intention for the IAAF Kids' Athletics group and a decrease for the control group after the experiment, explaining the interaction effect.

Group by Time Interaction Effects on Physical Fitness

As for the physical fitness variables, time by group interaction effects were indicated for sit and reach (Wilk's $\lambda=0.90$, $F(1,213)=25.02$, $p<0.001$, $\eta^2=0.11$), the agility T-Test ($\lambda=0.83$, $F(1,213)=42.94$, $p<0.001$, $\eta^2=0.17$), the shuttle run 10×5m (Wilk's $\lambda=0.71$, $F(1,213)=88.34$, $p<0.001$, $\eta^2=0.29$), and the endurance 20m shuttle run (Wilk's $\lambda=0.83$, $F(1,213)=43.00$, $p<0.001$, $\eta^2=0.17$) (Table 3). Baseline significant group differences were indicated for sit and reach ($t(1,213)=3.10$, $p<0.01$), shuttle run 10×5m ($t(1,213)=6.55$, $p<0.001$), and for the endurance 20m shuttle run ($t(1,213)=3.14$, $p<0.01$). The one-way analyses of covariance however, showed that these differences did not account for the post-intervention significant group differences in sit and reach ($F(1,213)=17.67$, $p<0.001$, $\eta^2=0.08$), shuttle run 10×5 ($F(1,213)=47.09$, $p<0.001$, $\eta^2=0.18$), and endurance 20m shuttle run ($F(1,213)=36.04$, $p<0.001$, $\eta^2=0.15$). The charts reveal that the time by group interaction effect in all physical fitness components are due to the significant improvement of the IAAF Kids' Athletics group (figures 2 a, b, c, d). There was no time by group interaction effect for the standing broad jump (Wilk's $\lambda=0.99$, $F(1,213)=0.92$, $p=0.35$, $\eta^2=0.004$).

Fig.2. Group and time interaction effect on the following physical fitness components: (a) Sit and reach, (b) Agility T-test, (c) Shuttle run 10x5m, and (d) Shuttle run 20m.

Group by Time Interaction Effects on Event Performance

As for the track and field event performance variables, a time by group interaction effect was indicated for the 50m sprinting event (Wilk's $\lambda=0.85$, $F(1,213)=36.93$, $p<0.001$, $\eta^2=0.15$), for the long jump (Wilk's $\lambda=0.84$, $F(1,213)=39.67$, $p<0.001$, $\eta^2=0.16$), the shot put (Wilk's $\lambda=0.92$, $F(1,213)=18.44$, $p<0.001$, $\eta^2=0.08$), and for the single-handed overhead softball throw (Wilk's $\lambda=0.86$, $F(1,213)=34.34$, $p<0.001$, $\eta^2=0.14$) (Table 3). Significant pre-experimental group differences were recorded for the 50m sprinting event ($t(1,213)=3.20$, $p<0.01$), for the shot put ($t(1,213)=2.84$, $p<0.01$), and for the single-handed overhead throw ($t(1,213)=4.45$, $p<0.001$). When controlling for pre-experimental scores the analysis of covariance revealed that the post-intervention differences between groups remained significant for the 50m sprinting event ($F(1,213)=27.60$, $p<0.001$, $\eta^2=0.12$), for the shot put ($F(1,213)=11.69$, $p<0.01$, $\eta^2=0.05$), and for the single-handed overhead throw ($F(1,213)=19.84$, $p<0.001$, $\eta^2=0.09$). Paired-sample t-tests showed that both groups significantly improved in long jump ($t(1,213)=5.4$, $p<0.001$ for the control group and $t(1,213)=10.7$, $p<0.001$ for the IAAF Kids Athletics group) and shot put ($t(1,213)=2.5$, $p<0.05$ for the control group and $t(1,213)=9.4$, $p<0.001$ for the IAAF Kids Athletics group). However, the IAAF Kids' Athletics group showed the biggest improvement (figure 3b, c). The paired sample t-test for the 50m sprinting event showed that the interaction effect was due to the improvement of the IAAF Kids Athletics group ($t(1,213)=1.56$, $p=0.12$ for the control group and $t(1,213)=12.85$, $p<0.001$ for the IAAF Kids Athletics group). The interaction effect and the chart (figure 3d) shows that only the IAAF Kids' Athletics group improved in the single-handed overhead throw. An interaction effect was not recorded for high jump (Wilk's $\lambda=1.00$, $F(1,213)=0.09$, $p=0.77$, $\eta^2=0.00$).

Fig.3. Group and time interaction effect on the following event performance variables: (a) Sprint 50m, (b) Long jump, (c) Shot put, and (d) Single-handed overhead throw (javelin).

Discussion

The IAAf Kids' Athletics program was implemented in an elementary physical education context. The purpose of the study was to examine the effect of the program on students' motivation, perceived enjoyment, perceived effort, intention to continue practicing track and field, and on their physical and event performance.

The Effect of IAAF Kids' Athletics on Motivation and Affect

The results demonstrated that 11-12 year old students, who practiced the IAAF Kids' Athletics program, significantly improved the identified regulation and they developed a more self-determined type of motivation when practicing track and field, while those who were taught track and field according to the traditional skill teaching approach recommended by the curriculum (Digelidis et al., 2006), did not. The results did not show an improvement of intrinsic motivation in the IAAF Kids' Athletics group, regardless of the researchers' expectations. However, there was a significant decrease of intrinsic motivation in the control group.

It was expected prior to the intervention, that the students who carried out the IAAF Kids' Athletics would have a greater improvement in both types of autonomous motivation (intrinsic motivation and identified regulation) than those who practised track and field with the traditional teaching method. This is due to the differences between the two groups in the teaching strategy used (games approach method), as well as the nature and type of the lesson content dominating the teaching sessions in each group (Table 2).

The improvement of identified regulation is responsible for the students' development of a more self-determined type of motivation and it derived from their desire to learn and improve their track and field skills. According to Ryan and Deci (2000), students with higher levels of self-determined motivation are more likely to get involved in activities because they are fun (intrinsic motivation) and because they are important to them (identified regulation). This improvement is due to the different teaching approach used in the IAAF Kids' Athletics group. The games approach method with the use of various playful exercises and modified activities, and the gradual progression to more competitive modified games, created a teaching environment where students were free to explore and discover the required skills and finally realize their importance and usefulness. This pedagogical strategy increased the significance of learning track and field skills and regulated the student's motivation to a more autonomous (self-determined) direction. Perlman (2013) reported that the implementation

of a games centred approach version (Teaching Games for Understanding) in physical education creates an autonomy supportive context that facilitates the improvement of self-determined motivation. Jones et al. (2010) investigated the effects of the games approach method (Teaching Games for Understanding), which lies in contradiction to the repetitive skill teaching method, and found that it is positively associated with intrinsic motivation.

Unexpectedly, there was no improvement in enjoyment and interest in physical education after the intervention for both groups. Despite the extensive use of playful games and drills in the IAAF Kids' Athletics group, the students finally reported that they experienced enjoyment nearly as much as they did prior to the intervention. This could be attributed to the nature and the content of the track and field exercises and games, which do not include team games with a ball. The Greek athletic culture is connected with physical education, influencing the choices that the instructors make. Popular pedagogical games are more frequently taught at schools and students mostly enjoy playing team sports with a ball. Traditionally, most time is spent in learning and playing soccer, basketball and team handball. The continuous and extended use of track and field drills and games, without the use of this kind of sports, probably explains the absence of an improvement in interest and enjoyment during the experiment.

However, students who practiced the IAAF Kids' Athletics significantly increased their perceived effort during the sessions, indicating the importance of learning useful track and field skills. The teaching approach, the content of the IAAF Kids' Athletics teaching sessions, and the type of competition contributed to the development of a self-determined (autonomous) type of motivation in practicing and learning track and field. This type of motivation helped students to realize the importance of track and field and to put more effort during the teaching sessions. This is in agreement with several studies showing that self-determined types of motivation are positively associated with desirable consequences in students' effort, persistence and concentration in a variety of contexts, including physical education and sports (Ryan et al., 2000; Vallerand, 1997).

The study revealed a very strong effect of the IAAF Kids' Athletics program on the children's intention to continue practicing track and field. There are many studies suggesting that in a physical education setting, students with higher levels of self-determined motivation report a stronger intention to participate in optional physical education and organized sports in the future (Ntoumanis, 2001; Standage et al., 2003).

The Effect of IAAF Kids' Athletics on Physical Fitness and Event Performance

The intervention showed that teaching track and field with the IAAF Kids' Athletics program can help students (11-12 years old) to improve their physical fitness and event performance, more than the traditional repetitive skill teaching method. In specific, students who practiced the IAAF Kids' Athletics improved all physical fitness components, whereas those who practiced track and field with the traditional method did not. This could be explained with the variety of preparatory exercises and modified games, aiming at the improvement of track and field skills. These findings are in agreement with investigations which claim that providing children with a wide variety of drills and multi-sport activities can have a positive outcome on their physical fitness (Kirk, 2005; Pesce, Faigenbaum, Crova, Marchetti, & Bellucci, 2012). The biggest improvement was primarily found for speed and agility and secondarily for endurance and flexibility (figure 2). Speed and agility were directly affected by the implementation of the program. Endurance was indirectly affected by the improvement of the other physical fitness components, because the content of the exercises used, did not deliberately aim at improving it. Students from both groups improved their event performance in long jump and shot put. However, those practicing the IAAF Kids' Athletics were the only students who improved their performance in 50m sprint and single-handed overhead throw (javelin) (figure 3). The improvement in the skill teaching group was expected, because of the specific nature of the lessons' contents, which were dominated by special track and field exercises. The IAAF Kids' Athletics group however, improved in all events more than the skill teaching group and this could be explained by the students' significant improvement in physical fitness.

In terms of motivation and affect, the positive effect of IAAF Kids' Athletics on students' motivation to practice track and field, could explain the significant improvement in their physical fitness and event performance. As previously mentioned, the structure of the IAAF Kids' Athletics program helped students to improve the identified regulation, which eventually resulted to an increased desire to put more effort. This could have resulted in an improved physical fitness and performance in track and field. These indications agree with studies in physical education, suggesting that a higher self-determined profile is correlated with higher physical fitness measures (Mouratidis, et al., 2008; Shen, et al., 2009).

Conclusions

In conclusion the IAAF Kids' Athletics is more effective than the traditional track and field skill teaching method, in terms of improving the elementary students' physical fitness and event performance. This could be the result of developing a more self-determined motivational type. The first limitation of this study is that it focused on the effect of the program's structural design and its content on students' motivation. As a result we do not know the extent to which the teachers' personality, their involvement support, their affection, and the learning climate provided to their classes, influenced the results in motivation and affect. The second limitation is that we do not know to which extent maturation has influenced the students' improvement in physical fitness.

A study in the future could investigate the effect of such a program on autonomy support, on motivational climate, and class learning climate, comparing it at the same time with the traditional track and field teaching method and the regular physical education curriculum.

The objectives of physical education are the improvement of students' psychomotor abilities, their health related fitness, and their levels of physical activity. Within the framework of self-determination, these objectives can be achieved by developing more autonomous types of motivation. This particular study indicates that the IAAF Kids Athletics is an effective program which can be applied in physical education, providing physical educators with an additional means to improve the quality of their lesson. This is justified by the effect of the program on students' motivation and affect, as well as their intention to get involved and continue practicing sports in an organized context. At the same time the study highlights the effectiveness of a games centered method of teaching track and field, versus the traditional skill teaching style, in terms of motivating students' participation and increasing their desire to learn useful skills. In addition, it gives evidence of a greater improvement in health related fitness for students with a higher level of self-determined motivation in physical education.

References

- Chen, A. (2001). A theoretical conceptualization for motivation research in physical education: An integrated perspective. *Quest*, 53, 35-58.
- Council of European Committee for Development of Sport. (1988). *Eurofit: Handbook for the European test of physical fitness*. Rome, Italy: Edigraf Editoriale Grafica.
- Deci, E.L., & Ryan, R.M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.
- Deci, E.L., & Ryan, R.M. (2000). The 'what' and 'why' of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- Deen, M. (2015). *Games autonomy motivation & education: How autonomy-supportive game design may improve motivation to learn*. Eindhoven, Holland: Fontys University of Applied Sciences and Eindhoven University of Technology.
- Digelidis, N., Theodorakis, Y., Zetou, H., & Dimas, I. (2006). *Physical education 5th-6th grade of elementary school: Teachers' book* (Translation from Greek). Athens, Greece: Greek Ministry of Education.
- Goudas, M., Biddle, S., & Fox, K. (1994). Perceived locus of causality, goal orientations, and perceived competence in school education classes. *British Journal of Educational Psychology*, 64, 453-463.
- Goudas, M., Dermitzaki, I., & Bagiatis, K. (2000). Predictor of students' intrinsic motivation in school physical education. *European Journal of Psychology of Education*, 15, 271-280.
- Gozzol, C., Locatelli, E., Massin, D., & Wangenmann, B. (2002). *IAAF Kids' Athletics- A practical guide*. IAAF (International Association of Athletics Federation): Monaco. Retrieved from: www.iaaf.org/about-iaaf/documents/schoolyouth#iaaf-kids-youth-newsletter.
- Gozzol, C., Simonhamed, J., & Elhebil, A. M. (2006). *IAAF Kids' Athletics- Educational Cards*. IAAF (International Association of Athletics Federation): Monaco. Retrieved from: www.iaaf.org/about-iaaf/documents/schoolyouth#iaaf-kids-youth-newsletter.
- Jakovljevic, S.T., Karalejic, M.S., Pajic, Z.B., Macura, M.M., & Erculj, F.F. (2012). Speed and agility of 12 and 14 year-old elite male Basketball players. *Journal of Strength and Conditioning Research*, 26(9), 2453-2459.
- Jones, R., Marshall, S., & Peters, D. (2010). 'Can we play a game now? The intrinsic benefits of TGfU. *European Journal of Physical and Health Education*, 4(2), 57-63.
- Kenny, D.A., & La Voie, L. (1985). Separating individual and group effects. *Journal of Personality and Social Psychology*, 48, 339-348.
- Kirk, D. (2005). Physical education, youth sport and lifelong participation: The importance of early learning experiences. *European Physical Education Review*, 11, 239-255.
- Kirk, D., & MacPhail, A. (2002). Teaching games for understanding and situated learning: Rethinking the Bunker-Thorp model. *Journal of Teaching in Physical Education*, 21(2), 177-192.
- Leger, L.A., Mercier, D., Gaboury, C., & Lambert, J. (1988). The multistage 20-m shuttle run test for aerobic fitness. *Journal of Sports Science*, 6(2), 93-101.
- Malina, R.M., & Katzmarzyk, P.T. (2006). Physical activity and fitness in an international growth standard for preadolescent and adolescent children. *Food and Nutrition Bulletin*, 27(4), S295-S313.
- McAuley, E., Duncan, T., & Tammien, V. (1989). Psychometric properties of intrinsic motivation inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport*, 60, 48-58.
- Miller, A. (2015). Games centered approaches in teaching children & adolescents: Systematic review of associated student outcomes. *Journal of Teaching in Physical Education*, 34, 36-58.

- Mouratidis, A., Vansteenkiste, M., Lens, W., & Sideridis, G. (2008). The motivating role of positive feedback in sport and physical education: Evidence for a motivational model. *Journal of Sport & Exercise Psychology*, 30, 240-268.
- Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *British Journal of Educational Psychology*, 71, 225-242.
- Pauole, K., Madole, K., Garhammer, J., Lacourse, M., & Rozenek, R. (2000). Reliability and validity of the T-test as a measure of agility, leg power, and leg speed in college-aged men and women. *Journal of Strength and Conditioning Research*, 14, 443-450.
- Papaioannou, A., & McDonald, A.I. (1993). Goal perspectives and purposes of physical education as perceived by Greek adolescents. *Physical Education Review*, 16, 41-48.
- Papaioannou, A., & Theodorakis, Y. (1996). A test of three models for the prediction of intention for participation in physical education lessons. *International Journal of Sport Psychology*, 27, 383-399.
- Pelletier, L.G., Fortier, M.S., Vallerand, R.J., Tuson, K.M., Briere, N.M., & Blais, M.R. (1995). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The sport motivation scale (SMS). *Journal of Sport and Exercise Psychology*, 17, 35-53.
- Perlman, D. (2013). Manipulation of the self-determined learning environment on student motivation and affect within secondary physical education. *The Physical Educator*, 70 (4), 413-428.
- Pesce, C., Faigenbaum, A., Crova, C., Marchetti, R., & Bellucci, M. (2012). Benefits of multi-sports physical education in the elementary school context. *Health Education Journal*, 72(3), 326-336.
- Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding socio-cultural influences on student motivation. In S. Van Etten & M. Pressley (Eds.) *Big theories revisited* (pp. 31-60). Greenwich, CT: Information Age Press.
- Ryan, R.M., & Deci, E.L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54-67.
- Seminick, D. (1990). The T-test. *National Strength and Conditioning Association Journal*, 12, 36-37.
- Shen, B., McCaughy, N., Martin, J., & Fahlman, M. (2009). Effects of teacher autonomy support and students' autonomous motivation on learning in physical education. *Research Quarterly for Exercise and Sport*, 80(1), 44-53.
- Standage, M., Duda, J.L., & Ntoumanis, N. (2003). A model of contextual motivation in physical education: Using constructs from self-determination and achievement goal theories to predict physical activity intentions. *Journal of Educational Psychology*, 95, 97-110.
- Standage, M., Duda, J.L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational Psychology*, 75, 411-433.
- Vallerand, R.J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M.P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 29, pp. 271-360). NY: Academic Press.
- Wilson, P.M., Sabiston, C.M., Mack, D.E., & Blanchard, C.M. (2012). On the nature and function of scoring protocols used in exercise motivation research: An empirical study of the behavioral regulation in exercise questionnaire. *Psychology of Sport and Exercise*, 13, 61