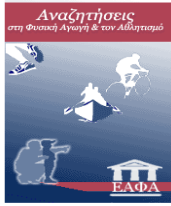


## Research



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### **“After School Exercise”: A Program to Promote Students Physical Activity III. Students’ Knowledge Development (Short version of a Greek article)**

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#### **Abstract**

The study aimed at examining students' knowledge of (a) setting goals and making plans for participating in physical activity (PA), (b) the benefits of exercise in health, and (c) activities that can be described as physical. Participants were 223 students who completed the relevant content of the student's workbook. Descriptive analyses were performed to analyze the data. Results showed that 49.1% and 44.9% of students set correct performance goals for strengthening abdominal and dorsal muscles respectively. Students' majority (61.2%, 58.4%, and 59.9%) effectively set a plan for achieving the goals in three times period when implementing the program. Finally, the results revealed that the majority of students have effectively learned the benefits of exercise for the human body as well as identifying the activities described as physical. Arguably, it can be stressed that the program was effective. However, since learning is a slow and long process it would be useful for programs such as “After School Exercise” to be incorporated into the curriculum of the physical education (PE) in elementary school in order to make them even more effective.

Keywords: *knowledge, goal setting, goal plan, physical education, benefits of exercise*

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## Introduction

Learning in the PE domain aims to develop students' cognitive skills, psychomotor skills, and emotional characteristics (Kirk et al., 2006). Students' cognitive development has increasingly attracted researchers and curriculum designers in recent decades. Especially, in the recent period, a significant number of researchers are focusing on the development of physical literacy. The term includes several characteristics such as motivation, confidence, physical fitness, cognitive development that individuals need to develop in order to maintain a satisfactory level of PA for life (Whitehead, 2010). Similarly, the Greek curriculum for PE in the early '90s (Ministry of Education) states that students' cognitive ability is one of the competencies that students should develop in this domain. Researchers (Gallahue & Donnelly, 2007) have also emphasized that the goal of PE should be the promotion of students' learning to move effectively as well as learning through movement. In the same vein, researchers (Ennis, 2007; Rink, 2005) argued that the integration of physical and cognitive tasks in PE is an effective strategy to facilitate students' cognitive learning.

Additionally, learning should incorporate learning tasks that require students to develop deeper cognitive information-processing skills that are likely to enhance their learning. An array of personal, educational, social and cultural factors influence the learning process and contribute to the enrichment or reconstruction of students' existing cognitive structures in a particular cognitive domain (Vosniadou, 2007). Bearing in mind the above, the program "After School Exercise" which included not only activities that promote physical fitness (e.g., endurance, strength, etc.) but a range of cognitive information (e.g., setting goals or the health benefits of exercise) aimed at promoting their participation in PA by providing them with the cognitive skills to design a simple exercise plan.

### *Goal-setting theory*

Aristotle was the first philosopher who stated that each person's action aims to achieve a goal that they consider to be good (Ethics Nicomachia, 1904a). Centuries later, Locke (1967) articulated the goal setting theory. According to this theory, the goal set by a person triggers a series of actions aimed at achieving that goal (Locke & Latham, 2002). When a person set a goal that shares the following characteristics (important, specific and difficult) then this person maximizes their effort in order to achieve this goal. According to Locke and Latham (2002) goals can contribute to maximizing performance when: (a) focus a person's effort and attention on goal-related activities rather than on irrelevant activities; (b) are challenging and enable the person to exert more effort; (c) influence the persistence of the person to achieve the goal; and (d) influence a person's effort to adopt strategies and knowledge relevant to the goal.

Three types of goals have been identified (process, performance, and outcome). Process goals refer to the strategies or behaviours a person adopts during the task (Hardy & Jones, 1994). At this point, it should be clarified that the process goals in this study refer to the behaviours students adopt in order to achieve a goal and resembles the plan of achieving a performance goal (e.g., doing three sets of ten push-ups on a Thursday afternoon after reading). Performance goals, on the other hand, refer to goals accomplishment or failure and emphasize personal improvement based on personal criteria (Hardy & Jones, 1994; Kingston & Hardy, 1997). An example of a performance goal is a person's goal to improve his performance on push-ups from 10 to 13 repetitions after one month. Finally, outcome goals ultimately emphasize the result of performance involving social comparison (Kingston & Hardy, 1997). For example, a persons' goal to outperform his/her classmates in the push-ups test.

Goal-setting theory has been widely applied in the work setting (Locke & Latham, 1990). Researchers (Doran, 1981; Hersey & Blanchard, 1988) based on the goal-setting theory formulated the acronym S.M.A.R.T. where they attribute specific characteristics to the goals (Specific, Measurable, Attainable, Realistic and Time-based) in order to be effective. Goal setting is a promising theory for altering a person's behaviour (Shilts et al., 2004). Researchers (Epton et al., 2017) concluded that the implementation of goal-setting theory in an intervention is more effective when a person sets face to face, publicly a difficult goal and the goal communicated to others. Additionally, is more effective when a third person monitors the behaviour or the outcome of the performance without providing feedback.

Researchers (e.g., Lonsdale et al., 2013) suggested that PE is the ideal environment for teaching strategies such as goal setting, self-assessment, and self-monitoring. Goal-setting theory has been applied in the PE context with positive results. For example, it has positive effects on students' development of social responsibility (Brunelle et al., 2007). Additionally, the implementation of goal setting in combination with the self-monitoring pro-

cess has helped students to improve their performance in the PACER test (aerobic capacity) (McDonald & Trost, 2015). While three consecutive studies have shown that applying goal setting in combination with problem-solving strategies and positive thinking has led students to improve their basic physical qualities (e.g., flexibility, strength) (Goudas et al., 2006) volleyball skills (e.g., finger passes) (Papacharisis et al., 2005) and basketball skills (e.g., ball handling) (Goudas & Giannoudis, 2008). Furthermore, the above interventions have been effective both in improving students' knowledge of the implementation of the goal-setting theory.

The adoption of goal setting theory can lead to positive results in many contexts. For example, researchers (Epton et al., 2017) point out that goal-setting theory has proven to be effective in adopting or improving health-related behaviours, sport skills, and cognitive learning. Similarly, the findings of a cross-sectional study (Pearson, 2012) showed that the implementation of goal-setting theory has a positive impact on health-related behaviours such as weight loss and body mass index, reduction in food and beverage consumption, and increase in energy expenditure. Finally, the findings of studies (Burns et al., 2017; Gu, Chen et al., 2018) have shown that applying goal setting theory can effectively increase students' participation in PE.

Several studies (Dermitzaki et al., 2006; Goudas et al., 2006; Goudas & Giannoudis, 2008; Papacharisis et al., 2005) examined students' knowledge of goal setting theory through the use of knowledge test and found that the participants in the intervention group of the program understood better the basic principles of goal setting than the participants in the control group. It is worth noting, that in this study, the examination of students' knowledge related to goal setting and making plans for participating in PA evaluated through cognitive assignments. More specifically, students were asked to set a performance plan in three times period during the implementation of the program. The use of cognitive assignments according to some researchers (Wang et al., 2019) better reflects the learning process and the students' knowledge development compared to the knowledge tests that are a snapshot of students' knowledge representations. On the contrary, it can be argued that cognitive assignment requires students to not simply recall from their memory and reproduce known knowledge but to convert the theory into practice. To the best of our knowledge, there is no study so far which has adopted cognitive assignments to evaluate students' knowledge in the aforementioned subject.

### *The purpose of the study*

The purpose of the present study was to examine the knowledge of the goal-setting theory of the students attending the "After School Exercise" program. An additional goal was to investigate their knowledge about the health benefits of PA and identify their ability to describe the activities that can be characterized as PA.

## **Methods**

The present study was implemented in the context of "After Scholl Exercise" program. The program is described in the manuscript Syrmpas and his colleagues (2020, in this issue). Students provided a consent form. The research took place with the approval of the Ministry of Education and Ethics Committee of the University of Thessaly

### *Participants*

Two hundred twenty-three students fill in the assignment in the student's workbook and thus participated in the study. During the program implementation, PE teachers have on their possession student's workbook and they distribute to their students each time that the lesson plan required it. At the end of each lesson, the students' workbooks were returned to the teachers. At the end of the program, teachers sent the workbooks to the researchers to analyze the information contained therein.

### *The educational material*

The program and the educational material described in a previous manuscript (Syrmpas et al., 2020 in this issue). The educational material was incorporated in the student's workbook and teacher's textbook and contained information on self-regulated learning strategies such as process and performance goals, self-recording, self-evaluation and causal attribution. It also contained information on what fitness and PA are and the health benefits of exercise.

### *Students' knowledge of goal setting*

The examination of students' knowledge of the content of the program was based on their responses to specific assignments in the student's workbook. In this way, the authors of the present manuscript and researchers (Wang et al., 2019) believe that they would be able to examine more thoroughly students' knowledge development than with a standardized knowledge test. More specifically, students' responses to an assignment that they have to set performance goals in the fifth lesson to improve abdominal and dorsal strength were evaluated. For example, a student that was able to perform 15 repetitions in a sit-up test in 30 seconds and set as his goal to perform 18 sit-ups after two months was perceived as correct.

Students' responses to set process goals or an achievement plan were also evaluated. More specifically, during the implementation of the program students were asked twice to design a plan for the following week that would include activities and goals to practice their flexibility and arms strength. Similarly, they were asked to set an achievement plan to improve their physical fitness. For example, as correct was perceived a student's response: "Tuesday and Friday I will perform two (2) sets of push-ups from eight (8) repetitions in the afternoon after reading".

### *Students' knowledge of the health benefits of PA*

A questionnaire containing dichotomous questions was used to examine students' knowledge of the health benefits of PA. For example, students had to answer "yes" or "no" to the question "... Exercise helps: strengthens the human immune system against diseases". The set of questions is presented in Table 1.

### *Students' knowledge of the PA*

A questionnaire containing several activities that students should identify as physical or not was used in order to examine students' knowledge of the PA. For example, students had to answer "yes" or "no" to the question "Which of the following activities can be characterized as a PA" in a set of activities such as "dusting, wiping and tidying up the room". The set of questions is presented in Table 2.

### *Coding of responses*

Prior to data analysis, students' responses related to setting performance goals were coded as correct or false. For example, a performance goal was considered correct when it was 20 - 40% higher than the performance in the first test. This choice was based on findings from previous studies (e.g., Theodorakis et al., 2001) which argue that goals that are higher by 20 - 40% of initial performance are more effective.

Students' ability to set process goals was assessed based on whether students used specific principles of goal-setting theory. More specifically, in the case that students adopted the five principles of goal setting (goals specific, measurable, activity-related, realistic and time-bound) then their goal was considered correct. The following example of a process goal set by a student aimed at improving his arms strength "On Thursday I will do one (1) set of 10 push-ups after reading" was considered correct because the goal included the aforementioned five principles. Similarly, correct was considered the following goal "walking for 15 minutes in the afternoon going to the school and 15 minutes walking from the school". On the contrary, the following goals "I will ride my bike for a 1 hour on Saturday" and "I will run 60 minutes with my father" were considered false because they did not include specific time-bound.

Additionally, students' knowledge of the health benefits of PA evaluated based on which extend they are aware or not of these benefits. Finally, students' knowledge of PA evaluated based on which extend they could identify from an array of activities that could be described as PA.

## **Results**

The descriptive analysis of the data shows that 49.1% (N = 106) of students set correct performance goals for increasing the strength of their abdominal muscles because they were higher by 20 to 40% of their initial performance. On the contrary, 50.9% (N = 110) of students set goals that were not within that range and therefore were false. The results also show that 76.7% (N = 166) of students achieved their goal as opposed to 23% (N = 50) of students who did not achieve their goal. The analysis of performance goals set by the students to strengthen their dorsal muscles showed that 44.9% (N = 97) set correct goals and 55.1% (N = 119) false goals. However, 78.5% (N = 170) of students achieved their goals as opposed to 21.5% (N = 46) who failed. It may sound paradox-

ical that the majority of students achieved their goals although they set false goals. A rational explanation for this could be that the majority of students that set false goals they set goals that were below the 20% range and therefore achievable.

Additionally, the descriptive analysis of the data shows that in the eighth lesson, 61.2% (N = 109) of the students set process goals (aimed at increasing the strength and flexibility of their arms) that are aligned with the S.M.A.R.T. acronym and thus are correct while 38.8% (N = 69) of the students set process goals that are false. Almost similar were the percentages of students who set process goals in the twelfth lesson. More specifically, 58.4% (N = 104) of the students set correct goals while 41.6% (N = 74) set false goals. Finally, in the fifteenth lesson, 59.9% (N = 106) of the students set correct process goals to improve their fitness compared to 40.1% (N = 71) who set false goals. It can be concluded that in the eighth lesson students were more effective in setting process goals.

The descriptive analysis of students' responses to the health benefits of PA shows that the majority of students were aware of the benefits of PA. For example, 92.4% (N = 196) of them reported that they knew that "physical activity helps increases muscle strength, stamina, and flexibility". Only in two cases, the majority of students report that they did not know those specific benefits. More specifically, 55.5% (N = 117) reported that they did not know that "physical activity reduces the risk of metabolic and neurological disorders". Similarly, 53.1% (N = 113) did not know that "physical activity helps to the control of diseases such as hypertension, diabetes, and osteoporosis". The descriptive statistics are presented below in Table 1.

**Table 1.** Percentage of positive and negative of students' responses to health benefits of physical activity.

N/A	Question	Percentage of positive responses (%)	Percentage of negative responses (%)
	Physical activity:		
1.	Strengths the immune system	73.9	26.1
2.	Reduces the risk of heart diseases	73.9	26.1
3.	Reduces the risk of respiratory diseases	71.1	28.9
4.	Reduces the risk of metabolic and neurological disorders	44.5	55.5
5.	Reduces the risk of injury to bones and muscles	82.5	17.5
6.	Helps to avoid back pain	68.7	31.3
7.	Helps to control body weight and thus obesity	82.9	17.1
8.	Reduce the risk of diseases hypertension, diabetes, and osteoporosis	46.9	53.1
9.	Improves academic performance	70.6	29.4
10.	Improves academic performance	75.4	24.6
11.	Helps to feel less tired	89.1	10.9
12.	Increases muscle strength, stamina, and flexibility	92.4	7.6
13.	Prevents the adoption of unhealthy habits such as smoking, alcohol, and drugs	84.4	15.6

Finally, students' response shows that the majority of them were able to identify the different types of PA. However, 51.1% of students continued to be unaware that "Dusting, wiping and tidying the room" represents a light type of PA. Interestingly, 32.6% of students and 23.4% cannot identify that light walking and skateboarding respectively are types of PA.

**Table 2.** Percentage of positive and negative of students' responses to identify the activities that can be categorized as PA.

N/A	Question	Percentage of positive responses (%)	Percentage of negative responses (%)
	Which of the following activities can be classified as physical activity?		
1.	Dusting, wiping and tidying the room	48.9	51.1
2.	General household tasks	59.8	40.2
3.	Playing with your friend in the neighbourhood	96.2	3.8
4.	Active participation in physical education	90.8	9.2
5.	Track and field (running, jumping, and throwing)	96.7	3.2

6. Playing desktop/tablet' mobile phone games	4.9	95.1
7. Running	97.8	2.2
8. Basketball	B	4.3
9. Jump rope	94.6	5.4
10. Aerobic	92.4	7.6
11. Swimming	96.7	3.3
12. Cycling	97.8	2.2
13. Dance (Ballet, Folk dance)	86.4	13.6
14. Talking with friends	9.8	90.2
15. Light walking	67.4	32.6
16. Martial arts	89.7	10.3
17. Racket sports (e.g., tennis, table tennis, badminton)	93.5	6.5
18. Playing games with your friends (e.g., tag, blind man's bluff)	85.9	14.1
19. Scateboarding	76.6	23.4
20. Volleyball	96.2	3.8
21. Handball	94.0	6.0
22. Doing your homework	6.5	93.6
23. <i>Rhythmic gymnastics</i>	93.5	6.5
24. Watching tv	6.0	94.0
25. Gymnastics	95.7	4.3
26. Climbing the stairs	91.3	8.7
27. Walking or biking to school	98.4	1.6

## Discussion

The purpose of the present study was to examine students' knowledge development on goal setting theory and their knowledge about the health benefits of PA and what activities can be characterized as PA. The results of the present study showed that the majority of students were aware of the principles of goal setting theory (performance and process goals). It can, therefore, be argued that the program was effective in teaching students to set effective goals. A rational explanation for the fact that several students did not learn how to set effective goals could be that learning is a slow, gradual, and long-term process (Vosniadou, 1999) and therefore more time is needed than what allocated to this program in order students learn effectively the principles of goal-setting theory. Of course, one can argue that although the time was limited the program was effective for the majority of students. An explanation according to cognitive psychology could be that the cognitive process is influenced by personal expectations based on experience and prior knowledge (Vosniadou, 1996). Similarly, scholars guided from the principles of constructivism argue that the student's social environment, cultural factors, and learners' personality facilitate or constrain the learning process. Arguably, it can be assumed that some of the aforementioned factors influence these students that did not learn effectively the principles of goal setting.

Although, a significant number of studies have used the goal-setting theory in the PE context a limited number of them examined whether participants learn this theory in order to apply it effectively. Previous studies (Dermitzaki et al., 2006; Goudas et al., 2005; Goudas & Giannoudis, 2008; Papacharisis et al., 2005) examined students' knowledge of the goal-setting theory by using knowledge tests. The findings suggested that students who participated in the program and taught the principles of goal setting improved their knowledge. They also performed better than their classmates in the control group did. Although, there is no assessment of students' knowledge before and after the end of the program; a benefit that a knowledge test can provide, it can be argued that the design of this study provides to the researchers the benefit to examine students' knowledge development throughout the program. More specifically, the basic principles of goal setting were delivered to the students in the fifth lesson and they set performance goals in this lesson. Additionally, they set process goals by designing an achievement plan in the eighth, twelfth and fifteenth lessons. Therefore, students' responses to these specific tasks can reveal whether and to what extent students have learned to set goals effectively as study progress. Based on the specific findings it can be concluded that the higher percentage of students set more effective process goals in the eighth lesson than in the next two. This finding may be expected since the students

had been recently taught how to set goals (just before three lessons) as opposed to the goals they had set in the fifteenth lesson where a much longer period had elapsed. Therefore, it can be said that the latter measurement can also be considered as evidence of the students' retention of knowledge.

Researchers (Zakarian et al., 1994) have argued that informing and raising students' awareness of the benefits of PA significantly influence their motivation to engage in PA. Students' responses revealed that the vast majority of them learned the benefits of PA in the human body. Therefore, it can be said that one of the objectives of the program, which was to raise students' awareness regarding the benefits of PA, was achieved. Of course, this may not be the case for students who did not know all the benefits of PA but this cannot call into question the effectiveness of the program. Moreover, the results of previous research (Syrmpas & Goudas, 2020, in this issue) show that students reported that they increased the time they spent on PA. Arguably, it can be said that their knowledge of the benefits of PA was a factor that influenced students' motivation to participate in PA, in a combination of course with other strategies included in the program. This assumption is confirmed by the findings of previous studies (Chen et al., 2017; Wang, & Chen, 2020) which indicated that students' health-related knowledge effectively contributes to their participation in out of school PA.

In conclusion, the findings of the present study indicated that the program was effective and helped students gain knowledge useful for their daily lives. This conclusion is mainly because the majority of students who attended the program learned to set effective goals to increase their participation in PA. The findings also show that students were aware of the health benefits of PA and they were able to identify the activities that can be described as PA.

### **Limitation**

This research was conducted in a specific geographical area and although participants attempted to cover representative characteristics of the students, likely, the students' cognitive background and the social and cultural factors may differ in other areas of Greece. Besides, the conclusion that pupils learned to set effective goals is based on assignments that they were asked to complete after their introduction to the relevant theory thus it is not clear whether the pupils who set the correct goals had prior knowledge that helped them to be effective. Future research with a larger and more representative number of participants as well as the use of pre and post knowledge tests and assignments will lead to a more objective assessment of students' knowledge of goal setting and therefore program effectiveness.

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