LIFESTYLE AND PHYSICAL ACTIVITY PATTERNS OF GREEK CHILDREN: THE APPLICABILITY OF A SCHOOL BASED INTERVENTION PROGRAMME

by

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ABSTRACT

The promotion of an active lifestyle has become a priority in Western societies and school plays a dominant role. The primary objectives of this thesis were i) to examine the lifestyle and physical activity (PA) patterns of a sample of Greek children and ii) to examine the applicability of a school based intervention programme in promoting PA and sport participation.

For the purposes of this study the *Physical Activity and Lifestyle Questionnaire* (PALQ) was developed and examined for its validity and reliability to assess habitual PA of Greek students. Afterwards, a *need analysis* was carried out in a) a cross sectional sample of 911 students from an urban area (11, 14 and 17 years olds, b) 103 elementary and secondary PE teachers, and c) 17 schools. The *students* answered the PALQ in order to depict a profile of their lifestyle and PA patterns. The *teachers* answered a questionnaire in order to evaluate their knowledge, attitudes and self-efficacy towards teaching health related exercise (HRE). A checklist has been used in order to establish the nature and extent of PA promotion in a sample of elementary and secondary schools. The results showed that: a) a large proportion of students adopted a sedentary lifestyle and were inadequately active to obtain health benefits, b) teachers' had limited ability in promoting effectively HR issues, and c) schools provided limited sport programmes and facilities. The overall finding of the *need analysis* justified the need for intervention and advocated the adoption of an ecological approach to promote PA.

Based on the *Active School* initiative (Almond & McGeorge, 1995), a school based intervention programme has been set up in order to a) promote students' participation in physical activity and sport and to enhance their knowledge on health related (HR) issues, b) increase teachers' knowledge and effectiveness on teaching HR exercise. The *decisions* about the intervention contents and priorities were based on the findings of the need analysis taking into consideration the cost and the resources. The *intervention strategy* and the *implementation process* focused on: a) the teachers' training, b) the creation and the provision of the necessary resources (PE curriculum, a handbook and a CD-Rom for the teachers and two books for the students), c) the

creation of a positive and enjoyable learning PE environment, and d) the co-operation between school and out of school health and sport alliances.

The *intervention programme* was applied in 9 elementary and 5 secondary schools for a period of six months and involved 15 PE teachers. A quasi-experimental design with a control group was applied (experimental group N_1=699 and control group N_2=213). A number of different parameters were estimated at the beginning, during and at the end of the program. The intervention process was *monitored* on a weekly basis by the author and the school teachers. The *effectiveness* of the intervention was evaluated in terms of: a) students' behaviour, fitness, self-efficacy, intrinsic motivation, intentions, and attitudes related to PA, b) teachers' knowledge, attitudes and self-efficacy on teaching HR issues, and c) the broader impact of the programme on the school ethos. The intervention implementation and effectiveness was also assessed by an external evaluator.

The overall purpose of the intervention was to examine the applicability of promoting PA throughout school environment by creating an innovative and realistic framework for school physical education lesson. The findings of this thesis were very encouraging. Significant differences have been observed in most of the evaluated variables both, for students (fitness, attitudes, self-efficacy, PA level), for teachers (knowledge) and schools' ethos. However, this pioneer study revealed a number of key considerations and issues in designing intervention programmes to promote PA throughout schools in urban areas.

Key words: lifestyle, physical activity, questionnaire, intervention, school, Greece

DEDICATION

To my wife Fani and to my children George and Glykeria

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PRESENTATIONS AND PUBLICATIONS

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Avgerinos, A., Papaharisis, V., & Goudas, M. (in press). The importance of physical education teachers' training in health related programmes. *Contemporary Education.*

Awards

The poster presentation entitled "Sport Education and Health: The frame of a school intervention programme" (by Avgerinos, A. Almond, L., Tzetzis, G., & Kioumourtzoglou, E.) which presented in the Pre-Olympic Congress Pre-Olympic Congress, International Congress on Sport Science, Sports Medicine and Physical Activity in Brisbane of Australia (2000) was honoured from the scientific committee for excellence in the field of pedagogy.

Educational resources and materials

Throughout this study a number of educational materials had been produced that can be used in promoting health related exercise in the school environment. Some of these materials are already used in a number of schools:

1. A multi-media application (CD-ROM) was created to introduce teachers to the area of health related exercise.
2. A multi-media application (CD-ROM) and a Video-tape were created to inform teachers, students and parents about the key-objectives and components of the intervention programme named "Sport Education and Health".
3. A resource package for physical education teachers in order to help them in establishing a realistic health policy within the school, in planning quality lesson plans and creating effective ideas to promote an active lifestyle among students.
4. A *Student Book* in order to motivate children to know how their bodies work by offering step-by-step knowledge and practical experience.

A part of these resources are presented online on http://www.pe.auth.gr

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GLOSSARY OF TERMS

Key terms used in this thesis:

Determinants of Physical Activity	Reflect the factors that affect, or are thought to affect, participation in exercise and physical activity (Biddle and Mutrie, 2001).
Exercise	Planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness (Caspersen, Powell and Christensen, 1985).
Extra-curricular sport	Is sport organized by the school but out of school lesson time (for example, a school trip, at the weekends or a school club after school).
Health	The World Health Organization has defined *health* as: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). More recently it has been seen more broadly as a resource for everyday life, not the objective of living; and a positive concept emphasizing social and personal recourses, as well as physical capacities (WHO, 1986).
Health related exercise	The term health-related exercise is defined as the knowledge, understanding, skills and attitudes associated with positive health and well-being through short- and long-term participation in physical activity.
Health related fitness components	a. Cardiorespiratory endurance (or aerobic fitness), b. Muscular endurance, c. Muscular strength, d. Body composition, e. Flexibility (Caspersen, Powell and Christensen, 1985).
Intervention research	Research that investigates the treatments that effect changes in physical activity and sedentary behaviors. Experimental study designs that include either treatment and control groups or evaluation of a group that serves as its own control are most appropriate (Fulton, Burgeson, Perry, sherry, Galuska, Alexander, Wechsher and Caspersen, 2001).
Lifestyle	Lifestyle is understood as relatively stable patterns of behaviour, habits, attitudes and values which are typical for groups one belongs to, or the groups one wants to belong to (Veal, 1993).
Moderate intensity physical activity	Activity usually equivalent to brisk walking, which might be expected to leave the participant feeling warm and slightly out of breath. Such activity is often defined as activities within the 3 to 6

	METs (multiples of resting metabolic rate) range (DHHS, 1996).
Physical Activity	Any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen, Powell and Christensen, 1985).
Physical education	The part of the school curriculum that aims to educate young people through physical activity. An important aim is to promote the adoption of a physically active lifestyle that persists through adulthood.
Physical fitness	A set of attributes that people have or achieve that relates to the ability to perform physical activity (Caspersen, Powell and Christensen, 1985).
Recommendations for young people and physical activity	In this thesis the U.K. recommendations for young people and physical activity were adopted, namely: a) All young people should participate in physical activity of at least moderate intensity for 1 hour per day, and b) At least twice a week, some of these activities should help to enhance and maintain muscular strength and flexibility, and bone health (Cavill, Biddle and Sallis, 2001).
Reliability	Is the consistency with which a test or an observer measures what is intended to be measured and the extent to which the measurements are repeatable (Baumgartner and Jackson, 1982). In this thesis, the term reliability refers to the consistency of scores or measures. It is differentiated between test-retest reliability (the reliability of a score measured two or more times) and inter-instrument reliability (between two or more instruments).
Sport	Is defined to include sport done both in school and out of school; and in formal and informal participation.
Sport clubs outside school	Include all clubs not organized by the school, including informal clubs run by leisure centers, with the exception of youth clubs or social clubs.
Validity	Validity is the degree to which an instrument measures what it is intended to measure (Nunnally, 1967).
Vigorous intensity physical activity	Activity usually equivalent to at least slow jogging, which might be expected to leave the participant feeling out of breath and sweaty (6 METs and above) (DHHS, 1996).
Young people	People aged 5-18 years.

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LIST OF ABBREVIATIONS

ACSM	American College of Sports Medicine
ANOVA	Analysis of Variance
BMI	Body Mass Index
CHD	Cardiovascular Heart Disease
CSA	Computer Science and Applications
FITT	Frequency - Intensity – Time- Type of PA
HRE	Health Related Exercise
HRPE	Health Related Physical Education
IMI	Intrinsic Motivation Inventory
KMO	The Kaiser-Meyer-Olkin measure
MANOVA	Multi Analysis of Variance
MET	Metabolic equivalent
MVPA	Moderate to Vigorous Physical Activity
PA	Physical Activity
PALQ	Physical Activity and Lifestyle Questionnaire
PE	Physical Education
SD	Standard Deviation
SEH	Sport Education & Health
VPA	Vigorous Physical Activity
WHO	World Health Organization

1.0 Introduction

1.1 Background – Statement of the problem

The examination of the youth lifestyle and the attempts to influence it is a high priority matter for the health and education authorities (Baranowski, Anderson and Carmack, 1998; Johnson and Deshpande, 2000; HEA, 1997; USDHHS, 2000a). The concept of lifestyle for every person is a relatively stable model consisting of individualized behaviours, habits, attitudes and values that can affect his/her health (Veal, 1993). Its formulation begins from early childhood with the dynamic interaction between persons' individual characteristics and the influence of the environment (Bouchard, Shepherd and Stephens, 1994). Physical activity (PA) is one of the most important components of the lifestyle of young people since it is directly related to a number of physical and psychological benefits (Sallis and Owen, 1999).

The lifestyle and PA are of particular interest for childhood and adolescence from the point of social and psychological development of the young people and also from the point of physical health (Berger, 1996). A strong relation between PA and health related indicators have already been observed since childhood. Physical activity may influence the health of young people in two ways. Firstly, PA could affect causes of morbidity during youth such as reducing weight gain and preventing obesity (Baranowski, Mendlein, Resnicow, Frank, Cullen and Baranowski, 2000), reducing psychological stress (Mutrie and Parfitt, 1998) and enhancing athletic performance. Secondly, PA during youth could reduce the risk for chronic diseases in adulthood (Twisk, 2001). Furthermore, the adoption of an active lifestyle in childhood acquires a particular importance since there is some evidence that the active behavior remains throughout adulthood (Malina, 1996; Janz, Dawson and Mohoney, 1999; Telama, Yang, Laakso and Vikari, 1997). This fact indicates that encouraging young people towards an active and healthy lifestyle promotes the future health of the adult population (Telama, 1998).

During the last decade a number of experts proposed guidelines for young people's PA level, and there is continuing debate over the amount and types of PA needed for health benefits (Twisk, 2001). Recommendations tend to encourage young people to

accumulate from 30 to 60 min.day^{-1} moderate intensity PA (Cavill, Biddle and Sallis, 2001), up to several hours per day (Andersen, Crespo, Bartlett, Cheskin and Pratt, 1998). Despite this controversy, the dominant notion is that a large number of children and teenagers do not engage in PA enough to attain optimum health (Armstrong and Welsman, 1997; Biddle and Goudas, 1996; Pratt, Macera and Blanton, 1999).

The involvement of youths in PA and sport is dramatically decreased throughout school years by up to 50-75% between the ages of 6-18 years (Rowland, 1991). Puberty is characterized by a more intense cutback on physical activity (Caspersen, Merritt and Stephens, 1994; Kimm et al, 2000), especially for the girls (Michaud, Narring, Cauderay and Cavadini, 1999). Sallis (1993) estimated that during puberty girls reduced their PA level by 7.4% per year compared with 2.7% for boys. These findings support the implementation of interventions to promote PA and to decrease sedentary behaviours for the population of the majority of the Western developed countries (Dunn, Andersen and Jakicic, 1998; Epstein and Roemmich, 2001).

The understanding of the mechanisms and the factors influencing PA behaviour is a fundamental condition for every successful intervention programme targeted at young people (DCD, 1998); research in this field – that is often called *determinants of PA* – revealed a number of variables that can affect the behaviour. The variables that influence the involvement of youths in physical activity and sports consist of both the biological characteristics and the psychological profile of the individual and the variables that are related to the environment in which she/he lives (Kohl and Hobbs, 1998; Sallis, Prochaska and Taylor, 2000). Gender and age seem to be the two basic biological variables related to the degree of involvement in physical activity (Sallis, Buono, Roby, Miracle and Nealson, 1993; Sallis and Owen, 1999), while the physiological and psychological determinants related to sports involvement have been investigated to some extent (Trost, Pate, Saundenrs, Ward, Dowda and Felton, 1997; Stuckey-Ropp and Dilorenzo, 1993; Craig, Goldberg and Dietz, 1996; Papaioannou, 1997). Less emphasis has been placed on the environmental factors that are related to physical activity and the influence of the contemporary living conditions to the lifestyle of young people. Studies have demonstrated that the environmental variables such as the access to sports infrastructure and programmes (Mason, 1995), the social-

cultural characteristics and ethnicity (Lindquist, Reynolds and Goran, 1999; Vilhjalmssona and Thorolfur, 1998; Steptoe, Wardle, Fuller, Holte, Justo, Sanderman and Wichstrom, 1997), the involvement in sedentary recreational activities (Cheung, 1995), the parental support (Taylor, Baranowski and Sallis, 1994) and the free time available for playing outdoors (Baranowski, Thompson, DuRant, Baranowski and Phul, 1993) limit children's involvement in physical activity. Generally, it seems that the wider environment exerts a strong influence on the PA of young people. However, many scientists highlight the need for more research in this area identifying consistent determinants of PA among young people in order to maximize the effectiveness of intervention programmes (Linquist, Reynolds and Goran, 1999; Trost, Pate, Saunders, Ward, Dowda and Felton, 1997; Sallis, Prochaska and Taylor, 2000).

The findings from the research on the determinants of PA have lead to the formulation of a number of theories and models for motivating young people to be physically active. These theories, frequently stressed the role of PA enjoyment, the perceived competence, and social support by parents, peers and teachers (Sallis, Prochaska and Taylor, 2000). A criticism of most theories and models of behaviour change towards a more active lifestyle is that they emphasize individual behaviour change processes and pay little attention to socio-cultural and physical environmental influence on behaviour (Mc Kenzie, 2001). Last decade, interest has been developed in ecological approaches to increasing participation in PA (Stokols, 1992). The ecological theory place the creation of supportive environments on a par with the development of personal skills and the reorientation of health services (Sallis, Bauman and Pratt, 1998). McKenzie (2001) suggests that ecological approaches to modifying youth PA are viable methods because large numbers of children frequently congregate within particular settings (e.g. schools) and they can be affected at one time. An underlying theme of ecological perspectives is that the most effective interventions occur on multiple levels. For example, McLeroy and colleagues (1988) have proposed a model that encompasses several levels of influences on health behaviours: intrapersonal factors, interpersonal factors, community factors, and public policy.

Schools have been identified as providing the most effective environment for promoting public health through physical activity (CDC, 1997; Johnson and Deshpande, 2000). Schools are an appropriate setting for the promotion of PA, and

other health behaviours, for the following reasons: a) they provide one of the few opportunities to address the full range of individuals in a population, at no extra cost, a captive audience (Fox, 1996; Department of Health, 1998; Health Education Authority, 1998); b) they have existing school staff, training programs and a funded infrastructure to support ongoing programs and to adopt new ones, and c) they have the statutory responsibility to provide a broad and balanced curriculum which promotes the spiritual, mental and physical development of pupils (Law 1566/85, Greek National Ministry of Education). Furthermore, any positive impact that schools have on young people has the potential of additional benefits in long term perspective in terms of quality of life and productivity. Thus, recent recommendations for public health practice suggest a) the establishment on schools policies and environments to promote a healthy lifestyle and PA, and b) the provision of more school-community linked PA programs that meet the needs and interests of both gender for all age groups (HEA, 1997; USDHHS, 2000a; Stone, McKenzie, Welk and Booth, 1998).

Recently, a number of interventions and initiatives aiming to promote a healthy and active lifestyle have been applied worldwide in the school environment among preschool through high school-aged students based on several theoretical models (Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, Fox, Bullock, Sobol, Colditz, Field and Laird, 1999; Mannios, Moschandreas, Hatzis and Kafatos, 1999; Mann, Peterson, Marek and Kealy, 2000; Allott, Paxton and Leonard, 1999). These efforts are characterized by different research designs, methodologies, sample sizes, personnel, intervention components, dependent variables and evaluation; a critical examination highlight a number of issues related to the research design, to the measurement, to the generalizability of the findings, to the implementation process, and to the evaluation criteria (Sleap, 1997; Stone, McKenzie, Welk and Booth, 1998). Baranowski and co-workers (1998) in their pervasive review concluded that so far, interventions do not attain the desired levels of change in behavioural outcomes because current theories do not predict behaviour and interventions can not substantially affect change in the mediating variables which are related to the behaviour. Thus, the solving of these issues constitutes at present time a very challenging international research area in order to promote better practice in designing more effective interventions (Baranowski, Anderson and Carmack, 1998; Stone, McKenzie, Welk and Booth, 1998; Hosman, 2000).

Recent studies in Europe had shown that there is a remarkable difference in the lifestyle and the PA level among young people in different European countries (Pieron and Ledent, 1996; Pieron, Telama, Almond and Da Costa, 1997; Telama, 1998). None of the studies found included a Greek population. However, Greece is a country with great socio-economic, cultural and environmental differences compared with other European countries. It is possible therefore that Greek children, apart from the differences related to common age characteristics, will also demonstrate lifestyle related differences (Baranowski, Anderson and Carmack, 1998). This hypothesis has been supported by recent studies with Greek adults (Steptoe *et al.* 1997). Furthermore, there is a lack of national data; only a limited number of studies have been conducted in Greece in the area of young lifestyle, leisure time pursuits and PA patterns. Previous studies have focused mainly on fitness levels and sport involvement (Tokmakidis and Giavroglou, 1984; Zoupos, Ziogas, Ikonomikou and Vergou, 1994) rather than to assessment of PA level (Manios, Kounali and Kafatos, 1993; Manios, Kafatos and Codrington, 1999). In addition, methodological and measurement differences do not encourage direct comparisons with national or international data.

Ten years ago, Georgiadis and Klisouras (1993) comparing longitudinal data of body measurements, concluded that the ratio of weight to height for the new generation is significantly higher than that of the previous one. More recent studies have shown that obesity is becoming a very important problem of young people in Greece (Manios, Moschandreas, Hatzis and Kafatos, 1999; Mamalakis, Kafatos, Manios, Anagnostopoulou and Apostolaki, 2000; Krassas, Tzotzas, Tsametis and Konstantinidis, 2001). Young Greek people also exhibit high risk characteristics in other health-related behaviors such as a diet rich in fat (Roma-Giannikou, Adamidis, Gianniou, Nikolara and Matsaniotis, 1997; Hassapidou and Fotiadou, 2001), regular smoking and alcohol consumption (Kokkevi, Terzidou, Politikoy and Stefanis, 2000; Petridou, Zavitsanos, Dessypris, Frangakis, Mandyla, Doxiadis and Trichopoulos, 1997; Steptoe *et al.* 1997) and sedentary leisure time pursuits (e.g. TV viewing and playing computer games) (Krassas, Tzotzas, Tsametis and Konstantinidis, 2001). Obviously, in present time, Greek children and adolescents demonstrate an unfavourable health profile that may have detrimental implications in the future in terms of their health and quality of life as well as in terms of economy.

Despite these worrying findings, no national policy for health education and physical activity for school-aged young people exist to date in Greece. In addition, only one intervention programme has been applied targeting elementary school students (Manios, Moschandreas, Hatzis and Kafatos, 1999). This first attempt concerned a school-based health education intervention program that was launched in 1992 on 4,171 pupils registered in the first grade in two counties of Crete. The school-based intervention was primarily aimed at improving children's diet, fitness, and physical activity. The findings of this study had shown positive serum lipid level changes occurred to a greater extent in the intervention group than in the control group; BMI increased less in the intervention group than for controls. The increase in health knowledge and physical activity and fitness levels occurred to a higher extent in the intervention group compared to those in controls (Manios, Kafatos and Mamalakis, 1998). The researchers concluded that the short-term changes observed were markedly encouraging and indicated great potential for progressive improvement and proposed continuation and expansion of similar programs that may prove to be beneficial in initiating long-term changes.

Therefore, there is an imperative need for further investigation of the lifestyle and PA patterns of Greek children. In addition, there is an emerging need to organize and to test different intervention programmes targeting at young people tailored to the characteristics of our country. The lack of data in such an important area constitutes a major gap in scientific knowledge concerning public health in Greece. This research is an attempt to bridge this gap by investigating Greek young people's lifestyle and PA patterns and to test the effectiveness of a school-based intervention programme aiming to promote habitual PA.

A fundamental condition in identifying the determinants of PA and evaluating the effectiveness of interventions is the valid assessment of PA (Dishman, Washburn and Schoeller, 2001). The need for improved assessments of PA in young people has been recognized as an important research priority (Kohl, Fulton and Caspersen, 2000; Stone, McKenzie, Welk and Booth, 1998). There are at least six categories of techniques that have been used to assess PA among young people. For large sample studies, self-report technique is the most commonly employed procedure to measure

PA because it is inexpensive, quick to administer, unobtrusive, and versatile and several sources of PA information can be obtained which may be useful in organizing PA intervention programmes (Kohl, Fulton and Caspersen, 2000). However, the majority of the well-known and widely used questionnaires have been constructed for specific research objectives and have been structured in a way that meets the specific socio-cultural characteristics encountered in each case (Kriska, 1997; Sallis, 1991). Also some of the available instruments have not been comprehensively evaluated yet as far as their validity and reliability are concerned providing therefore inaccurate and misleading conclusions (Stone, McKenzie, Welk and Booth, 1998).

The lack of validated self-report measurement for the measurement of the PA level of Greek young people led to the development of the "Physical Activity and Lifestyle Questionnaire" (PALQ) in order to meet the educational and socio-cultural characteristics of Greek students. The PALQ intended to assess habitual PA of a large sample of young people by gathering valid information regarding the amount and the types of PA of the Greek young people (Cavill, Biddle and Sallis, 2001). The development of such a questionnaire was a prerequisite for the valid interpretation of the findings of this study.

1.2 Research aims of the study

The aims of this study are threefold:

1. To design a specific self-report measure of PA for use with young people in Greece.
2. To examine the lifestyle and PA patterns of Greek young people taking into consideration specific PA determinants.
3. To examine the effectiveness and the applicability of a school based intervention programme in promoting PA and sport participation.

1.3 Main research questions

The main research questions of this study were the following:

1. What are the lifestyle and PA activity patterns of Greek young people? Are they justifying the application of an intervention programme?

2. What are the main issues to be considered in order for a school based intervention programme, to promote PA activity and sport, to be effective and applicable?

1.4 Personal and professional involvement

Involvement in this research project was developed from a long-standing personal and professional interest in the school's role in promoting a healthy lifestyle. Having taught in a number of schools for years and having delivered numerous pre-service and in-service training courses for PE teachers in Greece, I had detected some problems and limitations that have been confronted by schools' personnel in promoting health-related issues.

A four year scholarship from the State Scholarship Foundation of Greece gave me the opportunity to be initiated in the international perspective on promoting health and PA. I completed an MSc in Physical Education at Loughborough University, part of which was a thesis entitled "Analysis of Greek Children's Physical Activity Patterns". This thesis was an expansion in one Greek population of a broader study which was conducted by the *International Council of Sport Science and Physical Education* (Pieron and Ledent, 1996). The aim of this thesis was to investigate the place of physical activity in the lifestyles of young people in Greece. Despite the limited sample and the limitations of the *Lifestyle Questionnaire* which was used in this study, the findings had shown that Greek children, and especially girls, exhibited more sedentary leisure time pursuits and less involvement in organised sport compared to the counterparts of the same age and sex of other Western European countries (Avgerinos, 1997). However, the questionnaire used in this preliminary study exhibited a number of limitations which affected the accuracy of the findings and made comparisons difficult with the data gathered from other countries. More specifically, in the *Lifestyle Questionnaire* the PA level of the responders was estimated based in a physical activity index. However, this index was incompatible with the function frame of the Greek school because in Greece there are no extra-curricula activities or school sport clubs. Bolting of the findings of this pioneer study, it was decided to expand this investigation on lifestyle and PA patterns of Greek young people by conducting the present PhD study.

1.5 The importance of the study

This study is important for the following reasons:

a) The creation of a tested measurement that takes into consideration the cultural characteristics of young people in Greece, will contribute to a better understanding of young people's PA; the development of such as instruments is a research priority that has been stated worldwide (Dishman, Washburn and Schoeller, 2001; Kohl, Fulton and Caspersen, 2000).

b) The study of Greek young peoples' PA levels and the management of their spare time in combination with the specific personal and environmental determinants will offer important information about the formation of the lifestyle and the adoption of specific behaviours. This information is essential for the health and education organisations in our country as there are no extensive national data that would help the formulation of a documented national health policy (Manios, Kafatos and Mamalakis, 1998). This research will also provide information on the effect of culture on PA behaviour (Linquist, Reynolds and Goran, 1999; Sallis, Prochaska and Taylor, 2000) and will contribute to a better understanding of European youths' lifestyle and PA patterns (Pieron, Telama, Almond and Da Costa, 1997).

c) The organization and the application of an intervention programme to the school environment aiming to promote PA, will offer important information for multi-factorial initiatives. This is necessary for the educational needs in Greece (Manios, Moschandreas, Hatzis and Kafatos, 1999) and at an international level (Baranowski, Anderson and Carmack, 1998; Stone, McKenzie, Welk and Booth, 1998; Hosman, 2000).

1.6 Delimitation of the study

The study was delimitated taking into consideration the following factors:

- The sample of the students who were selected for the validity and reliability studies of the PALQ were Greeks who are living in Athens and Thessaloniki, the most densely populated cities in Greece.
- The results of the needs analysis (project 2) and the intervention programme (project 3) involves only Greek students of Thessaloniki.
- The classification of the students in PA categories in each study was based on the PA recommendations for young people proposed by the Health Education Authority (Cavill, Biddle and Sallis, 2001). These recommendations state that:
    - All young people should participate in physical activity of at least moderate intensity (3-6 METs) for 1 hour per day.
    - Young people who currently do little activity should participate in physical activity of at least moderate intensity for at least half an hour per day *(main recommendation)*.
    - At least twice a week, some of these activities should help to enhance and maintain muscular strength and flexibility, and bone health *(secondary recommendation)*.

1.7 Limitations of the study

This study was limited by the following conditions:

- The results of the samples' PA come from assessments in two specific periods of the year, spring and autumn. The level of participants' PA during other seasons is not known.
- The validity and reliability of the PALQ wasn't examined on high school students. It was assumed that it was valid as it was proved for students of elementary and secondary school.
- The physical education teachers who participated to the intervention program were volunteers. It isn't known whether the results would be the same in case the program had a wider application.
- The comparison of the three age groups (project 2: *Needs analysis*) is cross-sectional. The results may be different in longitudinal comparisons.

1.8 Basic assumptions

The study took place based on the following assumptions:

- The large sample of the students ensures the internal validity of the study.
- The changes which were noticed on the students who participated to the experimental group in the intervention program were due to the influence of the intervention.
- All the PA instruments that were used to the study were valid and reliable.

1.9 Approvals for the study

The study was approved by the Department of Physical Education, Sports Sciences and Recreation Management of Loughborough University. The Pedagogical Institute of Greece approved and funded the study to Greek population. The Physical Education teachers who participated in the study were volunteers. Volunteers were also the students who participated in the sub-studies; their participation was allowed with the written approval of their parents and the schools' headmasters.

1.10 Structure of the thesis

The effective promotion of PA and other health related behaviours requires a well organized strategic approach in order to maximize the effectiveness and to minimize loss on resources and money. This strategy involves a number of steps which are presented in figure 1.10.a and is adopted for this Ph.D thesis (Baun, Horton and Storlie, 1993; HEA, 1997).

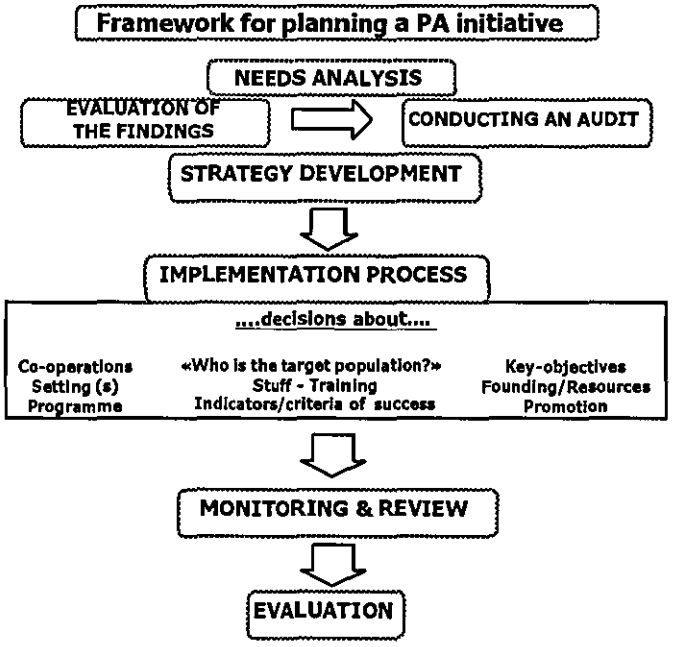


Figure 1.10.a: Framework for planning a physical activity initiative (HEA, 1997).

However, an additional step was added for the creation of the *Physical Activity and Lifestyle Questionnaire*. The outline of this thesis is presented in Figure 1.b.

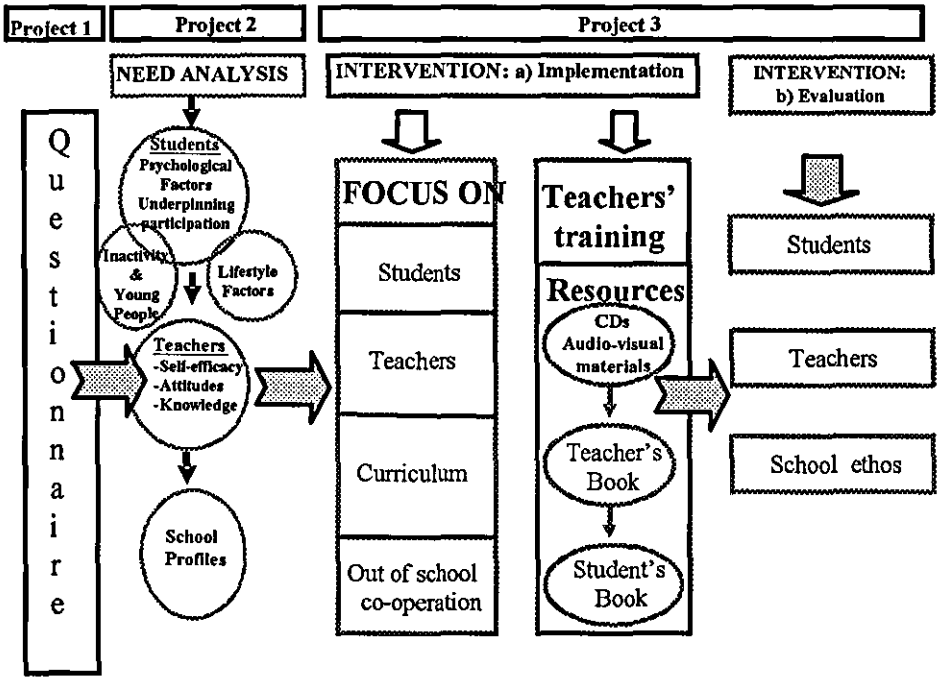


Figure 1.10.b: The outline of the PhD thesis.

This thesis consists of three separate but interrelated projects, in correspondence to the research aims. All three projects have common format that includes a summary of the main findings, an introduction presenting the specific research aims, a short literature review, the methodology, the presentation of the results, and the discussion. Every project consisted of several studies.

First project (chapter 2) addressed the first aim, the design of the *Physical Activity and Lifestyle Questionnaire* (PALQ). This project consists of five studies. The first study establishes the types of activities performed regularly by young people in Greece in order to formulate the questionnaire's activity checklists. The second study examines the differences between an objective method of measurement and the subjective estimation of the PA. The third study examines issues relevant to interviewees' comprehension of the questions and problems with the completion of the questionnaire. The fourth and fifth study assesses the concurrent validity and reliability of the PALQ for elementary and secondary school students.

In the **second project** (chapter 3), a *need analysis* was curried out in order a) to establish whether or not there was a need to increase PA level of Greek young people, and b) to consider the conditions for the development of an intervention programme aiming to promote PA through the school setting. This project consists of three separate studies. The purpose of the first study was to examine the lifestyle and PA patterns of Greek young people taking into consideration specific determinants. The second and the third studies consider the conditions for the development of a school based intervention, in terms of the training needs of the personnel and the resources provided by the schools. The information obtained from these three studies helped in identifying priorities and creating the strategy of intervention.

The **third project** (chapter 4) examines the applicability and the effectiveness of the intervention programme. This project presents the key-components of the *intervention strategy*, the *implementation process* and the *evaluation procedure*.

The final chapter presents a summary of the research findings, a discussion of their implications and recommendations for future work in the area.

Abstract of the Project 1

The overall aim of the project one was the creation and validation of a new self-report measure, named Physical Activity and Lifestyle Questionnaire (PALQ). This project consisted of five separate studies.

The **first study** established the types of activities performed regularly by young people in Greece in order to formulate the questionnaire's activity checklists.

The purpose of the **second study** was to examine the difference between an objective method of measurement and the subjective estimation of the PA for students who were involved in a skiing course. A number of 75 students aged 19-21 years old participated, which had no previous experience in skiing. Participants wore a heart rate monitor during practice in order to record the exercise intensity and a questionnaire was used to measure their perception of PA. Simultaneously, a trained observer recorded the time on task. A day after the objective measurement, the participants filled a questionnaire in order to estimate their perceived exertion during practice as well as their perceived time on task. The results showed (a) differences between the observed time on task and the perceived recalled time (b) no differences between the recorded and perceived recalled intensity of exercise for the same group (c) significant relation between the objective time and the perceived time on task and between the objective intensity and the perceived intensity. Generally, the participants had overestimated the time on task, independently of the intensity of their effort. These results raise the question whether the questionnaire as a method of measuring physical activity is reliable, especially when it is used to estimate energy expenditure.

The purpose of the **third study** was to examine issues relevant to a) interviewees' comprehension of the questions and problems with the completion of the questionnaire, and b) the administration procedure of the self-report taking into consideration the age of the interviewees.

The purpose of the **fourth study** was to assess the concurrent validity and reliability of the PALQ for adolescents. Subjects were secondary school students (N=40) aged 13.6 yrs (SD=0.9). Test-retest reliability was reported as the intraclass correlation between estimated individual scores (METs) determined from two administrations completed within one-week period. Two evaluators using the same scoring protocol determined inter observer reliability. Validity was assessed using two questionnaires (The"Three-Day Physical Activity Record" and The Four by One-Day Recall Physical Activity Questionnaire") and the CSA accelerometer as criterion measures. Test-retest and inter observer correlation was 0.772 and 1.0 respectively ($p<.001$). The rank correlation between the PALQ scores (METs) and i) the first questionnaire (Kcal) was 0.554 ($p<.001$), ii) the second questionnaire (METs) was .791 ($p<.001$), and iii) the CSA (counts) was .627 ($p<.001$). The results of this study supported the convergent validity and the reliability of the PALQ as a measure of physical activity level for secondary school students.

The primary purpose of the **fifth study** was to assess the concurrent validity of the PALQ for elementary school students; the secondary purpose was to investigate whether this sample fulfilled existing UK PA recommendations for health. Habitual PA of 51 randomly selected students (N=51) aged 11 yrs (SD=0.8) from 6 elementary schools was studied by using the CSA accelerometer and the PALQ. Subjects wore the CSA monitor for 4 days in their waist over the right hip (two non-consecutive weekdays and one weekend). The accelerometer was pre-programmed to store data at 1-min interval (epoch) on each monitored day for 24hours/day. CSA-derived variables were used to operationally define sedentary, moderate and vigorous activity according to the manufactured guidelines. Daily summary variables of average movement counts (total PA) and daily frequency of sedentary behaviour through vigorous activity were constructed. Both instruments recorded subjects' PA for the same time period. According to the CSA, 68,6% of the subjects fulfilled both existing UK PA recommendations for health (91,3% of the boys and 50% of the girls for the weekdays); boys were significantly more active than girls ($t_{(49)}=4.41$, $p<.001$) in all expressions of PA (at school, after school, participation in organized sports, PA in the weekends); participation in PA declined dramatically during weekends compared with weekdays ($t_{(49)}=3.34$, $p<.05$). The PALQ, overall, appeared to underestimate subjects' PA level. More specifically, 36.7% of the sample was classified as inactive. Boys appear to be significantly more active than girls only in their participation in organized sport activities ($t_{(49)}t=3,168$, $p<.05$) and in their leisure time PA ($t_{(49)}t=2.146$, $p<.05$). Furthermore, there was no difference in PA levels between weekdays and weekend. The two instruments were moderately correlated (Spearman $r=.56$, $p<.01$). Both instruments had shown that the subjects accumulated a large amount of PA in the school environment (46% and 57% for the CSA and the PALQ respectively). The fact that according to an objective measure (CSA) a large part of this sample fulfilled the PA recommendations for health is very encouraging. The findings have shown that schools play a key role in activating students in Greece. Despite the medium correlation between the accelerometer and the questionnaire, the results indicated that the PALQ is a valid instrument to assess habitual activity of Greek 11-yr-old children.

The variation between the instruments used in the 4th and the 5th study may be attributed to a) the different types of activity that were evaluated, b) the different definitions and thresholds set for intensity and duration of PA c) the fact that the CSA considered cumulative amounts of PA whereas the PALQ considered continuous bouts of PA, and d) the accuracy by which individuals recalled their PA in the self-report.

2.1.0 Introduction

2.1.1 Background – Statement of the problem

The development of reliable and valid instruments evaluating PA would significantly contribute to a better understanding of the relationship between PA and health as well as the implementation of effective intervention programmes (Baranowski, Anderson and Carmack, 1998; Lamonte and Ainsworth, 2001; NIH, 1996). Physical activity is difficult to measure because it is a complex behaviour (Montoye, Kemper, Saris and Washburn 1996). It is, in fact, an entire group of behaviours that theoretically includes all bodily movement, ranging from moving around to participating in competitive sports. Its measurement is restricted considerably by the current state of measurement techniques and problems with definition, reliability and validity are widespread in existing measures (Kohl, Fulton and Caspersen, 2000; Twisk, 2001). These problems are more complex when activity information from children is required (Sallis and Owen, 1999).

More than a dozen methods are currently available for the measurement of physical activity (Montoye, Kemper, Saris and Washburn 1996). They can be divided in laboratory and field methods. The advantages and disadvantages of these methods depend upon the population being studied and the research objectives (Dishman, Washburn and Schoeller, 2001). Field methods can be further divided in objective measurements of PA and self-report measurements. Physiological assessment techniques are used in laboratory settings and complicated electronic devices offer an accurate assessment of PA but they are inappropriate for measuring PA in epidemiological studies because of their intrusiveness and high cost (Bouchard, Shephard and Stephens, 1994). In epidemiological studies of PA, self-report is the recommended method of assessment because it is inexpensive, unobtrusive and easy to administer (Sallis and Owen, 1999). This method was chosen for the data collection in this thesis.

Although over the last decade significant progress has been made, the creation of reliable and valid measuring self-reports remains a critical scientific endeavor, especially in the evaluation of young people's physical activity (Cavill, Biddle and

Salllis, 2001; Pratt, Macera and Blanton, 1999) as many researchers have expressed concerns about the accuracy of self-report measures (Baranowski, 1988; Kohl, Fulton and Caspersen, 2000).

Two major constraints on the accuracy of self-report measures are the definition of the variables and the human cognitive process (Baranowski, 1988). In terms of the problems with definition, Twisk (2001) states that the PA stimulus to achieve health-related outcomes has not been clearly established and the proposed guidelines are highly speculative. A main concern in studying and measuring activity levels has been the identification of whether or not children are in fact doing sufficient exercise to optimize their functional capacity and to attain health benefits (Pratt, Macera and Blanton, 1999). So far, the mode, duration and intensity of activity required to produce health benefits is open to debate, especially for young people (Cavill, Biddle and Sallis, 2001; Lamonte and Ainsworth, 2001; Twisk, 2001). However, according to the existing scientific literature, the effects of two markers of PA are the most important for health outcomes: a) the amount of PA performed as indicated by estimated weekly caloric expenditure and b) the effect of exercise intensity, independent to the overall amount of activity (Kriska and Caspersen, 1997; Shephard, 2001).

Until recently, the predominant notion was that a large proportion of children are insufficiently active to attain optimum health (Armstrong and Welsman, 1997). Most of the data related to young people's PA levels have been analyzed assuming that sustained periods of moderate – to high – intensity PA are needed to gain health outcomes. The value of intermittent, accumulated, moderate-intensity PA has recently been recognized for young people (Riddoch, 1998); this has been clearly underlined in recommendations published by the UK Health Education Authority (HEA, 1998). However, the research question that arises from these recent PA recommendations is whether previous negative interpretations of children's PA levels are still tenable if intermittent, accumulated, moderate-intensity PA is accepted as beneficial. A recent study by Sleap and Tolfrey (2001) found that when cumulative amounts of PA were considered, at intensities greater than 120 beats.min^{-1}, pre- and early pubertal British children appear to engage in sufficient PA to meet UK minimum daily recommendations. This study has shown that interpretations of children's PA levels

depend on thresholds set for intensity of physical activity and whether cumulative or continuous bouts of activity are included in the analysis. It is obvious that the problems with definition remain unsolved and need more research to identify the physiological, psychological, and developmental health benefits of PA of different types, intensities, duration and frequency (Cavill, Biddle and Sallis, 2001).

The second major problem identified with self-report is the cognition-related error. Memory decay, primary recall of rare events and planned activities and lack of motivation in form completion are the main sources of error associated with self-reports, particularly in young people (Baranowski, 1988; Baranowski, Dworkin, Cieslic, Hooks, Ray, Dunn and Nader, 1984; Saris, 1985; Klesges, Eck, Mellon, Fulliton, Somes and Hanson, 1990; Sallis, Condon, Goggin, Lolody and Alcaraz, 1993; Cale, 1994). The accuracy of the recalls in children depends on the detail that is requested, the form of the question, the training before the recall, and the use of prompting questions and probes (Sallis and Owen, 1999). Even more so, the validity of the recalled information depends in a large part on the cognitive development, the age and the education of the child, including some contextual factors (e.g. the salience of the activity recalled or the personal characteristics of the responder) (Durante and Ainsworth, 1996; Falkner, Trevisan, Zielezny, Freudenheim, Winkelstein and Fisher, 1994). Problems usually arise when young people are asked to report time, frequency and intensity of physical activities or exercise precisely, especially when the recalled PA information refers to prolonged periods of time. Young people in general tend to overestimate time or intensity (Sallis, Strikmiller, Harsha, Feldman, Ehlinger, Stone, Williston and Woods, 1996); thus, it is proposed that self-report PA should not be used in children younger than 9 or 10 years old (Montoye, Kemper, Saris and Washburn, 1996).

However, so far, very few studies have examined the degree of the error associated with the perceived time and intensity, when interviewees recall their involvement in habitual PA and/or exercise (Baranowski, 1988; Friedenreich, 1994; Kledges, Eck, Mellou, Fulliton, James and Hanson, 1990; Sallis *et al*, 1985). Also, these studies have not examined how the intensity of exercise influences the perceived time of participation in a PA episode. This is a critical issue because the accuracy of the recalled information may have implications to the prevention of specific diseases

(Pate, 1995) Furthermore, measures of PA are used in various settings to describe PA habits in populations, to classify PA levels for intervention efforts, to evaluate intervention effectiveness, to assess changes in PA over time, and to identify behavioural correlates of PA. Therefore, this issue was examined in the second study of this project as it is a current research priority in order to improve the accuracy of self-report measures (Lamonte and Ainsworth, 2001).

Given that the interest in PA levels stems largely from the evidence that it has important health implications, the accurate measurement of PA must be a primary issue. Indeed, major organizations including *the Health Education Authority, the British Heart Foundation, the American Heart Association* and *the Centre for Disease Control* have identified the development and application of reliable and valid measures of PA for the surveillance of PA patterns as major methodological issues in PA epidemiology, particularly among young people. However, many of the available instruments have not yet been comprehensively evaluated in terms of their validity and reliability providing sometimes inaccurate and misleading conclusions (Dishman, Washburn and Schoeller, 2001; Montoye, Kemper, Saris and Washburn 1996; Sallis, Buono, Roby, Carlson and Nelson, 1990). Other self-reports have been constructed for specific research objectives and have been tailored to the specific socio-cultural characteristics of the population studied, and they are therefore very specific and inappropriate for use in other studies (Kriska, 1997; Sallis, 1991; Sallis and Owen, 1999). Furthermore, many researchers examined the validity and reliability of various self-report instruments against objective measures of PA and found low to medium correlation between them (Ainsworth, Haskell, Leon, Jacobs, Montoye, Sallis and Paffenbarger, 1993; Ainsworth, Haskell, Whitt, Irwin and Swartz, 2000; Baranowski, Dworkin, Cieslik, Hooks, Clearman, Ray, Dunn and Nader, 1984; Baranowski, 1988; Coleman *et al.*, 1997; Kohl, Fulton and Caspersen, 2000).

Clearly, there is a strong consensus that current self-report measures of PA present a number of limitations for gathering accurate activity information from children (Lamonte and Ainsworth, 2001). As a result of the concerns expressed by researchers over the accuracy of current self-report measures and the need to improve the assessment of PA (Kohl, Fulton and Caspersen, 2000; Stone, McKenzie, Welk and Booth, 1998), particularly among young people, the major aim of this project was to

construct and to validate a self-report measure designed for use with Greek young people. The instrument aimed to address some of the problems associated with the current self-report measures. The development and evaluation of this measure followed a systematic and vigorous methodological process including validity and reliability assessment. This procedure is presented in the second and the third study of this project.

2.1.2 Research aims of the project 1

The overall aim of this project is to design a self-report measure of PA specifically for use with young people in Greece. The specific sub-aims of this project are:

1. To investigate the accuracy of recalled information regarding the perceived time and intensity of PA, comparing it with the objective time and intensity of participants.
2. To assess the reliability and concurrent validity of the PALQ for secondary school students.
3. To assess the reliability and concurrent validity of the PALQ in elementary school children.

2.1.3 The importance of the project 1

This project is important for the following reasons:

1. The design of a valid self-report measure to assess habitual PA will contribute to a better understanding of the Greek young people's PA patterns.
2. This project will enhance our knowledge regarding the magnitude of the error related with the perceived time and intensity, when respondents recall their PA involvement compared to objective measures of PA. It will also contribute to a better understanding on how the perceived intensity of PA influences the perceived time on task.

2.1.4 Delimitations of the project 1

The project 1 was delimitated by the following factors:

- The sample of the first study was students of the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki.
- The sample used in the validation studies of the PALQ were students living in urban areas. Also, in the validation studies, students with BMI>27 were excluded.

2.1.5 Structure of the project 1

The literature review section presents briefly the main methodological issues on monitoring PA with particular focus on self-report technique and the stages involved in the development of the *Physical Activity and Lifestyle Questionnaire.* Following that, two sub-studies and three main studies associated with the format and the validation of the PALQ are presented. The final section presents a summary of the main research findings, a discussion of their implications in setting up intervention programmes and further recommendations for future research in the assessment of PA by self-report.

(Note: Detailed information regarding to the characteristics of the questionnaire is presented in appendix 1).

Abstract of the Project 1

The overall aim of the project one was the creation and validation of a new self-report measure, named Physical Activity and Lifestyle Questionnaire (PALQ). This project consisted of five separate studies.

The **first study** established the types of activities performed regularly by young people in Greece in order to formulate the questionnaire's activity checklists.

The purpose of the **second study** was to examine the difference between an objective method of measurement and the subjective estimation of the PA for students who were involved in a skiing course. A number of 75 students aged 19-21 years old participated, which had no previous experience in skiing. Participants wore a heart rate monitor during practice in order to record the exercise intensity and a questionnaire was used to measure their perception of PA. Simultaneously, a trained observer recorded the time on task. A day after the objective measurement, the participants filled a questionnaire in order to estimate their perceived exertion during practice as well as their perceived time on task. The results showed (a) differences between the observed time on task and the perceived recalled time (b) no differences between the recorded and perceived recalled intensity of exercise for the same group (c) significant relation between the objective time and the perceived time on task and between the objective intensity and the perceived intensity. Generally, the participants had overestimated the time on task, independently of the intensity of their effort. These results raise the question whether the questionnaire as a method of measuring physical activity is reliable, especially when it is used to estimate energy expenditure.

The purpose of the **third study** was to examine issues relevant to a) interviewees' comprehension of the questions and problems with the completion of the questionnaire, and b) the administration procedure of the self-report taking into consideration the age of the interviewees.

The purpose of the **fourth study** was to assess the concurrent validity and reliability of the PALQ for adolescents. Subjects were secondary school students (N=40) aged 13.6 yrs (SD=0.9). Test-retest reliability was reported as the intraclass correlation between estimated individual scores (METs) determined from two administrations completed within one-week period. Two evaluators using the same scoring protocol determined inter observer reliability. Validity was assessed using two questionnaires (The"Three-Day Physical Activity Record" and The Four by One-Day Recall Physical Activity Questionnaire") and the CSA accelerometer as criterion measures. Test-retest and inter observer correlation was 0.772 and 1.0 respectively ($p<.001$). The rank correlation between the PALQ scores (METs) and i) the first questionnaire (Kcal) was 0.554 ($p<.001$), ii) the second questionnaire (METs) was .791 ($p<.001$), and iii) the CSA (counts) was .627 ($p<.001$). The results of this study supported the convergent validity and the reliability of the PALQ as a measure of physical activity level for secondary school students.

The primary purpose of the **fifth study** was to assess the concurrent validity of the PALQ for elementary school students; the secondary purpose was to investigate whether this sample fulfilled existing UK PA recommendations for health. Habitual PA of 51 randomly selected students (N=51) aged 11 yrs (SD=0.8) from 6 elementary schools was studied by using the CSA accelerometer and the PALQ. Subjects wore the CSA monitor for 4 days in their waist over the right hip (two non-consecutive weekdays and one weekend). The accelerometer was pre-programmed to store data at 1-min interval (epoch) on each monitored day for 24hours/day. CSA-derived variables were used to operationally define sedentary, moderate and vigorous activity according to the manufactured guidelines. Daily summary variables of average movement counts (total PA) and daily frequency of sedentary behaviour through vigorous activity were constructed. Both instruments recorded subjects' PA for the same time period. According to the CSA, 68,6% of the subjects fulfilled both existing UK PA recommendations for health (91,3% of the boys and 50% of the girls for the weekdays); boys were significantly more active than girls ($t_{(49)}=4.41$, $p<.001$) in all expressions of PA (at school, after school, participation in organized sports, PA in the weekends); participation in PA declined dramatically during weekends compared with weekdays ($t_{(49)}=3.34$, $p<.05$). The PALQ, overall, appeared to underestimate subjects' PA level. More specifically, 36.7% of the sample was classified as inactive. Boys appear to be significantly more active than girls only in their participation in organized sport activities ($t_{(49)}t=3,168$, $p<.05$) and in their leisure time PA ($t_{(49)}t=2.146$, $p<.05$). Furthermore, there was no difference in PA levels between weekdays and weekend. The two instruments were moderately correlated (Spearman $r=.56$, $p<.01$). Both instruments had shown that the subjects accumulated a large amount of PA in the school environment (46% and 57% for the CSA and the PALQ respectively). The fact that according to an objective measure (CSA) a large part of this sample fulfilled the PA recommendations for health is very encouraging. The findings have shown that schools play a key role in activating students in Greece. Despite the medium correlation between the accelerometer and the questionnaire, the results indicated that the PALQ is a valid instrument to assess habitual activity of Greek 11-yr-old children.

The variation between the instruments used in the 4th and the 5th study may be attributed to a) the different types of activity that were evaluated, b) the different definitions and thresholds set for intensity and duration of PA c) the fact that the CSA considered cumulative amounts of PA whereas the PALQ considered continuous bouts of PA, and d) the accuracy by which individuals recalled their PA in the self-report.

2.2.0 Literature Review

2.2.1 Monitoring Physical Activity

Physical activity is defined "as any bodily movement produced by skeletal muscles that result in caloric expenditure" (Caspersen, Powell and Christenson, 1985). Components of total energy expenditure include basal metabolic rate, which typically encompasses 50%-70% of the total energy expended, the thermogenic effect of food, which accounts for another 7-10%, and physical activity (Montoye, Kemper, Saris and Washburn 1996). The share of total energy expenditure accounted for by PA is obviously greater for active individuals. However, the terms *energy expenditure* and *physical activity* are not synonymous and cannot be used interchangeably. The same amount of energy may be expended in a short burst of strenuous exercise as in a less intense endurance exercise of longer duration; the physiological effect of the two activities may be quite different (Montoye, Kemper, Saris and Washburn 1996). Physical activity is a behaviour that results in energy expenditure and is typically quantified in terms of frequency (number of bouts) and duration (e.g., minutes per hour). Energy expenditure reflects the energy cost or intensity associated with a given PA. It is a direct function of all metabolic processes involved with the exchange of energy required to support the skeletal muscle contraction associated with a given PA (Lamonte and Ainsworth, 2001). The basic dimensions of PA are commonly referred to by the acronym FITT: frequency (e.g. times per week or per month), intensity (e.g., rate of energy expenditure in kilocalories per minute or kilojoules per hour), time (hours, minutes) and type of activity. Furthermore, Montoye *et al.* (1996) propose a fifth dimension, the purpose of activity. However, according to the existing scientific literature, the effects of two markers of PA are the most important for health outcomes: a) the amount of PA performed as indicated by estimated weekly caloric expenditure based on the equation described by Kriska and Caspersen, (1997) and b) the effect of exercise intensity, independent to the overall amount of activity.

Exercise recommendations are often given in FITT, and each dimension of FITT may affect different health outcomes. For some purposes, it is desirable to assess all the FITT dimensions. For example, it is necessary to assess at least frequency, intensity, time and type of the activity in order to determine how many people in a young

population are meeting the U.K. recommendations (Cavill, Biddle and Sallis, 2001). For other purposes, it is sufficient to assess the overall amount, or volume, of PA. The most common measure of volume is kilocalorie (kcal) expenditure, a useful measure for weight control studies or programmes (Epstein, Paluch, Consalvi, Riordan and School, 2002).

Methods of assessing PA levels range from physiological, mechanical, and observational to self-report measures, with methods having a range of different measures or techniques to choose from (Dishman, Washburn and Schoeller, 2001). These methods and techniques present important differences in terms of their appropriateness for use in population groups, extent of interference with usual activity level, participant acceptability, and the ability of the method to provide specific information about the type, frequency, duration, and intensity of PA (Montoye, Kemper, Saris and Washburn 1996; Trost, 2001). Popular objective activity assessment tools include measures of total energy expenditure, such as the double-labelled water technique and the respiratory chamber; movement counters, which initially measured frequency of movement and have progressively been modified to detect differences in speed and direction of movement' and measures that estimate physical fitness, such as heart rate monitoring and graded exercise testing. However, the most widespread method of assessing PA in population studies is the self-report measures because it possesses the characteristics of non-reactiveness, practicality, applicability, and accuracy (Montoye and Taylor, 1984; Lamonte and Ainsworth, 2001). By contrast, objective measurements of energy expenditure, some of which have the advantage of providing more precise estimates of energy expenditure are not practical for most epidemiological studies, but they have been used in laboratory settings also to validate the PA self-report measures. However, the estimates obtained by the self-reports are valuable in relative terms and can be used to rank individuals or groups of subjects within a population from the least to the most active; the ranking can then be examined with respect to physiologic parameters (Kriska and Caspersen, 1997).

Many specialists in the area agree that no single method of PA assessment fully meets the criteria of being reliable, valid, practical, and non-interfering with usual activity (Dishman, Washburn and Schoeller, 2001; Pratt, Macera and Blanton, 1999; Kohl,

Fulton and Caspersen, 2000; Lamonte and Ainsworth, 2001). Because PA is a multidimensional behaviour, no single assessment method or tool can capture all of its dimensions. The method chosen to assess PA must depend on the research problem being addressed and the constraints imposed by sample size, time, setting, and budget. Specialists propose that multiple assessment methods should be utilized in order to obtain a more global estimate of PA; the use of multiple methods can contribute to the understanding of the relationship between different techniques (Kohl, Fulton and Caspersen, 2000; Montoye, Kemper, Saris and Washburn 1996; Trost, 2001).

Many researchers are interested in characterizing 'habitual' PA that reflects long-term patterns. However, many people, and especially the young people, may not have a typical 'habitual level' of PA. This is because PA is not a stable behaviour, and types and amounts of PA differ between days, seasons and years (Hovell, Sallis, Kolody and McKenzie, 1999). One way to assess habitual PA is to ask people to recall their 'usual' or 'typical' activity patterns. Another strategy is to measure PA more accurately over several days by using objective measures or self-reports. Recent studies have shown that 4 to 7 consecutive days (including week days and weekend) of monitoring provides accurate estimation of the habitual PA (Janz, Witt and Mahoney, 1995; Trost, Pate, Freedson, Sallis and Taylor, 2000).

Recently, there is an increasing interest in assessing specific sedentary behaviours or levels of inactivity rather than PA itself, because inactivity is part of the activity spectrum; inactive leisure time pursuits, such as hours of television viewing or playing computer games, has been associated with negative health effects (e.g. obesity) and is negatively correlated with high levels of PA (Epstein, Saelens and O' Braien, 1995; Epstein, Paluch, Consalvi, Riordan and School, 2002). However, so far, measurement of inactivity or sedentary behaviours is not well developed (Sallis and Owen, 1999).

In the following section special emphasis will be placed in self-reports measures as this method is the main focus of this project.

2.2.2 Self report measures: Main characteristics and current issues

Self-report measures are probably the most commonly used method of measuring PA. Self-reports have been used mainly in epidemiological, behaviour change and correlational studies. There are several types of child PA self-reports, including self-administered recall, interviewer-administered recall, diary, and proxy report, in which parents and/or teachers report on the child's PA (Sallis, 1991). These types of measures vary in cost of implementation, adherence rate, and validity (Sallis, Strikmiller, Harsha, Feldman, Ehlinger, Stone, Williston and Woods, 1996). Self-administered recalls are the least costly; diaries may be the most accurate, but they require the cooperation of the children and are inappropriate for use by children with poor reading and writing skills; Interviewer-administered recalls are expensive and time consuming because they require one-to-one interviews. Finally, proxy reports have shown validity limitations, probably because neither parents nor teachers are able to observe children all day (Sallis and Owen, 1999). All these measures vary in the specificity with which frequency, intensity, time and type of PA are assessed; in the period of time covered by the report; and in the nature of the resulting data, that is, whether the data are reported as activity scores (e.g. PA index), ratings, times, calories expended, or other summary scores (Sallis, 1991; Montoye, Kemper, Saris and Washburn 1996).

Perhaps the most commonly used self-report measures are the retrospective reports on self-completed forms and the retrospective interviewer forms. Questionnaires may be self-administered or completed in reply to questions by an interviewer. In the majority of the well-known questionnaires, the specific purpose of the survey determined the procedures and questions to be asked. For example, if obesity was of interest, total energy expenditure might be estimated; if maximal cardiovascular fitness was the concern, it might be important to determine participation in high-intensity, large-muscle aerobic exercise (Baranowski, Dworkin, Cieslik, Hooks, Clearman, Ray, Dunn and Nader, 1984). Therefore, the procedures, the form and the length of the questionnaire or interview might be different if one simply wished to classify respondents in activity groups [e.g. such as in the *Lifestyle Questionnaire,* (Pieron and Ledent, 1996)], versus wishing to obtain a specific activity score or energy

expenditure for each individual [e.g. such as in *The 4 by one-day Recall Physical Activity Questionnaire*, (Cale, 1994)].

There are a number of advantages to the questionnaire-interview technique compared to other objective approaches. It is inexpensive, versatile, and at present it is the only method feasible for large samples. It can be used to assess all FITT dimensions of PA, and also the physical location, the purpose of the activity, the social environment, as well as to identify reasons for activity or inactivity taking into consideration specific demographic data of each respondent. The procedure does not influence subjects' activities to the extent that this happens with other methods like observation or diary keeping. Furthermore, by employing energy expenditure tables, it may be possible to estimate total energy expenditure (Ainsworth, *et al.*, 1993; Ainsworth, Haskell, Whitt, Irwin and Swartz, 2000).

The limitations of this method are more evident when using self-report measures with children. Subjects do not necessarily recall their activities accurately; the potential errors in recall are likely to be greater with children, as they may tend to overestimate time or intensity. Many self-report measures require children to report duration of PA, yet young children may be ill equipped either to tell the time or to estimate it (Sallis, 1991). Also, in the mind of a child, intensity and joy are often important criteria for the duration of an activity (Montoye, Kemper, Saris and Washburn, 1996). Children may not be expected to estimate time accurately because many do not wear watches, and their days are often organized for them by school and parents (Baranowski *et al.*, 1984). In terms of the intensity recall young people have similar difficulty in estimating the intensity of the performed activities. Asking information about sweating, breathlessness or 'huff and puff activities' the researcher obtains only an abundant estimation of the respondent's perceived intensity of the activity. However, this issue is subject to further research (Montoye, Kemper, Saris and Washburn, 1996, Cavill, Biddle and Sallis, 2001).

Children, compared to adults, are believed to notice less, omit more, forget faster, be more susceptible to suggestion and to intermingle imagination and perception in remembering (Johnson and Foley, 1984). Wallace, McKenzie, and Nader (1985) reported that 11- to 13-old children recalled only 46% of their activities during the

previous 7 days and 55% to 65% during the previous 24 hours as documented by three adult observers. In the study of the 7-day recall, children completed two recalls in less than a 7-day period, so some days were recalled twice (Sallis, Buomo, Roby, Micale and Neslon, 1993). The correlations of overall PA scores on matched days were computed for short (2-3 days) and long (4-6 days) intervals between recalls. Across all ages, when children had to remember only the past 2 to 3 days, the reliability of recall was r=. 79. When children had to remember the past 4 to 6 days, the reliability was r=. 45. This finding on the length of the time to recall makes an important difference in accuracy, has led to an emphasis on brief recalls, especially for younger children. However, in order to collect representative information on the young people's habitual PA level at least 4 to 7 consecutive days of monitoring are required (Janz, Witt and Mahoney, 1995; Trost *et al.*, 2000).

While children may omit important information simply because they are unable to remember what activities they have done, they may also omit information by failing to pay attention to the specific characteristics of activity which are important to the investigator (Baranowski, 1988). Therefore, what may be vital information for the researcher may not be deemed as important by the respondent completing a form or participating to an interview, thus vital information could be ignored. Recall problems aside, other sources of error may result if the length of assessment is inappropriate. Insufficient detail and accuracy might occur if the measure is too short, or too long. If the questionnaire form is long and onerous and the respondents are less motivated to fill the form, they may deliberately cut responses short, rush them and therefore make mistakes, or respond inaccurately because of boredom (Cale, 1994).

To summarize, self-reported PA should be used in children older than 9 to 10 years old. The major errors associated with self-report in children stem from problems with definition, cognition, time length of assessment, and failure to account differences in PA level between weekday versus weekend and seasonal variations. Of course, the magnitude to which the measures are affected by such problems will depend on the type of the self-report measure and on the characteristics of the population studied.

Taking into consideration the problems related to the children's cognitive process and the definition of the desired variables, the implications that these assumptions have in

terms of attaining an accurate recall of PA from children are quite obvious in the validity and reliability of the method. Procedures and issues relevant to the validity and reliability of the self-report measures will be discussed in the following section.

2.2.3 Reliability and validity of self-reports

Reliability of self-reports

Reliability is the consistency with which a test or an observer measures what is intended to be measured and the extent to which the measurements are repeatable. To examine reliability a test-retest procedure is traditionally the optimal method (Lamb and Brodie, 1990). Reliability of an instrument may be affected by a number of factors such as the characteristics of the test, the testing situation, the measurement process, the person making the measurement, the statistical analyses of the data, and the subjects being measured (Baumgartner and Jackson, 1982). Moreover, an important consideration when evaluating the reliability of PA behaviour, is an understanding not only of the possible error involved with repeated measurements of the same behaviour, but also of the error included by a lack of stability of the behaviour itself, that is, when the behaviour varies over time (Kohl, Fulton and Caspersen, 2000). Thus, despite the fact that the assessment method may be reliable, changes in the behaviour (e.g. weekdays versus weekend or different activity choices from day-to-day during leisure time) could influence reliability. One other consideration that should be taken into account is the length of the time interval between the two measures or administrations of the self-report. If the period of activity recall is 7 days, for example, then a retest delay may be affected by memory (Sallis, Buomo, Roby, Micale and Neslon, 1993).

A summary of reliability studies of self-report methods has been published in a critical review by Kohl, Fulton and Caspersen (2000). This review stressed some important considerations for future research in this area. Firstly, most studies were designed to evaluate reliability over a relatively short period (from a few hours to a few weeks), and these studies yielded modest to high correlations; however, test-retest reliability was generally lower in the studies in which the period of time between the assessments was longer. For example, Andersen and Haraldsdottir (1993) addressing one-year recall of hours of activity spent in different sports twice in a period of 8

years apart, found test-retest correlation coefficient of 0.20; whereas, Weston, Petosa and Pate (1997) addressing a previous day PA recall in a period of 45 minutes apart found test-retest correlation coefficient of 0.99. Secondly, characteristics of children and adolescents investigated were inconsistent across the studies. For example, most reports included both boys and girls as study participants, but gender-specific results were reported and compared only in a few studies (Sallis, Buono, Roby, Micale and Nelson, 1993). Thirdly, the test-retest reliability appears to be lower for younger children than for older children and adolescents. For example, when compared with younger participants, higher correlations were found among the older children for assessments taken by the Godin-Shephard survey (Godin and Shephard, 1984) and a modified 7-day Physical Activity Recall Sallis, Buono, Roby, Micale and Nelson, 1993).

Conducting therefore a reliability procedure of a self-report measurement a number of considerations should be taken into account for a comprehensive interpretation of the findings; these include the age of the respondents, the gender and the time interval between the two administrations.

Validity of self-reports

Validity is the degree to which an instrument measures what it is intended to measure (Nunnally, 1967). Problems in conducting validity studies arise because the most appropriate way to assess validity is not really known and there is no accepted criterion method of assessing PA (Aaron, Kriska, Dearwater, Cauley, Metz & LaPorte, 1995; Kohl, Fulton and Caspersen, 2000). Thus, without an adequate criterion by which techniques can be compared, it is impossible to determine the true validity of any method (Montoye, Kemper and Saris, 1996). In the case of studies of validity so far, there are no methods with non-error against which to assess self-reported activity. Because of the differences in precision, the choice of validation standard is a critical aspect of studies of PA assessment. Validation efforts must rely on a more precise method as the choice of a criterion against which to measure a test method (Allor and Pivarnik, 2000). Currently, double-labelled water method is considered the *gold standard* for the assessment of energy expenditure. Doubly labelled water is a method that can assess total energy expenditure (and hence activity) in both the laboratory setting and the field. The main drawbacks of the

method are the high cost, and the fact that information is limited to total energy expenditure with no frequency, intensity or duration information.

Validation studies of PA assessment methods are usually designed to be either *indirect* or *concurrent* studies. Indirect validation studies are designed to evaluate the extent to which the measurement in question corresponds to constructs or parameters that are theoretically related to it (Last, 1983). In PA assessment, indirect validation studies are designed to assess the extent to which PA is related to a parameter or construct to which it may be related, for example change in a measure of cardiorespiratory fitness as measured by a treadmill exercise test. Indirect validation has frequently been used in studies of PA assessment because of a lack of the 'gold standard' against which PA assessment methods can be compared (LaPorte, Montoye and Caspersen, 1985).

Concurrent validation studies are designed to measure both the 'test' and a presumably more accurate measure of the same parameter as the validation criterion at the same or similar point in time (Last, 1983). Concurrent validity therefore is the degree of accordance with the other widely used and acknowledged physical activity measures. Thus, when different methods of measuring physical activity are being compared with each other it is expected that they will give similar results when they measure the same behaviour. This compatibility must be present when the comparison is being done between questionnaires (subjective method of estimating physical activity) (Kowalski, Croker and Faulkner, 1997; Kowalski, Croker and Kowalski, 1997) or between questionnaires and objective measures of estimating physical activity (Matthews and Freedson, 1995).

Indirect and concurrent validity studies provide different information, in that, with concurrent validation designs the validation criterion is another more precise measure of the same parameter being assessed. Indirect validation techniques, on the other hand, use a by-product or correlate of the physiologic properties or phenomenon under study as a validation criterion. In table 1 a sample of relevant published studies designed to evaluate the validity of self-reports for use with children and adolescents are listed.

Table 2.2.1: Characteristics and validity of self-report measures of PA for children

Study	Sample	Instrument	Validation standard	Design	Findings
Bouchard, Tremblay, LeBlanc, Lortie, Savard & Theriault, (1983)	150 children aged 14.6 yrs (SD 2.9 yrs)	3-day record of every 15 min of 2 weekdays and 1 weekend day	Submaximal cycle test (PWC)- sum of six skinfolds - % body fat	Indirect validation study of energy expenditure derived from 3-day diary	Correlation coefficients between mean energy expenditure (kcal/day) were 0.31 with PCW, 0.40 with sum of 6 skin folds and 0.13 with % body fat.
Bush, Iannotti, Zuckerman, O'Brien & Smith (1991)	524 subjects 4th to 5th grade children	3-day PA recall	Mother's 3-day PA recall score	Concurrent validation within families, comparing mother's and child's PA	Significant agreement found between reports from mother and reports from children (Kappa coefficient)
Cale (1994)	16 students of 9 to 10 yrs	The 4 by one-day PA recall (interview self-report)	Heart rate monitoring and observation	Concurrent validation of previous day PA recall for 4 different days (2 weekdays & one weekend).	A correlation of 0.61 found between the time pupils reported to spend in moderate to vigorous PA in the interview questionnaire ant the time they spend with the heart rate above139 beats per min. Also, a correlation of 0.79 found between the scores obtained from the questionnaire an the scores obtained from the observational records (Pearson correlation coefficient).
Craig, Bandini, Lichrtenstein, Schaefer & Dietz (1996).	45 girls (8 to 11 yrs)	1-year recall of average number of hours/week in 33 PA at a minimum intensity of 4 METs	Nonresting energy expenditure measured by Doubly Labeled Water	Concurrent validation	Correlation coefficient between PA estimates and nonresting energy expenditure was, 0.47 (Pearson correlation coefficient).
Finegan, Niccols, Zacher & Hood (1991)	125 mothers of 7-years-old children	Play activity questionnaire (Parent-report measure of children's play preferences)	Mother's reports of their child's activity level	Concurrent validation	Conner's scale low correlated (0.01-0.42) with factors of Play Activity Questionnaire (Pearson correlation coefficient).
Janz, Golden, Hansen & Mahoney (1992)	40 girls & 36 boys, 11 yrs old	12 hour recall of activity	Heart rate monitor	Concurrent validation	Correlation coefficient between recall of activity and minutes >60% heart rate reserve was -0.38 (Pearson correlation coefficient).
Janz, Golden, Hansen & Mahoney (1992)	40 girls & 36 boys, 11 yrs old	Simple activity rating	Heart rate monitor	Concurrent validation	Correlation coefficient between simple activity rating and minutes >60% heart rate reserve was -0.18 (Pearson correlation coefficient).
Janz, Witt & Mahoney (1995)	15 girls & 15 boys aged 7 to 15 years	Activity Rating Instrument	CSA accelerometer	Concurrent validation	Correlation coefficients between self-rating and average movement count ranged from -0.03 to 0.17 (Pearson correlation coefficient).
Janz, Witt & Mahoney (1995)	15 girls & 15 boys aged 7 to 15 years	3-day recall of sweat episodes	CSA accelerometer	Concurrent validation	Correlation coefficients between self-rating and average movement count ranged from 0.46 to 0.48 (Pearson correlation coefficient).
Janz, Witt & Mahoney (1995)	15 girls & 15 boys aged 7 to 15 years	3-day aerobic activity recall	CSA accelerometer	Concurrent validation	Correlation coefficients between self-rating and average movement count ranged from 0.05 to 0.39 (Pearson correlation coefficient).
Kowalski, Crocker & Kowalski (1997)	85 of 8th to 12th grade	PA Questionnarie for Adolescents (PAQ-A)	CALTRAC – Activity Rating - Leisure Time Exercise Questionnaire	Concurrent validation.	The PAQ-A was moderately correlated to the activity rating (0.73), the Leisure Time Exercise Questionnaire (0.57), the CALTRAC (0.33) and the

			& 7-day PA recall interview		7-day PA recall interview (0.59) (Pearson correlation coefficient).
Murphy, Alpert, Christman & Willey (1988)	89 girls & 124 boys (6 to 18 years)	Parental report of global assessment of child's overall activity	Oxygen uptake measured by cycle ergometry	Indirect validation study	Parental reports of greater activity were associated with higher cardiorespiratory fitness of children (ANOVA).
Murphy, Alpert, Dupaul, Willey, Walker & Nanney (1990)	92 boys & girls (10 to 17 yrs) who participated in a blood pressure study	Pictorial posters depicting various intensities of activity	Oxygen uptake measured by cycle ergometry	Indirect validation	Children who self-classified in sedentary category had significantly lower oxygen consumption than that measured among children who self-classified into moderate or vigorous categories (ANOVA).
Noland, Danner, DeWalt, Fadden & Kotchen (1990)	21 girls & boys in pre-school (mean age 4.25 years)	Parent rating of PA	Videotape of activity in controlled setting and home observation using CAPS observation rating scheme	Concurrent validation	No correlation found between observed activity during 20-min observation period with at-home reported PA (correlation coefficient)
Ridley, Dollman and Olds (2001).	30 students (11.9 yrs)	Computer delivered multimedia 1-day PA questionnaire (CDPAQ)	CALTRA – Heart rate monitoring	Concurrent validation.	The QDPAQ was moderately correlated with CALTRAC (0.36) and HRM (0.63) (Pearson correlation coefficient).
Sallis, Buomo, Roby, Micale & Nelson, (1993)	93 students of 5th – 8th – 11th grade.	7-day Physical Activity Recall (recalled *very hard* activity only)	Heart rate monitoring (min in heart rate intervals above specific intensity thresholds).	Concurrent validation.	A 0.44 and 0.53 correlation coefficient found between recalled *very hard* activity and min spent in intervals of heart rate>140 beats per min and >160 beats per min respectively. There was an increasing correlation with increasing age (Pearson correlation coefficient).
Sallis, McKenzie & Alcaraz (1993)	35 girls and 34 boys of 4th grade	Yesterday Activity Checklist	CALTRAC	Concurrent validation of after-school PA (one single day).	A 0.33 correlation coefficient was found between CALTRAC and energy expenditure estimated from the single day checklist (Pearson correlation coefficient).
Sallis, McKenzie & Alcaraz (1993)	528 children of 4th grade	Yesterday Activity Checklist	CALTRAC	Concurrent validation.	A 0.098 correlation found between CALTRAC and weekday PA index score. Correlation coefficient between CALTRAC and weekend PA index score was 0.093 (Pearson correlation coefficient).
Sallis, McKenzie & Alcaraz (1993)	528 children of 4th grade	Child's report of summer-time organised sports and class participation	CALTRAC	Concurrent validation.	A 0.038 correlation found between CALTRAC and child's report of summer class participation. Correlation coefficient between CALTRAC and child's report of participation in summer sports teams was 0.11 (Pearson correlation coefficient).
Sallis, McKenzie & Alcaraz (1993)	35 girls & 34 boys of 4th grade.	7-day recall of after-school PA	CALTRAC	Concurrent validation (average of 3 days of monitoring).	Correlation coefficients between CALTRAC and energy expenditure estimated from weekly recall was 0.11 (Pearson correlation coefficient).
Sallis, Strikmiller, Harsha, Feldman, Ehlinger, Stone, Williston & Woods (1996)	70 girls & 55 boys of 5th grade.	PA checklist interview	CALTRAC & Heart rate monitoring	Concurrent validation.	A 0.32 correlation found between CALTRAC and child's report of min in moderate to vigorous PA. Correlation coefficient between HRM and child's report of min in moderate to vigorous PA was 0.50 (Pearson correlation

					coefficient).
Simons-Morton, O' Hara, Parcel, Huang, Baranowski & Wilson (1990)	44 students of 3rd grade	Recall of moderate to vigorous PA recall	Direct observation	Concurrent validation of PA during PE class	Percentage of agreement was 86.3% between observed moderate to vigorous PA episodes >10 min and those reported by children (Percentage agreement).
Simons-Morton, Taylor & Huang (1994)	27 students of 3rd grade and 21 students of 5th grade	PA interview (PAI)	Heart rate monitoring (HRM)	Concurrent validation of previous day recall of PA using PA record as memory aid	A correlation of 0.57 and 0.72 found between min >180% resting heart rate and PAI-reported moderate-to-vigorous intensity minutes for 3rd and 5th grade respectively (Pearson correlation coefficient).
Weston, Petosa & Pate (1997).	48 students 7th & 12th grade	Previous day PA recall (energy expenditure from the end of the school day to bedtime)	CALTRAC – Pedometer counts	Concurrent validation	Correlation coefficients between total energy expenditure were 0.88 with CALTRAC and 0.77 with pedometer counts.

The concurrent validation criteria that have been used for energy expenditure are the doubly labelled water technique, direct observation or monitoring. Indirect validation criteria included performance tests, measurement of oxygen uptake, indices of body fatness, and parental PA scores. For studies with children aged less than 10 years old, analyses revealed low validation coefficients. These findings indicate that a number of self-report instruments failed to measure what they intended to measure in young children. Among children and adolescents of 10 years and older, when monitoring devices were used as the validation standard, validation coefficients for the self-reported data ranged from 0.03 to 0.88; in the majority of these studies validation coefficients ranged from 0.30 to 0.50. It is important to note that only one study was found in which a self-report measure validated against the doubly labelled water method.

The most completed series of studies on the validity of self-report instruments was published by Sallis, MacKenzie and Alcaraz (1993) comparing the validity of four different instruments among 66 fourth grade students in a classroom setting. In this study the criterion measure was the CALTRAC; none of the four involved instruments (two checklists, a 7-day recall, and a 7-day tally of the number of days a child remembered being physically active) was highly correlated with CALTRAC activity counts. Authors suggested that because of the relatively low correlation, some combination of self-report and monitoring devices may increase validity and accuracy of the measurement.

Three studies among young people were conducted using the accelerometer CSA as a validation criterion (Janz, Witt and Mahoney, 1995). The CSA has several advantages over other accelerometers, including a smaller size, easier attachment to study participants, and a longer monitoring period. This accelerometer is of particular interest for the validation studies presented in the following section because it has been proved valid and reliable across a range of ages and types of activity (Sirard, Melanson, Li and Freedson, 2000; Bassett, Ainsworth, Swartz, Strath, O' Brien and King, 2000; Ekelund, Sjostrom, Yngve, Poortvliet, Nilsson, Froberg, Wedderkopp and Westerterp, 2001; Welk, Blair, Wood, Jones and Thompson, 2000). However, in these studies, low to modest correlations (0.03 to 0.48) were found between the questionnaire measures and the CSA indices. These results support the low validity findings from other studies of self-report instruments and suggest that the CSA does not correlate highly with self-reported measures of PA (Kohl, Fulton and Caspersen, 2000).

However, except children's cognitive processes that affect the accuracy of the recalled information about their level of PA, a large part of the discrepancy detected between self-report measures and objectives methods of assessing PA may be due to: a) the sensitivity of each measure to capture all PA dimensions, and b) the activities included in self-report measures in order to produce a personal activity score. Some researchers highlighted the transitory nature of children's PA (Bailey, Olson, Pepper, Porszasz, Borstow and Cooper, 1995). The median duration of low and medium intensity activities was found to be a mere 6 seconds and of high intensity activities 3 seconds; none was longer than 22.5 seconds. This rapid change in activities in young people and in particular in children, was also stressed by Saris (1985) who stated that prolonged exercise and voluntary involvement in high intensity PA is not part of the natural activity pattern in children. Thus, whilst some self-report measures are searching for 10 to 20-minute periods of sustained activity in specific intensities, they fail to detect sporadic activity, which can be captured by monitor devices in an accumulative way throughout the day. Furthermore, self-report measures usually search for specific types of activity in specific setting, failing to capture a large part of the children's habitual activity spectrum.

In summary, interpretation of validity data from PA assessment techniques seems to be quite complex. Much of this complexity lies in the fact that no single or widely available validation criterion exists against which to compare test methods. Laboratory methods such as calorimetry and doubly labelled water methods are precise, but are not the appropriate validation criterion for studies in free-living people because of their own limitations, including feasibility of the protocol and cost. At present, a feasible solution in validation of self-report measures is the use of monitoring devices as validation criterion because recent studies have shown that they provide an accurate assessment of PA (Sirard, Melanson, Li and Freedson, 2000; Bassett *et al.*, 2000; Ekelund *et al.*, 2001; Welk *et al.*, 2000). However, the data suggest low to moderate validity for the self-report and monitoring measures of PA assessment. Results are quite variable, due in large part to the lack of consistency among study designs and methods across investigations. In some of the studies presented in Table1 indirect measures such as estimates of body composition, aerobic power, or fitness tests have been adopted as validation criterion. Although these factors are related to PA, either as a precursor or consequence, they also are influenced by other genetic and environmental factors (Kohl, Fulton and Caspersen, 2000). Thus, the use of indirect validation standards may not be served as a precise criterion against to which compared PA scores obtained from self-report measures.

2.2.4 Scoring Procedures

The self-report measurements described in Table 1 outline a number of different procedures for scoring PA. Physical activity behaviour is reported as ratings, activity scores (indexes) with arbitrary units, times, calories expenditure, or other summary scores (Sallis, 1991). A more extensive PA questionnaire measures the type of activity (e.g. leisure, sport, transportation, school physical education etc) the frequency of PA performed during a particular time frame (typically one day, week or month) and estimates the intensity (degree of vigour or metabolic cost) of the activity. However, more sophisticated self-report instruments activity scores are expressed in terms of energy expenditure. For example, in The Paffenbarger Physical Activity Questionnaire (Paffenbarger, Wing and Hyde, 1978), the Four by-1 day Physical Activity Questionnaire (Cale, 1994), and the 7-Day Recall Physical Activity Questionnaire (Sallis, Buomo, Roby, Micale & Nelson, 1993) all rely on estimates of

energy expenditure based on established energy costs. The methods employed to make the calculations in these questionnaires are of particular interest for the purpose of this project. The researcher can analyze the data at several levels according to the equation described by Kriska and Caspersen (1997) (see figure 2.2.4.a).

The two most common estimates for questionnaire data are derived from summing time spent in PA; or time weighed by an estimate of the intensity of that activity. Total time is derived by multiplying frequency by duration. A summary estimate of energy expenditure can then be derived by multiplying the average hours per week of reported activity by the average intensity, expressed as metabolic cost or METs.

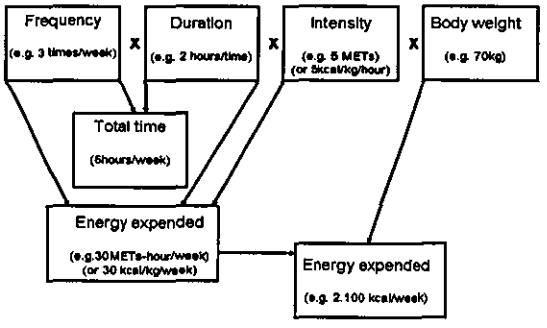


Figure 2.2.4.a: Computation of summary estimates of PA (Kriska and Caspersen, 1997).

One MET represents the metabolic rate of an individual at rest and is set at 3.5 ml of oxygen consumed per kilogram body mass per minute, or approximately 1 kcal/kg/h. Thus, these summary estimates of energy expenditure are calculated without consideration of the individual's body weight. The method assumes that a task performed by a heavy individual raises the metabolism to the same extent (in percentage terms) as the same task performed by a lighter individual, even though the caloric expenditure might be different. The energy costs of the specific activities used in the calculations are presented in the *Compendium of Physical Activity* which was developed and updated by Ainsworth and co-workers (Ainsworth, *et al.*, 1993; Ainsworth, Haskell, Whitt, Irwin and Swartz, 2000). However, when using this method the researchers should take into consideration a number of assumptions which may affect the accuracy of the energy expenditure estimation. First, a MET value in a list is assumed to be representative of the manner in which the individual performed

the activity. However, sporting activities can be performed for different purposes, in a variety of intensities, skill levels, and environmental conditions. Therefore, the actual energy expenditure across subjects who report the same amounts of time in the same activity may vary considerably (Kriska and Caspersen, 1997). Second, weighting PA by intensity also assumes that body weight is proportional to resting metabolic rate, and that the relative increase in the metabolic cost of a specific activity above resting is constant from person to person, regardless of body weight. The third concern is the fact that some activities do not have intensity codes and therefore estimations become from activities having similar movement patterns (Ainsworth, Haskell, Whitt, Irwin and Swartz, 2000). A last concern comes from the use of existing methods to estimate energy expenditure among children and adolescents from generalized metabolic equivalent (MET) tables developed for adults (Ainsworth, *et al.*, 1993; Sallis, Buomo and Freedson, 1991).

2.2.5 Recommendations and new directions

The need for valid self-report measures for the assessment of PA in young people has been widely acknowledged (Dishman, Washburn and Schoeller, 2001; Durante and Ainsworth, 1996; Pratt, Macera and Blanton, 1999; Twisk, 2001). It has been recommended that the development of valid and reliable PA assessment techniques is particularly important for facilitating public health efforts to promote PA among young people (Cavill, Biddle and Salllis, 2001). Kohl and colleagues stressed the crucial role on PA promotion of the adequate surveillance that uses valid and reliable assessment methods. Valid surveillance systems allow not only for an accurate baseline assessment, but also for a dependable set of ongoing measurements that can be used to measure secular changes (Kohl, Fulton and Caspersen, 2000).

The introduction of this project presented the main source of error on the accuracy of self-report to assess PA in young people; two major constraints had been identified as the human cognitive process and the definition of the desired variables (Baranowski, 1988). Therefore, valid and reliable PA information using self-report methods can be collected if they eliminate the negative effect of these constraints.

The cognitive skills necessary to self-report PA activity need to be identified and the knowledge of the best way of gathering accurate information from children needs to be gained (Cale, 1994; Durante and Ainsworth, 1996). It has been recommended that further research should identify and develop reporting formats for the children's cognitive characteristics in order to eliminate recall problems. The accuracy of the recall in children depends in part on the time length of the recall, the form of the questions, the detail that is requested, training before the recall, and the use of prompting questions and probes (Sallis and Owen, 1999).

In terms of time length in retrospective recalls, questions which ask respondents to remember their activity over the past week, month or even year may be not help memory enhancement and may be therefore inappropriate for children. Despite the fact that one-day recall seems to provide more accurate information than other prolonged recalls, it is often characterized by low accuracy because PA is not a stable behaviour (Baranowski, Thompson, DuRant, Baranowski and Puhl, 1993; Hovell, Sallis, Kolody and McKenzie, 1999). Thus, according to the findings, a self-report measure should recall PA information of a minimum period of 4 to 7 consecutive days in order to obtain an accurate estimation of the behaviour (Janz, Witt and Mahoney, 1995; Trost, Pate, Freedson, Sallis and Taylor, 2000).

In terms of the form of the questions and the detail of the information requested, experts recommend a number of novelties (Baranowski, 1988; Sallis, 1991). It is suggested that children's memory can be more efficient if respondents are asked to remember sequentially activity events during the day and report a 'stream of activity'. The 'segmented day' method of recall has been used in studies in the past and represents another possible way of reducing error. This procedure, which involves children recalling activities before school, at school, and after dinner, has been found to elicit more accurate information than reporting activities for the day as a whole (Baranowski *et al.* 1984). The segment-day approach helps the respondent to identify other time-related cues during the weekday or the weekend day, which in turn cues memory for activity more accurately.

Another critical variable related to the accuracy of children's self-report related to the estimation of the duration and the intensity of PA. Problems usually arise when young

people are asked to make precise judgements of time and to report the intensity of PA they performed. Baranowski *et al.* (1984) found that children eliminate the error of time estimation when they report duration of PA in a trichotomous format (namely, no activity, less than 20 minutes, or more than 20 minutes of activity) than an exact estimation of time. In terms of intensity judgement, young people usually have similar difficulty in estimating it. For this reason self-report measures ask for information about sweating, breathlessness or 'huff and puff' activity; obviously, only a crude estimation of the perceived intensity may be obtained and therefore the true intensity may be masked. Currently, there are no studies examining the magnitude of the error related with the estimation of time and intensity, when respondents recall their involvement in habitual PA or exercise. According to Cale (1994), another way of enhancing the integrity of activity information may be to identify habitual events such as the activities a child performs on specific days of the week, the habitual TV programmes watched, and any unusual events which may have occurred in the past week. By identifying such 'habit' patterns a more accurate report may be gained (Baranowski, 1988).

While improving recall is of obvious importance, making improvements to this alone will not overcome other errors and biases in self-report measures. A second major source of error with self-reports stems from the definition of the desired variables. At present time, the exact mode, duration and intensity of activity required to produce health benefits is open to debate, especially for young people (Cavill, Biddle and Sallis, 2001; Twisk, 2001). Also, the importance for the investigator of intermittent, accumulated, moderate-intensity physical activity (HEA, 1998; Riddoch, 1998) creates additional difficulties both to themselves and also to the respondents. Investigators face the problem of formulating the appropriate questions in order to capture all the important PA which a child may perform throughout the day; children probably confront additional difficulties because they have to recall a number of non-scheduled activities which may be performed sporadically across the day in a medium intensity (e.g. walking). Investigators have therefore recommended that the task must be clearly defined for children prior to the assessment. Investigators must also consider to what extent the formulation and the content of the questions included in a self-report measure are appropriate for respondents' activity profile, developmental level, age and attention span.

Finally, the development of detailed protocols for implementing self-report methods has been recommended (Baranowski, 1988). Attention should be given to the development of standard training protocols and administration procedures for self-report measures (Sallis, 1991). Protocols must pay attention to interviewer training, definition of the variables and concepts, procedures for handling both usual and unexpected responses, and procedures in order to secure precision in data collection.

These recommendations have formed the basis for the development of the *Physical Activity and Lifestyle Questionnaire (PALQ)* for young people, which briefly is outlined in the following section.

2.3.0 Designing the self-report questionnaire – Preliminary studies

Following the review of literature on monitoring PA with self-report measures, this section outlines in summary the procedures which were followed and the considerations which were made in designing the PALQ. The proposed characteristics of the measure are established early in this section following recommendations made in the literature. In the latter part of the section the final characteristics of the PALQ are outlined.

In fulfilling the aim of developing a self-report measure of PA, designed specifically for use with Greek children, a number of decisions with regard to the design of the measure had to be made. Those were made taking into consideration recommendations reviewed in the literature, as well as the characteristics of the Greek young people. These decisions were associated with:

- The age of children: It was decided that the PALQ would be designed for children aged of 11+ years old.
- The nature of the activity to be measured: It was decided that the measure would encompass way of transportation, PA at school (PA at school breaks, at physical education lesson, participation in school sport clubs), PA at leisure time, participation in organized sport clubs (after school), participation in private sport clubs (after school), and participation in PA during weekends.

- Dimensions of PA: As there is still controversy over what constitutes appropriate PA and what kind and how much PA could produce the optimum health benefits in children and adults , it was decided to measure a) all dimensions of FITT acronym in different types of activity, b) total energy expenditure, and c) vigorous ('huff and puff') aerobic activity. Furthermore, it seemed more appropriate to assess all aspects of PA rather than specific types of activity performed in specific intensities or durations because children's activity is sporadic and change frequently. The questionnaire therefore, proposes to elicit activity information with respect to the following: i) average daily energy expenditure, ii) the mean daily amount of time spent in moderate activity, iii) the mean daily and weekly amount of time spent in vigorous PA, and iv) the profile of PA regarding the mode of activities collected and formed the total score of the participant. The *Physical Activity Profile* can contribute to a better understanding of the priorities that an intervention program should establish. Furthermore, the amount of time spent in vigorous activity would provide some indication as to the amount of aerobic activity the children were engaging in and could result in fitness conditioning (see Appendix 1).
- Scoring procedure: It was decided that the PALQ will use an objective scoring procedure to assess PA. The daily energy expenditure (in kcal.kg-1.day-1) would be adopted. To calculate energy expenditure a scoring system similar to those which have been used in 7-Day Recall Questionnaire (Sallis, Haskell and Wood, 1985; Bouchard *et al*, 1983) was adopted. The scoring procedure is explained in detail in appendix 1.
- Time length of the recall: The PALQ would determine the PA levels of children by gathering information from the previous week's activities. Throughout a 7-day recall representative information of the respondent's PA habitual level activity both for the weekdays and weekend would be collected.
- Format of the PALQ: To enhance recall, the forms would be divided in segments of the weekdays, namely, PA at school and PA after school. Decisions related to formulation of the questions related to time, intensity and frequency estimation of PA would be obtained after careful consideration of a number of parameters related to the children' s cognitive

characteristics and the definition of the desired variables (e.g. intensity of the activity). Furthermore, for ease of administration respondents would be provided with checklists of common activities for Greek children.

- Administration procedure & Guidelines to interviewers: It was decided to develop a standard training protocol and administration procedure. Also, special attention was placed on the handling of the PA data in terms of the computation and statistical analysis (see Appendix 1).
- Validity and reliability procedures: It was decided that a systematic and vigorous evaluation of the PALQ would be adopted, according to the recent recommendations presented in the literature.

Prior to any firm decisions being made with respect to the design of the final version of the PALQ, three preliminary studies in school children of ages ranging between 10- to -15 years old were conducted.

2.3.1 Study one: Organising the activity checklists

Following the review of literature and the proposed design and format of the self-report measure, the types of activities to be included in the form's checklists were established. This study established the types of physical activity and sports as well as the activities during free time that were included in the forms' checklist, in order to offer a representative range of the activities of the Greek young people.

Both activity categories were selected on the basis of a) the answers provided by a number of elementary (12 boys – 9 girls) and secondary (10 boys – 8 girls) students who filled a short self-administered questionnaire in the classroom, b) 6 school physical education teachers (3 from elementary school and 3 from secondary school) who responded in a face to face interview, and c) 16 guardians of elementary school students (all females) who responded in a group interview in the classroom setting. This survey was made in order for students, teachers and parents to provide a number of potential activities for inclusion in the PALQ checklists. Furthermore, the specific checklist concerning the activities in which Greek youths were involved during free time was developed in the basis of the questionnaire used in the European study entitled *Comparative Analysis of Youth Lifestyle in Selected European Countries*

(Pieron and Ledent, 1996). The activities included in this initial checklist covered a range of 31 typical social, academic, functional and recreational activities of young people in Greece. A combined sample of activities was drawn up from the questionnaires and the interviews and resulted in a final list of 71 activities.

These activities were grouped in a questionnaire which was administered in a classroom setting to a) a sample of 22 elementary school students (9 boys and 13 girls) of age 11- to 12 years old, and b) to a sample of 23 secondary school students (11 boys and 12 girls) of age 14- to 15 years old, from two local schools in Thessaloniki. The responses to the questionnaire proved to be similar across the two samples. However, some activities were more prevalent in terms of age (for example none of the elementary students answered 'yes' in the question *'Please, state how many days last week you participated in the following activities..... : I spend my time with my boyfriend/ girlfriend'*) and gender (for example only boys reported 'yes' in the question *'Please, state how many days last week you participated in the following activities..... : I went with my father for hunting or fishing"*. A number of the activities on the list were not found to be popular and were reported to be of no interest to the interviewees (for example *"I am working in a part time job to earn some money"*).

For the exclusion of activities from the forms, it was decided that if 75% of the pupils did not engage in a particular activity, then it could be omitted from the final checklists (Cale, 1993). Taking into consideration the danger of omitting some activities from the forms that might be important for some respondents, it was decided to include an *'any other activity'* category in the final checklists.

2.3.2 Study two: Time and intensity perception

Background

An important process involved in self-reporting of PA is the estimation of time spent in activity as well as the intensity which it is performed. The ability to recall past PA episodes accurately is important to identify the associations between PA and health outcomes. However, efforts to validate self-reports of PA demonstrate low to moderate associations between recalled information and both direct and indirect measures of PA (see section 2.2.3). According to Durante and Ainsworth (1996), at best the surveys fail to explain more than 45% of the variance in these measures of PA. The important question is what accounts for the unexplained variance in self-report measures. A large part of this variance may be attributed to error in the cognitive operations employed in recalling and reporting PA. For example, some error may be due to respondents omitting the types of activities that they have done in the past. Other error may be attributable to their inability to accurately recall the details of a past PA, such as the duration or the intensity of a particular episode. Factors that influence the degree of bias include the interval between the activity in question and the recall episode, the salience of the activities recalled, the social desirability of the responses, the personal characteristics of the respondent (e.g. gender, age, race, education), the behaviour of the interviewer, and the interviewing techniques used to obtain the information (Coughlin, 1990).

So far, a very limited number of studies have examined the degree of the error associated with the perceived time and intensity, when interviewees recall their involvement in habitual PA and/or exercise (Baranowski, 1988; Friedenreich, 1994; Kledges, *et al.*, 1990; Sallis *et al.*, 1985). Also, there are no studies examining how different intensities of exercise are related with the perception of time, and what is the degree of error associated with this estimation when the recalled PA information covers prolonged periods of time.

Recently, experts have proposed some innovations in order to improve the data quality in PA surveys. For example, Durante and Ainsworth (1996) proposed a cognitive model of the question-answering process in order to minimize inaccuracies arising from problems related to cognitive processing with regard to the type and the frequency of recalled events. In order for the interviewees to report more accurately

the intensity of an activity episode, Montoye and colleagues (1996) proposed that a subjective rating of exertion, such as Borg Scale (Borg, 1982), might improve some of the questionnaire/interviews if incorporated into the survey. In the relevant literature only one questionnaire was found in which the interviewee was asked to report his/her perceived level of exertion (degree of effort) by using numeric values (Paffenbarger, Wing and Hyde, 1978); however, there is not validity evidence of the accuracy of such a scale (Kriska and Caspersen, 1997).

Taking into consideration the nature of the information required by the PALQ, the concerns over children's ability to accurately estimate time and intensity (Baranowski *et al.*, 1984; Sallis *et al.*, 1993; Sallis and Owen, 1999) and the prompts for identifying sources of bias and variance in the recall of PA using questionnaires (Lamonte and Ainsworth, 2001), it was decided to examine the accuracy with which interviewees are able to make judgements about time and intensity when recall past activity. The purpose therefore of this study was to investigate the accuracy of recalled information relevant to perceived time and intensity of PA comparing it with the objective time and intensity of participants.

Method

Sample

Seventy-five physical education students of our university, 42 girls and 33 boys, 19-21 years of age ($\underline{M}$=20.2) enrolled in the ski course as part of their undergraduate program. All subjects had no previous experience in skiing and they voluntarily participated in the study. This sample and the specific setting of activity were chosen in order to:

- Create a well controlled environment for the experiment.
- Have continual and direct access to the sample because the subjects remained for 9 consecutive days in a specific setting.

Procedure

The study was conducted in a ski resort. A sample of nine or ten subjects was examined each day for eight (8) days. Subjects participated in two 45 minutes practice sessions each day and their practice included specific fundamental skiing exercises.

Prior to the start of the practice session, each subject wore a Polar Heart Rate Monitor (Polar HRM) that recorded the intensity of the practice. After giving the prescribed instructions, subjects were engaged in the ski practice session. The data from the HRM were collected at the end of the two practices sessions each day. All sessions were videotaped and three trained observers recorded and evaluated the practice time (time on task) of each individual by completing an observation protocol.

The following day subjects completed a short physical activity questionnaire (Borg 1982). They were asked to report their perceived intensity and their time on task of each of the two practice sessions of the previous day. Subjects were then divided in three groups according to their mean heart rate (HR) scores during the practice. The cut-points for the three groups are suggested by Grosser and Starischaka (1998), and Zintl (1990) and correspond to adults. The first group ($N_1 = 41$) was consisted of students whose mean HR was fewer than 130 pulses per minute (p/min) *(low intensity group).* Students who worked in a range of mean intensity between 130-170 p/min ($N_2 = 28$) comprised the *medium intensity group.* Finally, students with a HR mean more than 170 p/min comprised the *high intensity group* ($N_3 = 6$).

Measures

Measure 1: Objective Assessment of Exercise Intensity: In order to objectively assess the intensity of exercise, the Polar HRM recorded the heart rate during practice. This device, compared to laboratory methods, has been proved to be a valid and reliable method of estimating work performance as well as a functional and stable method in a variety of field conditions (Leger and Thivierge, 1988; Kalkwarf, Haas, *et al.*, 1989).

Measure 2: Objective time assessment: The most basic level of duration recorded was the observation of *the time on task* which was described as the time students spent in a state of motion devoted to the fitness activity (Chung 1989), a single behavior, event, or episode (Cooper, Heron and Heward, 1987). For this reason practice sessions were videotaped (Chung 1989) and observers evaluated the duration of the physical activity behavior.

Measure 3: the questionnaire: Subjects completed a questionnaire 24hours after the practice and they were asked for: a) their perceived exertion and b) their perceived time on task during their practice the previous day. The questionnaire consisted of the following items: a) demographic information, b) previous experience in skiing, c)

Borg' s scale (4 very light –20 very hard) in order to estimate the intensity of perceived exertion (Noble and Robertson, 1996), d) a question concerning their estimation of the time on task.

Tasks

Three different ski skills were used in this experiment according to the Rogers skiing test (Rogers, 1954).

Turn: The students assumed a starting position with ski tips behind the starting line. On the "go" signal the students skied towards slalom, lope 30 feet away, then had to process through 6 gates and cross the finish line. Two trials were given. The student's time needed to complete the run.

Stop: The students assumed a starting position with ski tips behind the starting line and had to stop after skiing straight down the fall line for 30 feet, executing a snow plow stop and stop completely as quick as possible. Three trials were allowed. Trials were repeated if the students fell or began to stop before reaching the stop line. Each trial was scored on a point basis, depending on the distance it took the skiers to stop.

Climb: Students stood below the starting gate with ski tips behind the first gate. On the "go" signal, students walked the first 25 feet (level base of the slope) to gate 1. At gate 1, students performed a step turn to the right and half steps the 50 feet to gate 2. At gate 2 a kick turn to the left was performed followed by half steps covering 50 feet to gate 3. From gate 3 to gate 4 the student performed a herringbone step. At gate 4 a step turn was performed followed by a side step to the finish line with leading. Proper climbing technique required proper use of the ski poles. Students were striving towards time.

Statistical analysis: Since homogeneity test for all variables were not significant, t-test analysis was used to determine the differences between a) the perceived time on task and the objective time (b) the perceived intensity and the objective intensity for the whole sample. The group was split in three homogenous groups a) a low, b) medium and c) high according to their objective intensity. An analysis of variance (ANOVA) was used to estimate the difference between a) the perceived and objective time on task and intensity for the three groups. Each variable was tested using an alpha level of .05.

Results

There were significant differences $t_{(73)} = 22.706$, $p<.05$ between the objective (M = 39.28, SD=14.98) and the perceived time on task (M = 65.55, SD = 37.12), (Figure 2.3.2.a). The t-test indicated that overall subjects overestimated their time on task.

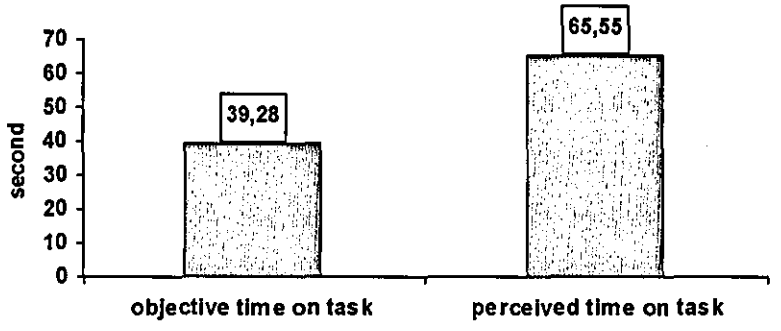


Figure 2.3.2.a: Subjects' scores of objective and subjective time on task.

The scores from the objective intensity from HRM and the questionnaire were transformed into z-scores in order to be compared. The results showed that there were no significant differences $t_{(73)} = 22.706$, $p<.05$ between the objective intensity (M = 3.2, SD=.09) and the perceived intensity (M = 5.7, SD=1), (Figure 2.3.2.b).

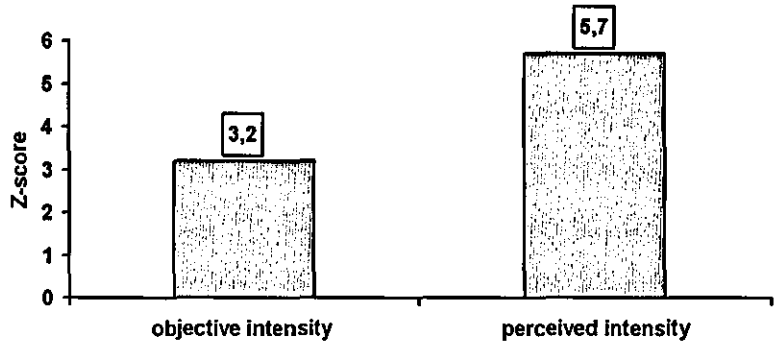


Figure 2.3.2.b: Subjects' scores of perceived and objective intensity.

After the forming of the three groups according to subjects' intensity levels, a comparison among the groups was made for the objective time on task and the perceived time on task. There were no significant differences $F_{(2,73)} = 1.2$, $p>.05$ on the objective time on task when groups split according to their intensity levels however, there were significant differences $F_{(2,73)} = 5.253$, $p<.05$ among the three groups for the perceived time on task (Figure 2.3.2.c). The Scheffé post hoc analysis indicated, that the high intensity group (M = 75, SD=21.21) perceived higher practice

time than the other two groups of medium (M = 62.88, SD=31.05) and low (M = 66.85, SD = 38.37) intensity. There were no differences for the objective time on task.

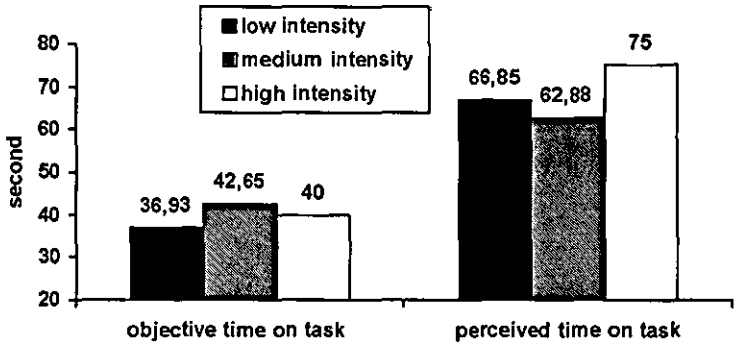


Figure 2.3.2.c: Differences among the three intensity groups on the objective and the perceived time on task.

A comparison was made among the three groups for the objective and the subjective intensity. It was found that even if the groups were significantly different $F_{(2,73)}$ = 76.74, $p < .05$ in the levels of intensity according to the objective measurement they did not significantly differ $F_{(2,73)} = 2.75$, $p > .05$ in their perception of the intensity (Figure 2.3.2.d). For each corresponding level of intensity a comparison was made between objective and subjective intensity scores. Significant differences were found for all three pairs of comparisons, namely, low intensity ($t = 4.50$, $p < .05$), medium intensity ($t = 5.30$, $p<.05$) and high intensity ($t = 8.45$, $p<.05$). This finding implies that participants, for each corresponding level of intensity, underestimated their exertion when they asked to recall this information a day after the practice session.

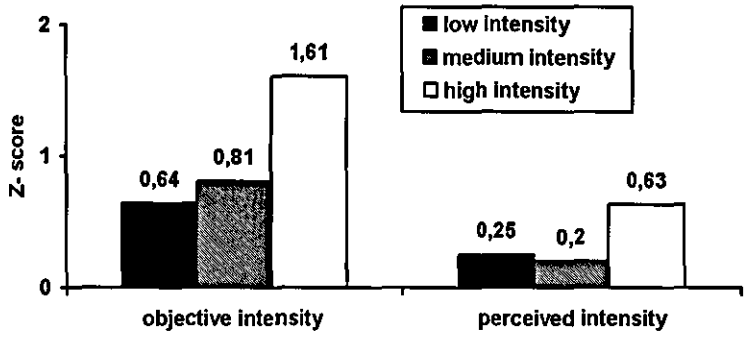


Figure 2.3.2.d: Differences between the objective and the perceived intensity among the different intensity levels.

Discussion

The measurement of physical activity has raised a considerable debate. This is because health is a multi-factorial construct and PA has been shown that it can affect numerous health parameters in different ways (Pate, 1995). Thus, different researchers have measured different aspects of physical activity such as caloric expenditure associated with any type of activity (Sallis, Buono, Roby, Micale and Nelson, 1993), while others have been concerned with measuring aerobic activity of specific duration, intensity and frequency (Simons-Morton *et al.*, 1990). Furthermore, there is an agreement that the true relationships between physical activity and health can not be fully established due to the current state of techniques used in the measurement of physical activity (Williams, Klesges, Hanson and Eck, 1989; Lamonte and Ainsworth, 2001; Montoye, Kemper, Saris and Washburn 1996; Trost, 2001).

Many studies have shown the diversity between the various methods, caused probably by the limited use of the 'gold standard' and the practical field limitations of other methods (Ainsworth *et al.* 1993; Lamonte and Ainsworth, 2001). The need for explanation of this variation marks the importance of the validity and the accuracy both of the objective and the subjective PA measurements. Although the questionnaire is a widespread method of measuring PA in epidemiological studies, it is characterized by a number of limitations that may affect its potential use as a valid and accurate research instrument. In this study an attempt was made to estimate the accuracy of recalled information for perceived time and intensity of exercise.

The results indicated that subjects overall, independently of the intensity of their effort, overestimated their time on task. They perceived that the time they exercised was much longer than the real time. In addition, it was found that the high intensity group recalled the time on task with less accuracy. This finding indicates that the accuracy of the recalled time on task was negatively associated with the level of activity's intensity performed by the participants. Therefore, for self-report PA instruments that ask respondents' precise time judgments in order to classify them in activity categories, they are likely to overestimate the actual activity. This is an

important finding because the duration of exercise is a key indicator in the measurement of PA.

In this research the estimation of the perceived intensity, retrospectively recalled, for the whole sample did not differ from the objective intensity of the exercise measured by the HRM. However, when participants split into three groups according to their intensity levels, the discrepancies of intensity existed as measured by a HRM did not exist when measured by the questionnaire. This finding indicates that participants for each corresponding level of intensity underestimated their exertion when they asked to recall this information a day after the practice session. Borg's scale is a valid instrument to measure perceived exertion simultaneously with the exercise; however, it seems that it was difficult for the participants to recall the intensity of their effort or to express it in a more quantitative way one day after practice. The Paffenbarger' s Physical Activity Questionnaire (Lee, Paffenbarger and Hsieh, 1992) is an example of a self-report instrument which used a ten-point scale in order to quantify the level of exertion *"When you are exercising in your usual fashion, how would you rate your level of exertion (degree of effort)? Please, circle one number"*. According to the findings of this study, this description did not provide more accurate information than more general descriptions used in other questionnaires such as: 'huff and puff activity' (Cale, 1994), "make you breathe heavily and make your heart beat fast" ("Modifiable Activity Questionnaire for Adolescents") (Aaron, Kriska, Dearwater, Cauley, Metz and LaPorte,1995), "regularly engagement in strenuous activity or hard physical labour" (The Lipid Research Clinics Physical Activity Questionnaire), (Ainsworth, Jacobs and Leon, 1993). It is expected that measures of PA that require from respondents to recall intensity of activities retrospectively for prolonged periods of time (e.g. 12 months) could provide only general estimations (Williams, Klesges, Hanson and Eck, 1989).

The discussion so far indicates that self-report measures may be ineffective in providing accurate information regarding the time and intensity of PA. An important question that emerges refers to the magnitude of the associated error in the measurement. This is a particular difficult issue taking into account the methodology used in this study, namely, a) the error of the time and intensity estimation may be more obvious when the recall time is longer than used in this study (for example 7

days recall as decided for the PALQ), b) the type of the activity (daily living activities or occupational activities versus organized or sport activities) may influence the process of the recalled information.

Furthermore, in this study there was no evaluation of the level or type of motivation that students had when they reported their intensity levels. Participants' motivation to provide accurate results might have influenced their responses and future research is needed to assess the degree to which accuracy of physical activity information is affected by subjects' motivational level. A second limitation related to the type of activity that may also influence participants' responses. In this study, a well-organized activity (ski) was chosen in a particular setting. The findings of the present study must be confirmed using other forms of physical activity such as occupational, daily or leisure activities performed in different settings. However, organized activities are easier to be recalled. It is assumed that with less organized activities it is more difficult to evaluate accurately the intensity or the time of the activity.

Participants of this study were physical education students and were more familiar with evaluation of time or intensity of their effort than the typical population. It is expected therefore that the estimation of time and intensity may be different with groups of different characteristics in terms of age, educational level, activity level and weight. The associated error is expected to be higher when self -report is applied to children because children compared to adults notice less, omit more, and forget faster. Furthermore, in terms of cognition-related error, the limitations of the child's memory and the considerable demands self-report places on the cognitive abilities of children to recall events must be acknowledged (Baranowski, 1988).

Finally, the accuracy of the recalled information may be different if: a) subjects had to recall a longer time (more than the 45 minutes of exercise) and b) subjects completed the questionnaire more than 24 hours later. In the present study, PA was observed for a short period of time, and, therefore, these results should not be over generalized. Longer observation and assessment periods may be needed for more accurate results.

The use of questionnaires is a favourable procedure in epidemiological studies; however, the discussion so far showed that they may not be the most accurate

instrument to measure physical activity levels. Therefore, when questionnaires are used to quantify PA (in terms of time or energy expenditure) in order to evaluate the effectiveness of intervention efforts, to assess changes in PA over time and to identify behavioural correlates of PA, they should be considered with some degree of caution. The findings of the present study support the combination of a subjective and an objective measures, especially when use of objective measures only is not possible. Finally, it is clear that before the relationship between health and physical activity could be established, research should focus on the development of simple, low cost, reliable, and valid physical activity assessments (Lamonde and Ainsworth, 2001).

Implications: Taking into consideration:

a) The findings of the first study with regard to the activities included in the checklists.
b) The findings of the second study in terms of the time and intensity estimation by the interviewees.
c) The recommendations presented in the literature in terms of the format of the questions and the detail of the information requested in order to eliminate recall problems (Baranowski, 1988; Cale, 1994; Durante and Ainsworth, 1996; Sallis, 1991; Sallis and Owen, 1999).

A number of decisions were made, with regard to the PALQ. More specifically it was decided:

- In terms of time estimation: the adoption of a four or five options form (namely, *1=Less than 15 min, 2=Between 15-30 min, 3=Between 31-45 minutes, 4=Between 46-60 min, and 5=More than 60 min*).
- In terms of frequency of participation in PA episodes the last 7 days: the adoption of a) a 4- to -7 options form (from *never* to *almost every day*) depending of the question (e.g. four options in PE lesson and seven options in participation in organised sport).
- In terms of intensity estimation: the adoption of 'huff and puff" activity that lasts for at minimum of 20 minutes.

After the preparation of the final draft of the self-report questionnaire, the PALQ tested in a sample of students in order to prepare the final form of the measure. This study is presented in the following section.

2.3.3 Study three: Piloting the self-report measure

The proposed characteristics of the questionnaire established earlier (see section 2.3.0) and the findings of the previous two studies concerning the activity checklists (see 2.3.1) and the intensity and time perception (see 2.3.2) were implemented in the design and the format of the *Physical Activity and Lifestyle Questionnaire.*

The purpose of this sub-study was to examine issues relevant to: a) interviewees' comprehension of the questions and problems with the completion of the questionnaire, and b) the administration procedure of the self-report taking into consideration the age of the interviewees.

A sample of a) 23 elementary school students (11- to 12 years old), and b) 19 secondary school students (14- to 15 years old) from two local schools of Thessaloniki completed the questionnaire under the instructions of the researcher in the classroom environment. The administration procedure in both classes was recorded by: a) a tape recorder in order to obtain a precise record of the instructions and also the issues raised by the interviewees and b) a timekeeper in order to record the time needed for the completion of the form in each particular age.

Despite precise instructions and wording questions during the administration of the questionnaire, a number of problems emerged. These problems were more salient with the elementary school students. More specifically, younger children misinterpreted some questions and some others questions used inappropriate wording. In both ages, some children asked additional clarifications about the time and intensity estimation, and specific activities included in the checklists. Furthermore, younger children needed more precise and close (often question by question) guidance.

Taking into consideration these points and the responses from the completed forms, a number of changes were made to the wording of the questions, to the checklist of activities and additional clarifications were included in the final version. In addition, these points and some comments recommended by the interviewees helped on the

development of a standard training protocol and administration procedure (see Appendix 1a). It was estimated that the mean time to questionnaire completion ranged from 13 –to 25 minutes for the secondary and elementary students respectively.

2.3.4 The *"Physical Activity and Lifestyle Questionnaire"*: final form

General Characteristics: The PALQ is a 7-day recall, designed for 11-to-18 year old students and is divided into two parts. Participation in activities during free time is being evaluated in the first part of the questionnaire. The participant is asked to check the frequency with which he/she participates in any of the 24 activities listed in this first part. The questions cover a broad range of social, academic, functional, recreational and sport activities that youngsters are typically involved. The answer for every activity-question should be given in the form of a 5-point scale that ranges from "never' (score: 1) to "almost daily" (score 5). The activities included in the list match the interests of the Greek young people (see appendix 1b, question 8). Further information of this part of the questionnaire is presented in the second project of this study.

The second part of the questionnaire assesses the participation in physical and sporting activities during the last seven days. This assessment deals with: a) active transportation, b) participation in PA and sport at school, c) participation in recreational activities during leisure time after school, d) participation in sport clubs/fitness centers after school, and e) participation in PA and sport during weekends. The questionnaire is designed for large population studies; the administration time is 15-25 min according to the subject's age and after following the instructions provided by the instructor (see Appendix 1a).

This new questionnaire meets the standards set by all contemporary physical activity questionnaires since it i) evaluates all the parameters of physical activity (time, intensity, type of activity, frequency), ii) objectively classifies participants, iii) divides the day into parts facilitating the recall of information, iv) includes standard training protocol and administration procedure, v) includes activity checklists facilitating the recall, and vi) includes statistical analysis that is easy to perform while there is

specific coding procedure (Baranowski, 1984; Baranowski, 1988; Sallis, 1991; Cale, 1994).

The innovation of this instrument is that it introduces the concept of the *physical activity profile*. Through this profile, important information regarding the nature of activities is collected and it contributes to the total score of the participant. It also permits a better understanding of the priorities that an intervention program should establish. At the same time the activities that a child chooses to participate in are being evaluated in relation to their contribution to the total activity score and also to the possibility to track physical activity into adulthood (Vanreusel *et al.*, 1997; Janz, Dawson and Mohoney, 1999).

Estimating individual activity score: For the evaluation of the participant in terms of PA, PALQ uses an objective scoring system. After a series of transformations and calculations that are based on the original data a final numeric score is being produced for every participant (Bouchard *et al.*, 1983; Cale, 1994). This score expresses energy expenditure (in Kcal • kg^{-1}• day^{-1}) and is based on the energy cost of the activities (METs) according to the *Compendium of Physical activity* (Ainsworth *et al.*, 1993; Ainsworth *et al.*, 2000). According to this score the participant is assigned to one of the four categories of physical activity: *very inactive*, *inactive*, *moderately active* and *active*. Additionally, total participation time is easy to estimate on a daily basis for moderate and high intensity PA that may improve cardiovascular function and muscular performance. The questionnaire formats, as well as detailed information of the administrative procedures and the handling of the data are presented in the appendices 1a, and 1b.

So far, effort was made in designing a self-report measure that addresses many of the problems associated with the current measures. Physical activity self-reports have to be developed and evaluated rigorously and their development should follow a systematic evaluation. In the developmental procedure of the PALQ a number of recommendations made in the literature were followed and a series of preliminary investigations determined the content of the form and the feasibility of collecting the information required by the forms. Finally, the most important feature of a new self-

report measure of PA is to provide valid assessment of the behaviour. In order to evaluate the PALQ and to assess whether it provides reliable and valid measurement, further studies are needed that could address such issues. The following section therefore deals with the validation of the instrument in both elementary and secondary students.

2.4.0 Evaluating the "Physical Activity and Lifestyle Questionnaire"

The most significant problem in constructing a valid instrument for evaluating physical activity in children and youth is the absence of a reliable criterion against which all questionnaires could be compared (Aaron, Kriska, Dearwater, Cauley, Metz and LaPorte, 1995; Kohl, Fulton and Caspersen, 1999). Given this weakness the effort to validate a physical activity questionnaire involves the examination of its concurrent validity, which is the degree of accordance with the other widely used and acknowledged physical activity measures (see section 2.2.3) (Last, 1983). Therefore when different methods of measuring physical activity are being compared with each other it is expected that they will give similar results when they measure the same behaviour. This compatibility must be present when the comparison is being done between questionnaires (subjective method of estimating physical activity) (Kowalski, Croker and Faulkner, 1997; Kowalski, Croker and Kowalski, 1997) or between questionnaires and objective measures of estimating physical activity (Matthews and Freedson, 1995).

The PALQ is a PA measurement which can be administered to a range of age-groups of students. Therefore, there is a need for its validity and applicability to be rigorously tested for both elementary and secondary students in order to provide reliable assessment of the behaviour. In the following sections, the findings of two validation studies which were conducted in secondary and elementary school children respectively are presented.

2.4.1 Study four: Concurrent validity and reliability of the PALQ for secondary school students.

The purpose of this study was to examine the reliability and concurrent validity of the PALQ for secondary school students. Three reliable and valid instruments are involved in this study; two questionnaires (Bouchard, Tremblay, Leblanc, Lortie, Savard and Theriault 1983; Cale, 1994), and one accelerometer (Computer Science and Applications, CSA) (Janz, Witt and Mahoney, 1995; Sirard, Melanson, Li and Freedson, 2000; Bassett, Ainsworth, Swartz, Strath, O' Brien and King, 2000) that were used as the objective criterion. The hypotheses stated in this study were that a)

the PALQ will be significantly correlated with the other instruments and b) that the readings for intra-observer reliability as well as test-retest reliability will be stable over time.

Methodology

The validity and reliability study lasted four months, from February until May 1999. Informed consent was obtained from the children's parents (see Appendix 1c) and access to the school settings was permitted from the masters of the schools (see Appendix 1d).

Subjects

Subjects were 40 male and female students from 7 different public secondary high schools (23 boys and 17 girls) aged 13.65 (SD ±0.7) years. They all volunteered to participate in this study.

Instrumentation

For the validation and the reliability study, the PALQ was compared with three other valid instruments (Montoye, Kemper, Saris and Washburn, 1996), two PA questionnaires and an accelerometer that was used as objective criterion measure. The particular characteristics of each measure are described in the following section.

a) Accelerometer

The CSA accelerometer (Computer Science and Applications Inc. 7164, Shalimar, Florida) was designed to record human movement in field settings. The CSA is a small portable instrument (size 6.6X4.3X1.5cm and weight of 70 grammars) that does not hinder normal movement. Movement counts are stored in memory over a period of six weeks, producing minute by minute chronological record of movement. A microprocessor digitizes the acceleration signal and the quantified magnitude signal is then compiled over a previously programmed epoch interval. At the end of each epoch period, the integrated value of movement count is stored and the integrator is reset. More information on the CSA's functional characteristics provided elsewhere (Melanson and Freedson, 1995; Janz, 1994). The researcher can set the duration of the epoch according to the purpose of the study. At the end of the recording a score in

"counts" is produced for each subject. Even though CSA is proven to be reliable when tested with children of 10-14 years old in laboratory studies (Computer Science and Applications, 1995; Ekelund, Sjostrom, Yngve, Poortvliet, Nilsson, Froberg, Wedderkopp and Westerterp, 2001; Trost, Ward, Moorehead, Watson, Riner and Burke, 1998; Welk, Blair, Wood, Jones and Thompson, 2000), it demonstrates some limitations that may affect the accuracy of the calculations. These limitations are related to the inability to accurately record movement in some activities such as cycling and rowing when the CSA is worn at the waist, climbing, weight bearing or lifting, swimming and during isometric and eccentric muscle contraction movements (Montoye, Kemper, Saris and Washburn, 1996; Sallis, Buono, Roby, Carlson and Nelson, 1990).

b) Three-day physical activity record (3-DPAR)

The 3-DPAR is a self-administered instrument used to record physical activity over three days (two weekdays and one weekend day). Its validity (r=0.80) and reliability (r=0.91) have been checked for children and youngsters (Bouchard, Tremblay, Leblanc, Lortie, Savard and Theriault, 1983; Lamb and Brodie, 1990; Sallis, 1991). The three-day record is divided into 15-min intervals and each day has 96 intervals. Activities are quantified on a 1-9 scale of energy expenditure (1 corresponds of the state of sleep and 9 corresponds to the intensive activity) (Bouchard, 1997). Median energy cost in kilocalories (kcal) per kilogram of body weight per 15-minutes intervals is used to compute daily energy expenditure for every category for each participant. The energy cost of each category is multiplied by a factor and by the number of 15min periods. The sum of all categories is multiplied by the body weight of the participant and provides the total daily energy expenditure in kcal.

One limitation of this instrument is that the mean energy expenditure for all participants in each of the nine categories of physical activity is estimated without taking into account the individual characteristics (e.g. gender, age) that affect energy expenditure. Another limitation is that the nine categories are described in such a way that it is not easy to distinguish between them. According to the findings of a related research the 3-DPAR provided moderate accuracy in estimating physical activity (Miller, Freedson and Kline, 1994). A possible reason for that could be that the

validity of this instrument was established indirectly (Bouchard, Tremblay, Leblanc, Lortie, Savard and Theriault, 1983).

c) The four by one-day recall physical activity questionnaire (4-1DRPAQ)

This is a questionnaire of physical activity that is based on a structured interview administered by the researcher who records physical activity of the previous day (Cale 1994). It is an innovative instrument that permits gathering information on four different days and it is suggested that the subjects should complete it twice a year during two different seasons. The 4-1DRPAQ estimates PA during two weekdays and two weekend days; furthermore, it contains two different forms, for weekdays and weekend respectively. This questionnaire measures four dimensions of physical activity during three separate periods each day (morning, afternoon and evening): PA at school, physical education and sport at school, PA during leisure time, and the participation at organized sporting activities during leisure time.

The participant is assessed on the basis of an objective score that is the product of the time, frequency, intensity and purpose of PA expressed in METs. The energy expenditure is based on the calculation procedure used by Blair (1984) in the 7-Day Recall Questionnaire. Participation time is being used for estimating mean daily energy expenditure. The activities (based on their metabolic cost) are divided into five categories of very low, low, medium, high, and very high intensity where mean energy value is set at 1.5, 2.5, 4, 6, and 10 METs respectively. Each participant may be characterized as very inactive, inactive, moderately active or active. The validity of this questionnaire against Heart Rate Monitoring was .61 and the reliability was .62 (Cale, 1994).

Rationale for chosen questionnaires – Pilot studies

The choice of the specific questionnaires was based on the fact that the evaluation of different dimensions of PA and the structure of specific questions can be effectively applied to students of our country. Therefore, their adaptability in Greek settings minimizes problems concerning their validity since the number and the content of questions remain constant. More specifically the 4-1DRPAQ (Cale, 1994) was chosen because it uses a similar method with PALQ in estimating individual score and classifying the participants into activity categories. Furthermore, with the 4-1DRPAQ

the researcher collects data by interviewing participants individually. This fact facilitates the recall and provides more accurate PA information. These particular characteristics and similarities were very useful for a more comprehensive comparison between the measures.

Prior to the final study both questionnaires were translated into Greek. The following steps were followed to ensure their comprehensiveness:

1. Translation of both questionnaires from English to Greek language from a professional translator. Afterwards, these forms were checked by a Greek literature teacher for the accuracy of the translation and the appropriateness of the wording.
2. Translation of both questionnaires from Greek to English language from a professional English translator and comparison with the initial forms.
3. After the preparation of the final version of the two questionnaires, a pilot study was conducted in a sample of 25 secondary school students (14 years old) in order: a) to check the comprehension of the questions, and b) to estimate the time needed for completion of each form.

Procedure

All measurements and interviews were performed at a familiar environment for the participant, at school or at their house. During this study participants were advised not to change their patterns of their daily activities and in case of sickness the study was discontinued and scheduled for a later date.

Participants wore the CSA on the right hip. It was placed in a special case and attached to a belt that they wore for stability purposes. The recording interval (epoch) was set at 1 min. Each participant wore the device for seven (7) consecutive days and 24 hours per day. Only during swimming or showering where participants allowed removing the CSA from their waist. All subjects were trained how to put back on the CSA after they removed it for showering or swimming. Researchers checked the stability of CSA on the participants on a daily basis. All parents were informed after a meeting with the researchers for the purposes and goals of this study and the rules that their children had to follow. Data was downloaded on a PC at the end of every week. Seven (7) devices were used during this study and they were all checked prior to the

first measurements for their reliability from the manufacturing company and new batteries were placed in all of them.

Validation Procedure

The participants wore the CSA for a week and at the same time they completed all three questionnaires: a) the 3-DPAR (Bouchard) b) The 4-1DRPAQ (Cale) and c) the PALQ according to the guidelines proposed by the authors. Participants completed the first questionnaire at school under the supervision of the researcher and they returned it after the third day. Researchers completed the second questionnaire with a structured interview and they recorded the activities performed by the participant on the previous day. The third questionnaire was completed on the seventh day right after the CSA device was removed from the participant. Questionnaires (a) and (b) referred to the PA of the same day and questionnaire (c) referred to the physical activity of the entire week. This procedure minimizes the recall interference between instruments and ensures the precise follow up of guidelines proposed by the authors.

Reliability procedure

Intra-observer reliability

In this study both researchers acting separately estimated the student's performance (in METs) by using the instructions of the evaluation protocol and assigned each person to one of the four activity categories. The *Pearson's r* coefficient correlation was used to compare the individual results (in METs) provided by the two independent researchers.

Reliability of repeated measurements

Repeated measurements were performed after one-week period in order to control for the reliability of the instruments (test-retest reliability, see also, section 2.2.3). Reliability measurements lasted more than expected because in several cases the weather conditions drastically altered the activity behaviour of the participants. It is important to underline that the CSA reliability measurement was conducted during two non-consecutive weeks due to very unstable weather conditions. In contrast, the reliability measurement of the three questionnaires was performed in two consecutive weeks. The same researcher estimated the activity scores of each participant in all three questionnaires. *Pearson's r* coefficient correlation was used for reliability

control and t-tests were used for estimating differences in mean values between the first and second measurements (Thomas and Nelson, 1996).

Separate data transformations for the 4 measures were performed and mean values and standard deviations have been calculated for all variables of each instrument separately. *Spearman's* coefficient correlation was used for validity control. The *Spearman's* coefficient was used since the correlation was based on the participant's ranking in each instrument according to the personal scores and not on the absolute values obtained.

Results

Descriptive data

Table 2.4.1.a presents descriptive data for the participants of the study.

Table 2.4.1.a: Mean Value (M) and Standard Deviation (SD) for anthropometric data and age.

	Age (years)		Weight (kg)		Height (cm)		BMI *	
	MO	SD	MO	SD	MO	SD	MO	SD
Boys (N=23)	13.50	.9	58.74	12.2	165.7	11	21.3	3.53
Girls (N=17)	13.75	.8	53.41	10.86	160.2	6.3	20.3	3.3
Total (N=40)	13.65	.9	56.48	11.8	163.4	9.6	20.87	3.4

*BMI =Body mass index. Calculated with formula "Body weight *(kg)* /height^2 *(m)*".

Table 2.4.1.b presents mean values and standard deviations of the first administration. The PALQ slightly overestimated physical activity (M=37.13, SD=3.17) when compared with Cale's questionnaire (M=35.95, SD=3.33) for both genders.

Table 2.4.1.b: Mean values (M) and standard deviations (SD) for the four instruments used.

	CSA *(Counts)*		3-DPAR *(kcal)*		4-1DRPAQ *(METs)*		PALQ *(METs)*	
	M	SD	M	SD	M	SD	M	SD
Boys	674124.7 (N=18)	233428.5	2493.37 (N=23)	703.85	37.48 (N=23)	3.61	38.26 (N=23)	3.7
Girls	478362.6 (N=15)	214606.3	2002.9 (N=16)	468.22	33.89 (N=17)	1.14	35.6 (N=17)	1.2
Total	585142 (N=33)	242683.1	2292.15 (N=39)	658.09	35.95 (N=40)	3.33	37.13 (N=40)	3.17

Reliability measures

Intra-observer reliability

Pearson coefficient correlation (r) for PALQ was 1.00 ($p<.001$) between the two researchers.

Test-retest reliability for all four instruments

The degree of correlation was used as an indicator for the reliability measure for two repeated measurements within one-week period. T-test (for dependent groups) was performed in order to evaluate differences between mean values for the four instruments. Table 2.4.1.c presents mean values (M) and standard deviations (SD) for all instruments for the first and second measurement and the correlation coefficient between the first and the second measurements as well as the t-test values. The CSA accelerometer presented the lowest correlation between first and second measurement ($r=.329$), and the 3-DPAR presented the highest one ($r=.861$, $p<.001$). Significant differences were found between the two measurements ($p<.05$), for the 3-DPAR and the PALQ. The results showed that all three instruments were sensitive enough to indicate changes in physical activity in the same direction.

Table 2.4.1.c: Differences in mean values and intraclass correlation between the two measurements

	1st measurement		2nd measurement		t-test	
	MO	SD	MO	SD	t	r
CSA (Counts) (N=15)	669433	250893.47	677422.3	308469.3	t_{14}=-0.97*	.329
3-DPAR (kcal) (N=21)	2409.68	542.03	2284.58	503.06	t_{20}=3.174*	.861**
4-1DRPAQ (METs) (N=21)	36.52	3.25	35.43	2.57	t_{20}=1.783	.731**
PALQ (METs) (N=21)	38.52	3.69	36.17	1.96	t_{20}=2.597*	.772**

Note:* = p<.05, ** = p<.001

Validity of the PALQ

Table 2.4.1.d includes the coefficient correlation *(Spearman's r)* for the 4 instruments assessing physical activity for all participants. The PALQ was moderately correlated with CSA (r=.627, p<.001), with the 3-DPAR (r=.554, p<.001) and highly correlated with the 4-1DRPAQ (r=.791, p<.001). Similar correlation was found between all measures involved.

Table 2.4.1.d: Correlation matrix between the 4 instruments for all participants.

	CSA (Counts)	3-DPAR (kcal)	4-1DRPAQ (METs)	PALQ (METs)
CSA (N=33)	-			
3-DPAR (N=39)	.713**	-		
4-1 DRPAQ (Cale) (N=40)	.647**	.422**	-	
PAL Questionnaire (N=40)	.627**	.554**	.791**	-

Notes: a) *p<.05 και ** p<.001

b) Correlation matrix was based on pairwise comparisons.

Table 2.4.1.e presents the coefficient correlation *(Spearman's r)* for the 4 instruments recording physical activity by gender. According to these findings PALQ was not significantly correlated with CSA and the 3-DPAR for the girls group. When data was plotted for boys the findings showed significant correlation for all 4 instruments.

Table 2.4.1.e: Correlations between instruments by gender.

	CSA (Counts)		3DPAR (kcal)		4-1DRPAQ (METs)		PALQ (METs)	
	B (N=18)	G (N=15)	B (N=23)	G (N=16)	B (N=23)	G (N=17)	B (N=23)	G (N=17)
CSA (N=33)	-	-						
3DPAR (N=39)	.550*	.390	-	-				
4-1DRPAQ (N=40)	.531*	.543*	.420*	.262	-	-		
PALQ (N=40)	.529*	.365	.582**	.412	.701**	758**	-	-

Notes: a) *p<.05 and ** p<.001.
b) Correlation matrix was based on pairwise comparisons.

The CSA and the 3-DPAR provided a total score for each participant but they did not provide the possibility to group the participants in different categories of physical activity. Furthermore, the 4-1DRPAQ and the PALQ use the same classification system and the same units of measurement. Table 2.4.1.f presents differences in participants classification according to their level of physical activity for these two instruments.

Table 2.4.1.f: Participants classification into activity levels for the 4-1DRPAQ and the PALQ.

	(1) Very inactive %		(2) Inactive %		(3) Moderately active %		(4) Active %	
	1η Meas/ment	2η Meas/ment	1η Meas/ment	2η Meas/ment	1η Meas/ment	2η Meas/ment	1η Meas/ment	2η Meas/ment
4-1DRPAQ (N=40)	17.5% (N=7)	14.3%	55% (N=22)	57.2%	15% (N=6)	23,8%	12.5% (N=5)	4.8%
PALQ (N=40)	-	-	65% (N=26)	71.4%	22.5% (N=9)	19%	12.5% (N=5)	9.5%

According to the findings presented in Table 2.4.1.f, the PALQ overestimates physical activity in relation to the results provided by the 4-1DRPAQ. Following the results of the PALQ none of the participants was "very inactive" even though with the 4-1DRPAQ 17.5% and 14.3% of the subjects were characterized as "very inactive" for the first and the second measurement respectively. However, the participants characterized according to the 4-1DRPAQ as "very inactive" and as "inactive" represent the 65% of the total group for the first measurement and the 71.4% for the second measurement. The percentages from the PALQ for the same activity categories were 67.5% and 71.5% for the first and the second measurement

respectively. There is therefore a high accordance between these instruments to identify the subjects who are possible targets for intervention efforts.

The profile of physical activity formed by the PALQ for both boys and girls are presented in figures 2.4.1.a and 2.4.1.b.

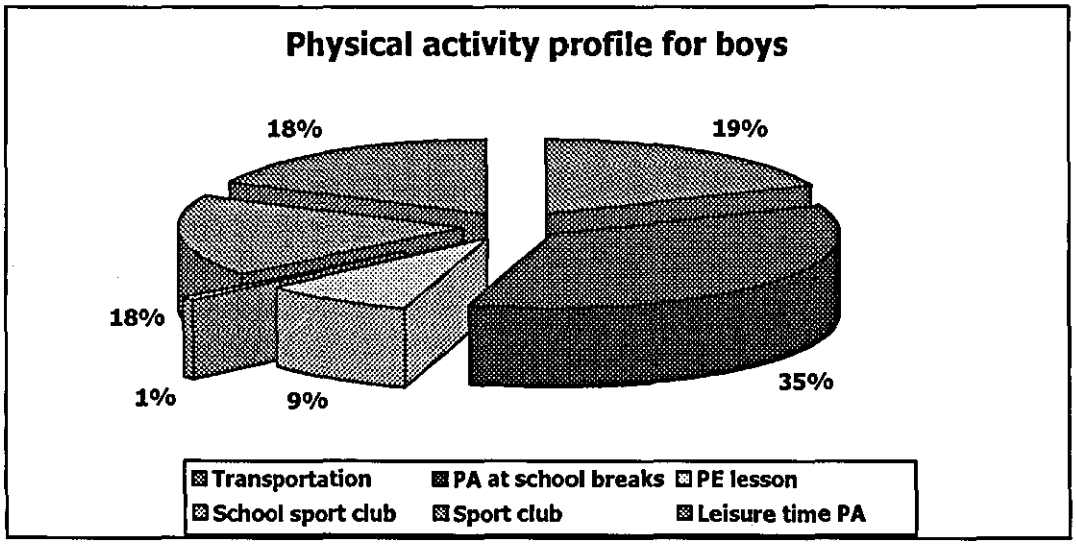


Figure 2.4.1.a: Allocation (%) of the weekly energy expenditure (METs) from participation in physical activities and sports for boys (PALQ).

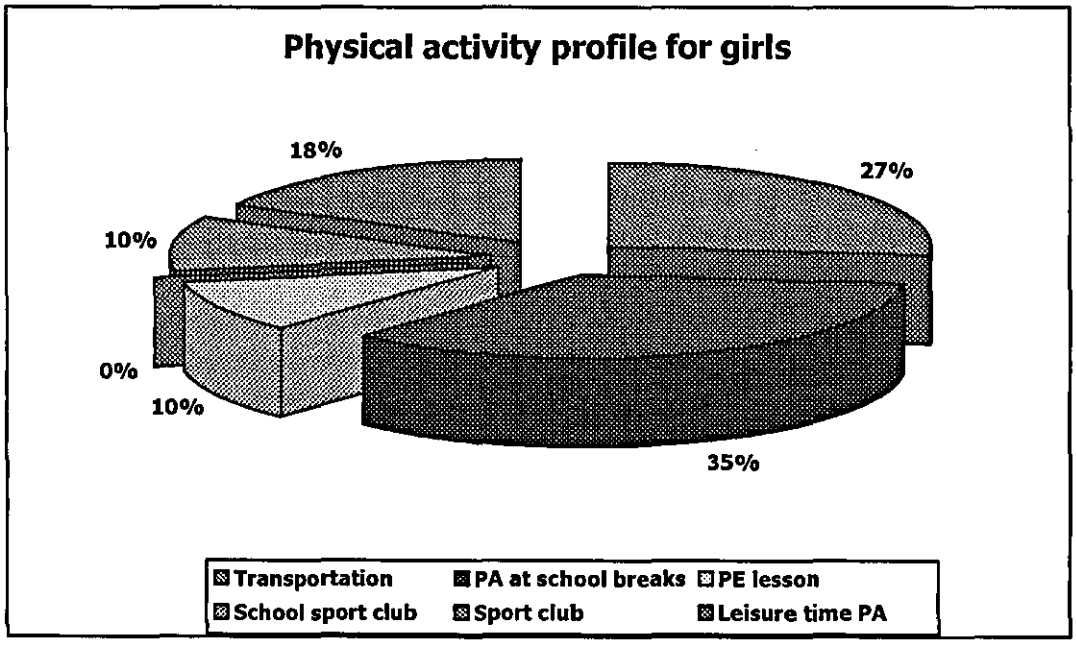


Figure 2.4.1.b: Allocation (%) of the weekly energy expenditure (METs) from participation in physical activities and sports for girls (PALQ).

Physical activities that took place at school and in particular, during class breaks account for the greatest part of weekly energy expenditure (45.4% girls and 44.7% boys). However, it is important to underline the very low participation for both genders in organized sport activities at school or at sport clubs out of school environment (10.4% for the girls and 17.8% for the boys of their total energy expenditure in physical activities). Also, only 17.5% of the total energy expenditure took place during free time for both genders. Statistically significant differences were found in physical activity scores between boys and girls for both measures (t_{38}=-2846, $p<.05$).

Discussion

The aim of this study was to assess the validity and reliability of the PALQ that was created in order to evaluate habitual PA of the secondary school children in Greece. The findings of this study supported the hypothesis that the new questionnaire would show a satisfactory correlation with other physical activity measures and would also show significant intra-observer reliability as well as reproducibility. Additionally, the PALQ was proven sensitive enough to record differences in PA between gender and repeated measurements.

Validity study

The validity study revealed that the PALQ was satisfactorily correlated with the two other questionnaires assessing PA and the CSA accelerometer that were used as criterion measures in this study. The correlation with CSA accelerometer was higher when compared with the ones reported in other studies (Janz, 1994). However, the validity findings in this study suggest the CSA is not highly correlated in general with questionnaires, which is also supported by other studies (Kohl, Fulton and Caspersen, 2000). The results of this study may indicate that different instruments record different aspects of PA behaviour, leading to the conclusion that high correlations are not easily attained. This is in accordance with the finding that the highest correlation was between the 4-1DRPAQ and the PALQ. These two instruments evaluate similar aspects of PA and use an identical protocol for estimating personal activity scores. However, PALQ had the lowest correlation with the 3-DPAR. The reason for this

may be that the 3-DPAR was constructed for clinical studies and its validity was indirectly estimated (Miller, Freedson and Kline, 1994).

Several factors have contributed to deviations reported between the three questionnaires and the CSA device. These factors refer to:

a) The activities included in each questionnaire in order to produce a personal activity score and to the sensitivity of each questionnaire in recording physical activity. For example, the three questionnaires assign different energy values for similar physical activities. Additionally in the PALQ the participant is considered equally active during weekday and weekend days, a hypothesis that is not followed by the 4-1DRPAQ. CSA presents several manufacturer limitations since it cannot be used in activities such as swimming and cycling. This could possibly lower the correlation with other instruments since several of the participants were regularly involved in the above activities. These limitations may lead to the conclusion that the CSA accelerometer is not an appropriate objective criterion measure for habitual PA of children.

b) The nature of units that each instrument uses. Even though the correlation between these instruments was based on scaling the participant's performance and not on the real values obtained, there were significant limitations in estimating personal scores with each instrument. More specifically, the energy costs of physical activities presented in the compendium of physical activity (Ainsworth *et al.*, 1993) refer to adults and not to children. Furthermore, the 3-DPAR does not take into account the participant's different characteristics and at the same time it uses a gross intensity estimation of physical activity (Miller, Freedson and Kline, 1994).

c) The procedure that was followed in order to estimate the intensity and the time of participation in physical activity and sport. Since the assessment of physical activity involvement includes self-perceived estimation it seems that using a questionnaire to collect activity data in young people may lead to an overestimation of physical activity from 67% up to 112% (Sallis *et al.*, 1996). This fact may be the reason for differences detected between the three questionnaires since both the questions and scales that were used for estimating intensity and time of involvement in physical activities were different for each instrument. In this study the female participants showed greater responsibility in completing the questionnaires and using the CSA device and this might be the reason for increased deviation in validity that

was detected between the two genders. This finding needs further research since gender differences have not been fully investigated (Kohl, Fulton and Caspersen, 2000). Following the findings from PALQ and the other instruments, the male participants were significantly more active than the female ones. The above findings are in accordance with the ones provided from other studies (Armstrong, 1998; Health Education Authority, 1997).

Reliability

Even though the PALQ provided relatively constant data, the t-test performed showed significant differences between the two measurements for three of the four instruments. These differences may be the result of differences in weather conditions during the two measurements. The significant environmental effect stress the difficulties in accurately recording PA during different seasons of the year and the instability that the subject's behaviour may show regarding the engagement in PA and sport for short periods of time (Sallis, Condon, Goggin, Roby, Kolody and Alcaraz, 1993; Sallis, Buono, Roby, Micale and Nelson, 1993). This was evident through the significant deviation observed on the data obtained from the CSA when used in two non-consecutive weeks and from the high reliability readings that the 3-DPAR showed when used four days apart. In the study of Janz (1994) referring to the reliability of CSA in recording physical activity during three consecutive days, significant variance was detected in day-to-day correlation. However, another study produced contradictory findings when recording physical activity in children for six consecutive days (Janz, Witt and Mahoney, 1995). Thus it is proposed that this factor should be taken into consideration when the obtained PA scores are used as criterion of the effectiveness of intervention programs regarding the promotion of physical activity.

Physical activity levels

The majority of the participants have adopted a sedentary life style. This percentage may be even greater if one takes into account the fact that children tend to overestimate their physical activity level (Sallis *et al.*, 1996). This finding may have important negative implications in the future since this behaviour is very likely to

continue into adulthood (Janz, Dawson and Mohoney, 1999). Student's needs should be studied and understood in larger groups and with the use of more accurate instruments in assessing PA. The study of the activity profile of the participants may lead to interesting conclusions and areas of intervention. For example the energy expenditure from regular participation in organized sport activities in and out of the school environment is small. In contrast with other studies (Miller, Freedson and Kline, 1994) subjects in this study were more active in the school environment whereas, participation in physical education classes and in school sport clubs had a small contribution to the total weekly PA. However, it is noteworthy that PA was mainly recorded during the breaks between classes. The improvement of school sport infrastructure, the increase of physical education hours and the creation of the appropriate conditions for participation in organized sport activities in and out of school may be feasible actions to deal with the problem of inactivity. The small percentage of physical activity recorded during free time (18%) is possibly related to lack of leisure time due to a heavy schedule at school (Arabatzogloy and Antoniou, 1994) and to the difficulty in accessing recreational facilities safely (Sallis, 1993). The distinctive feature of PALQ classifying individuals in activity levels and in the same time creating the profile of PA seems to be useful in setting priorities when designing physical activity intervention programs.

Limitations

Several unpredicted problems occurred during this study. The validation procedure was very demanding for some of the participants. Other subjects had difficulties in grouping the activities when filling out the 3-DPAR. The use of CSA in this study revealed the difficulty of using an objective method to record PA in field studies (Montoye, Kemper, Saris and Washburn, 1996). A reliable evaluation of PA requires continuous assessment of the behaviour for at least 4 to7 days (Janz, Witt and Mohoney, 1995; Trost, Pate, Freedson, Sallis and Taylor, 2000). However, some participants had difficulties in recalling events and significant activities in the 7-day recall PALQ, whereas these activities were already recorded in the other questionnaires (24 hrs, 3-days recall).

2.4.2 Study five: Concurrent validity and reliability of the PALQ in elementary school students.

The first aim of this study was to assess the convergent validity of the PALQ in elementary school students; the second aim was to investigate whether this sample fulfilled existing UK physical activity recommendations for health. As a criterion measure the accelerometer CSA was chosen (Computer Science and Applications, CSA) (Janz, Witt and Mahoney, 1995; Sirard, Melanson, Li and Freedson, 2000; Bassett *et al.*, 2000). The hypotheses of this study were that a) the PALQ will be significantly correlated with the accelerometer, and b) the majority of the participants will fulfill the existing UK recommendations for health.

Methodology

The validity and reliability study of the PALQ lasted four months, from February until May. Informed consent was obtained from the children's parents (see Appendix 1c) and access to the school settings was permitted from the headmasters of the schools (see Appendix 1d). This was approved by the Department of Physical Education and Sports Science of the Aristotle University of Thessaloniki. The good health of the participants was certified by the school medical cards.

Sample

Sixty sixth-grade pupils, from 6 different public schools participated in this study. However, only the data from 51 pupils (23 boys and 28 girls) were used to the analysis. Three students didn't follow accurately the protocol of the research, two didn't use the CSA correctly, and in four cases the recording was cancelled due to illness. The method of random numbers was used for the selection of the students who had to meet the following criteria:

- Age of 11 years old (SD±6 months).
- Pupils without physical disadvantage or health problems which could limit their participation in physical activities and sports.

- Children of immigrants were excluded because the different culture is related to the involvement in physical activity and sport (Sallis and Owen, 1999).
- Pupils with Body Mass Index (BMI) higher than 27 were also excluded.

Instrumentation

The concurrent validity of PALQ was examined using as criterion measure the accelerometer CSA (Computer Science and Applications Inc. 7164, Shalimar, Florida). The CSA was chosen as an objective PA measure for the following reasons:

1. Its validity and reliability has been proved in measurements of children's PA (aged from 7-17 years old) both in field and laboratory conditions (Janz, 1994; Janz, Witt and Mohoney, 1995; Ekelund *et al.*, 2001). Furthermore, the CSA has been used as criterion measure of concurrent validity of self-reports in some other studies (Janz and Mahoney, 1997).
2. The CSA is easily adjusted to the subject's body without disturbing the normal human movement. It offers also the possibility of recording PA for several days without being removed from the subject's body in order to transmit or save the data.
3. The CSA can be controlled quickly and effectively in field conditions so the problems of losing the data due to dysfunction of the device are minimal.
4. The appearance and the construction of the CSA do not attract the attention of the child in order to examine closely and, consequently, to influence the quality of recording of the data or to reprogram it.
5. The CSA has the feature to be programmed for recording in certain periods of time and in certain dates. By this way it is possible to record PA in specific time intervals, that is, before school, during the school and after school for each day separately.
6. Finally, the CSA has the feature to assess different dimensions of PA, for example, frequency, duration and intensity of the activity episodes, by giving simultaneously the time sequence of recording. So, quality and quantity characteristics of PA are recorded at the same time, which are especially important for the subject's classification into activity categories or levels.

Procedure

The measurement with the CSA lasted four continuous days for every subject in order to obtain a reliable estimation of PA during the school days and the weekends (Janz, Witt and Mahoney, 1995; Trost *et al.*, 2000). Overall, the PA of 240 days was monitored by the CSA for the total of the sample. The data from 204 days were used with a mean daily recording of 900 minutes (±25 minutes). The days of recording were a) Thursday, Friday, Saturday and Sunday, or b) Saturday, Sunday, Monday and Tuesday. Data were not collected during the days of bank holidays and also during the days when conditions which could affect the participants' activity occurred (e.g. school excursions) and finally, during extreme weather conditions. All the measurements and the interviews took place in the school environment. Subjects were encouraged to perform their usual daily PA inside and outside of the school.

Seven (7) CSA devices were used to assess the PA of a respective number of pupils every week (3-4 boys and 3-4 girls). Before the beginning of the study the 7 devices were checked for their reliability from the manufacturing company and new batteries were placed in all of them. The interior watches of the CSA were adjusted according to each case to a certain time and date of the beginning of recording the PA. This time was corresponding accurately to the time of the computer where the storing of the data was taking place and to the time of daily school breaks in order to accurately focus on the duration of the breaks.

The watch of the computer in which the CSA was adjusted and the watch of each supervisor of the school of the participants who wore the CSA, were regulated for every measurement to a minute accuracy. At the same time, the responsible supervisors of each school were informed in order to keep accurate breaks (10 minutes for each break). The watches were adjusted according to the National Time Operator Service in order to achieve precise time measure. Through these actions an accurate timing of the physical activity of the subjects was achieved during the school time and especially during the breaks and the physical education lesson.

Two days before the start of the measurement, a meeting took place with the participants and their parents in order: a) to give detailed guidelines for the use of the CSA, and b) to train both parents and children about the right use and adjustment of the

device on the body. At the same time the use of the device was displayed and explained and answers were given to the parents regarding their children's safety and other technical details (e.g. radiation, influence in PA and performance at school etc). In this meeting the individual tag of each participant was completed with the demographic characteristics and the body measurements.

After being adjusted, the 7 CSA were given to the participants one day before the start of the measurement. The researcher called the participants every morning and reminded them to adjust the belt with the CSA device according to the instructions. The researcher called also at the end of each day at 22.00-22:30 to ask if something urgent had forced the participants to take the device off.

The CSA was placed in a special case adjusted to an elastic belt at the right side of the participant's waist. By this way, the stability of the device and the easy removal was secured. The CSA's correct placing was checked in a daily basis by the researcher. The recording of the PA was taking place minute by minute for 24 hours a day for 4 consecutive days, two of which were weekdays and the other two were weekend days. During the weekdays (school days) there was at least one hour of participation by the participant to the school physical education lesson. The participant's PA was analysed minute by minute from 7:00 in the morning to 22:00 in the evening. The device was taken off from the participant's waist after 22:00 in the evening and was adjusted again in the morning at about 7:00 after the daily reminding through the telephone by the researcher. The CSA batteries were checked before each measurement. The daily communication with the participant's parents and teachers of physical education in the schools helped the researcher to form a representative picture of the children's habitual PA.

During the measurements the weather conditions were recorded daily (temperature, sunshine, extreme weather conditions) according to the weather forecast of the National Meteorological Service for Thessaloniki. This led to the recording of the typical PA for the season, as the season is related to the level of the children's PA. Consequently, the days with extreme weather conditions were not concluded. When the four days of PA monitoring were completed, the devices were collected and the data were transmitted to a PC. After that, there was a control of the data: a) if the participants were regularly

wearing the devices during the measurements, b) if there were negative numbers indicating wrong placement of the CSA.

Assessment of physical activity

Accelerometry-derived variables of <1952 movement counts·min-1, 1953-5724 movement counts·min-1, >5725 movement counts·min-1 were used to operationally define light (less than 2.99 METs), moderate (3.0 to 5.99 METs) and vigorous activity respectively (greater than 6.0 METs) (Computer Science and Applications, 7164 model, Shalimar).

Average movement counts.day^{-1} from the CSA and the kcals.kg^{-1}.day^{-1} values from the PALQ were used as summary variables to quantify a) overall PA per day, b) PA at school, c) PA after school, and d) PA in specific occasions (during physical education lesson and during school breaks). Physical activity in these variables was defined:

- For the CSA as the sum of 1-min movement counts divided by the number of monitored minutes. For example, the average PA during school breaks was the quotient of the PA counts which recorded during 6 different breaks by the number of monitored minutes, namely 60 minutes (6 breaks of 10 minutes each).
- For the PALQ as kcal.kg^{-1}.day^{-1} values which was derived according to the scoring procedure of the questionnaire taking into consideration the reported intensity, time of participation and type/purpose of the activity.

Anthropometric Measures

Body mass was measured to the nearest 0.1 kg (Seca Beam Balance 710) with participants dressed in minimal clothing and height to the nearest 0.1 cm (Seca Stadiometer 208).

Validity and reliability procedure

The day after the completion of the recording of PA with the accelerometer, the 7 participants completed the PALQ, under the supervision of the researcher. The reliability of the PALQ was tested with repeated measurements during one week period (test-retest reliability).

Management of the data – Variables

The data were analyzed with the statistical program SPSS/PC+ (version 10.0). Prior to the statistical analysis the original values obtained from the CSA were summarized using the Excel for Windows programme. Descriptive statistics were performed for weight, height, questionnaire data, and the accelerometer-derived measures of PA. For all dependent variables normal distribution was established.

Between-gender comparisons on dependent variables were evaluated using independent Student's t-tests. Homogeneity of variance between grouped data was established using Levene's test. Analysis of variance (ANOVA) repeated measures method was used to determine if significant gender mean differences existed for activity variables between weekdays and weekend. Homogeneity of variance between grouped data on the 4 days was examined using Mauchly's test of sphericity.

Pearson's correlation coefficient was used to examine a) the bivariate association between the test-retest administrations of the questionnaire, and b) the association between the CSA and PALQ after transforming the original values obtained in z-scores. Finally, Spearman's coefficient correlation was used to examine the bivariate association of the participants ranking in those instruments. Statistical significance was set at $p<.05$ level.

Results

Descriptive data

Table 2.4.2.a presents descriptive data by gender.

Table 2.4.2a: Means (M) and standard deviation (SD) of the body measurements

	Weight		Height		BMI*	
	Mean (Kg)	SD	Mean (cm)	SD	Mean	SD
Boys (n=23)	49.83	11.62	150.48	7.39	21.96	4.68
Girls (n=28)	47.69	7.80	152.59	6.46	20.38	2.6
Total (n=51)	48.73	9.79	151.56	6.93	21.15	3.8

***BMI** = The Body Mass Index was calculated based on the equation *Body weight (Kg)/ height^2 (m)*.

Tables 2.4.2.b and 2.4.2.c present descriptive data of the participants' performance to the two PA measures during different activities and days of the week. According to the CSA, boys seem to be more active than girls in every activity in and out of school, both for the weekdays and the weekend. However, PALQ presents a different picture.

Table 2.4.2.b: Descriptive data of PA based on the CSA (counts.day^{-1}) by gender

		Boys (n=23)		Girls (n=28)		Total (n=51)	
		Mean	SD	Mean	SD	Mean	SD
PA at school environment	Physical Education Lesson (Mean counts of a typical PE lesson)	107852	38672.9	72956.2	43008.4	88693.8	44322.2
	PA during school breaks	68239.4	29500.7	40369.9	14345.6	52938.5	26271.9
	PA at school (excluded PE lesson and PA during breaks)	174952	58449	131568.4	59444.7	151133.5	62343.3
	Total of PA at school	286332.4	77655.9	201120.7	66740.7	239549.5	83021
	PA after school	306281.6	162261	262518.6	78770.4	282254.9	124172.8
	Mean daily PA (weekdays)*	611206.5	209378.6	475657.3	140431.5	536787.3	185954
	PA during the 1st day of monitoring	619092	281161.5	483500.4	162106	544649.5	231551.8
	PA during the 2nd day of monitoring	603321	192683	467814.3	158637.8	528925.1	185910.5
PA at weekend	Total PA for the weekend (Saturday and Sunday)	543141.2	214785.2	366058	179094.7	436899.4	209405
	PA during Saturday	570534.9	245847	418700.3	209172.8	487174.7	236733.86
	PA during Sunday	475747.5	259161.3	286852.4	136052	372040.4	220361.5

* The activity values for the weekdays represent the mean value of counts for the two days of recording.

Table 2.4.2.c: Descriptive data of PA based on the PALQ (in kcals.kg^{-1}.day^{-1}).

	Boys (n=23)		Girls (n=28)		Total (n=51)	
	Mean	SD	Mean	SD	Mean	SD
PA from active transportation	0.91	0.41	1.14	0.56	1.04	0.5
PA from participation in school PE lesson	0.80	0.14	0.84	8.09	0.82	0.12
PA at school breaks	4.24	2	3.89	2.1	4.2	2.07
PA from participation at school sport club	0.28	0.46	0.0	0.0	0.12	0.34
PA from participation is organized sport clubs outside of school	1.27	1.93	0.75	2.2	0.99	2.08
PA from participation in privet sport clubs/gyms/fitness centers	0.14	0.67	0.36	0.8	0.26	0.74
Leisure time PA (after school)	2.76	2.57	1.55	1.37	2.09	2.07
PA total*	10.84	4.1	8.55	4.27	9.59	4.33

* The total PA did not include activities with energy cost <3 METs (e.g. sleep, reading, video-games)

Reliability and validity of the measures

The reliability among repeated measures (test – retest) during one week period for the PALQ was r=0.78 (p<.01). On table 2.4.2.d the coefficient correlation between CSA and PALQ by gender is presented.

Table 2.4.2.d: Correlation between CSA and PALQ.

	Boys (n=23) PALQ		Girls (n=28) PALQ		Total (n=51) PALQ	
	Pearson	Spearman	Pearson	Spearman	Pearson	Spearman
CSA	0.245	0.422	0.503**	0.594**	0.441**	O.562**

Notes: a) * p<.05 and ** p<.001 (2-tailed)

b) Correlation matrix was based on pairwise comparisons.

c) The correlation coefficient Pearson derived after transforming the original values in Z scores

From the values presented on table 2.4.2.d it seems that the PALQ and the CSA are correlated moderately. Higher correlations are achieved when the subjects' ranking to the two measures (Spearman) is compared and not when the absolute performances to

these (z-scores) are compared. With regard to the gender, the two measures present different correlation. It is important to note that for the boys the correlation is not statistically significant.

Assessment of PA

Accelerometer (CSA)

Figure 2.4.2.a presented the total PA for each of the 4 days monitored by the CSA. It seems that this sample is more active during the weekdays than during the weekend. In particular, during Sunday children are less active in comparison to the other days. Analysis of variance with repeated measures (ANOVA) had shown statistically significant main effects of the gender and the day of the measure. Especially on Sunday, the sample was statistically less active than during the other days ($F_{1,49}$=11.746, p<.001, Greenhous e-Geisser=0.798).

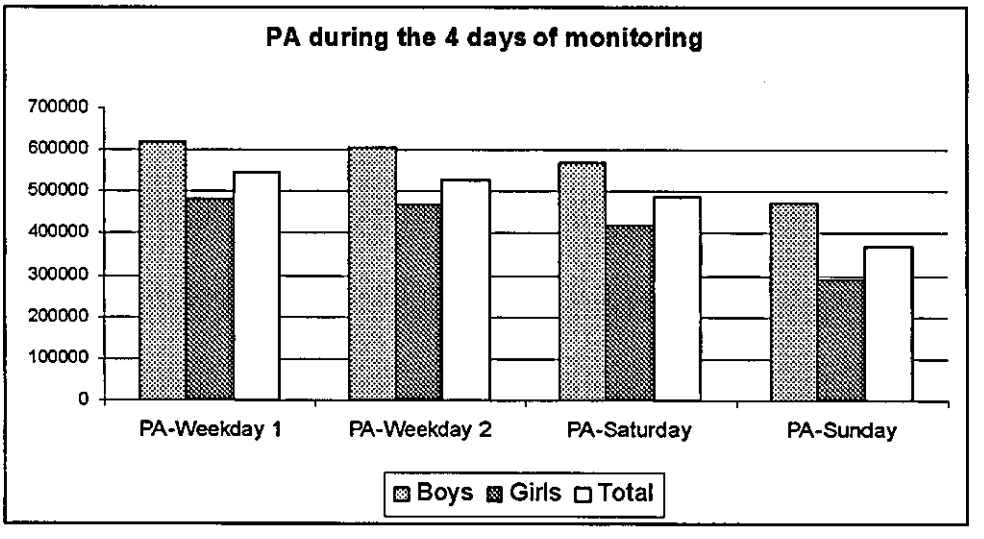


Figure 2.4.2.a: P.A. levels (counts) during the four days of monitoring.

The boys were statistically significant more active than the girls ($F_{1,49}$=15.82, p<.001) with regards to the total PA level, the PA level during the weekdays and the weekend (see table 2.4.2.e).

Table 2.4.2.e: Gender Comparison in different dimensions of P.A. according to CSA (t-test for independent samples).

	t	P
School PE lesson	$t_{(49)}=3.016$	$p<.05$
PA at school breaks	$t_{(49)}=4.411$	$p<.001$
PA at school (excluded PE lesson and PA during breaks)	$t_{(49)}=2.613$	$p<.05$
Total of PA at school	$t_{(49)}=4.215$	$p<.001$
PA after school	No statistical significant difference	
Mean daily PA for the weekdays	$t_{(49)}=2.756$	$p<.05$
Total PA for the weekend (Saturday and Sunday)	$t_{(49)}=2.849$	$p<.05$
PA during Saturday	$t_{(49)}=2.383$	$p<.05$
PA during Sunday	$t_{(49)}=3.341$	$p<.05$

In table 2.4.2.f the profile of the PA of the sample during a typical school day is presented as it was formed by the CSA readings in different activities. The numbers present the contribution (%) of each activity to the total score (counts). It must be noticed that for the school physical education lesson (which for the sample is two hours per week) the percentage represents the quotient of the energy expenditure of the two hours allocated to the 5 school days of the week.

Table 2.4.2.f: Profile of sample's P.A. based on CSA recording (counts %).

	Boys (n=23)	Girls (n=28)	Total (n=51)
PA at school breaks	13.4%	10.5%	11.86%
PA at school PE lesson	8%	6.1%	6.8%
PA at school (excluded PE lesson and PA during breaks)	28.62%	27.6%	28.15%
PA after school	50%	55.19%	52.5%
Total PA	100%	100%	100%

It seems that a large part of the pupils' total physical activity is accumulated to the school environment (see also figure 2.4.2.c). Specifically, according to the CSA, it seems that 50% of the boys' PA and the 45% of the girls' PA is accumulated while they are at school. It is remarkable that the free and without supervision playing during the breaks, is the basic source of activity for the pupils of this age. For the

whole sample the physical activity during the breaks contributes more than the participation in any other form of organized exercise inside the school. It must also be mentioned that the high rate of the PA (28.62% for the boys and 27.6%for the girls) derives from activities during the teaching of other subjects, beyond the PE lesson.

In table 2.4.2.g the mean time of the sample's participation in various intensity activity levels for the two weekdays of recording is presented. It is worth to be mentioned the very low involvement of children in PA at moderate – to - vigorous intensities during the school physical education lesson as well as in the time period after school.

Table 2.4.2.g: Mean time (min) of the participation in PA of various intensity levels for the weekdays according to CSA.

			Total (n=51)		Boys (n=23)		Girls (n=28)	
			Mean	SD	Mean	SD	Mean	SD
Physical Activity at School	School PE lesson	Light PA	29.24	9.35	26.43	10.56	31.54	7.67
		Moderate PA	12.02	9	16.09	10.17	8.68	6.29
		Vigorous PA	2.20	3.46	1.82	2.85	2.5	3.9
	School Breaks	Light PA	48.3	6.85	44.13	7.47	51.7	3.82
		Moderate PA	9.04	6.08	12.76	6.44	6.0	3.64
		Vigorous PA	0.64	0.6	1	1.2	0.34	0.47
	Total PA at School	Light PA	307.63	25.46	294.37	20.32	318.53	24.31
		Moderate PA	46.53	22.25	60.45	18.57	35.08	18.3
		Vigorous PA	4.46	4.1	5.41	4.87	3.68	3.3
PA after School		Light PA	475.65	53.72	456.8	64.55	491.14	37.4
		Moderate PA	35.67	26.36	41.04	29.62	31.26	22.96
		Vigorous PA	3.83	7.31	5.54	9.51	2.42	4.54

In figure 2.4.2.b the mean time of the participation in PA in the three intensity categories is presented for the whole sample and according to gender during the weekdays. Boys participate statistically significantly in more moderate PA ($t_{1,49}$=3.315, $p<.05$) than girls.

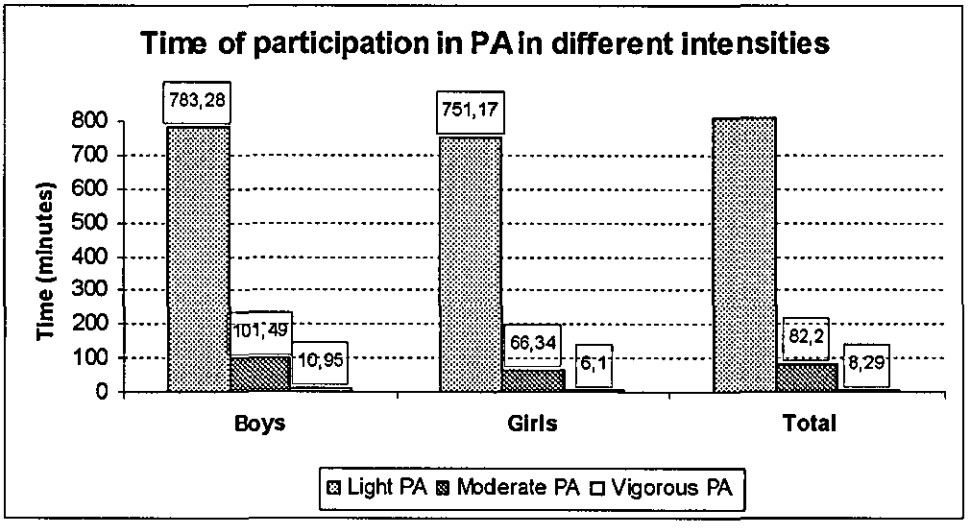


Figure 2.4.2.b: The time of participation of the sample in PA according to the intensity of activity (weekdays).

In figure 2.4.2.c the participation time in moderate/vigorous P.A. in school and after school for both genders is presented. It is obvious that the two genders participate more in moderate/vigorous PA in the school environment than after school. However, from this figure it is obvious that the involvement in vigorous PA for both genders is remarkably low in school environment as well as out of school.

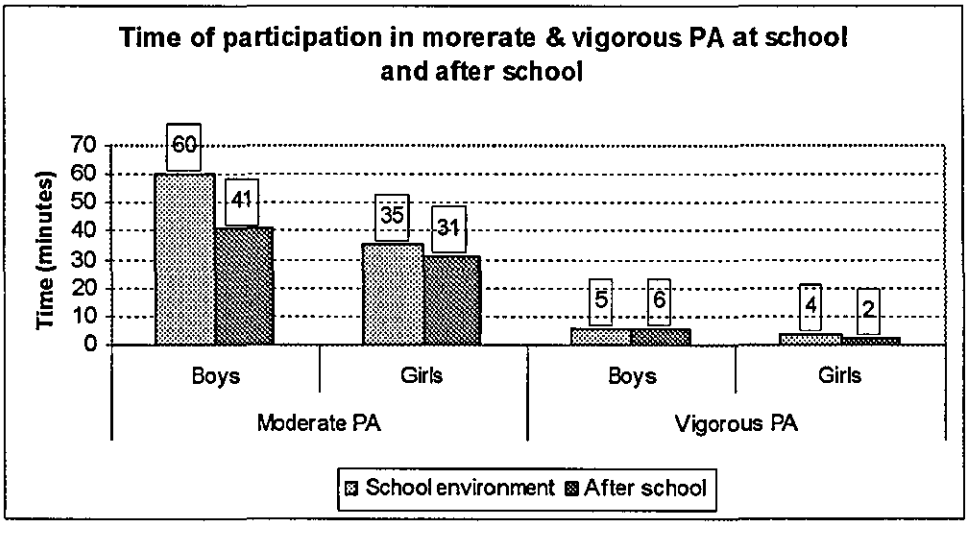


Figure 2.4.2.c: Participation time in moderate and vigorous PA in school environment and after school by gender.

From table 2.4.2.h it seems that 91% of the boys and 50% of the girls meet the first P.A. recommendation for health. It is important to notice that 56% of the boys meet

the first PA recommendation for health only from their activity during school hours. In addition, 26.1% of the boys become so intensively active during their free time that they can meet the first recommendation. The percentage is lower for girls.

Table 2.4.2.h: Percentage of the sample (%) that met the first UK recommendation of PA for health (according to CSA) in the school environment and after school (weekday).

	Total (n=51)	Boys (n=23)	Girls (n=28)
	>60min	>60min	>60min
At school environment	35.3%	56.5%	17.9%
After school	17.6%	26.1%	10.7%
Total of the weekdays	68.6%	91.3%	50%

The Physical Activity and Lifestyle Questionnaire

In table 2.4.2.i the classification of the sample into activity categories based on their answers in PALQ is presented.

Table 2.4.2.i: Classification of the sample (%) in PA categories based on PALQ.

	Boys (n=23)	Girls (n=28)	Total (n=51)
A) Very inactive	--	--	--
B) Inactive	18.2	51.9	36.7
C) Moderately active	40.9	33.3	36.7
D) Active	40.9	14.8	26.5

Similar to CSA, the PALQ identified the same participants' rates (in both genders) to the category of those did not meet the UK PA recommendations for health (the *inactive*). However, the PALQ gives a different picture for a large number of participants who were classified as *moderately active.*

The comparison between the two genders in different dimensions of their physical activity according to the PALQ (T-test for independent samples) had shown statistically significant differences only to the PA during the free time (t=2.146, p<.05) and to the participation to organized sports in school (t=3.168, p<.05). In contrast with the CSA findings, in the PALQ, boys answered that they performed more PA during the weekend than the week days (t_{22}=-2.947, p<.05). The girls considered themselves to be as active during the weekend as during the weekdays.

In table 2.4.2.j the PA profile of the sample is presented as it is formed by the answers in the PALQ. The numbers express the contribution (%) of each activity dimension in the total score of the interviewee ($kcal.kg^{-1}.day^{-1}$).

Table 2.4.2.j: Profile of PA of the sample based on their answers in PALQ (%).

	Boys (n=23)		Girls (n=28)		Total (n=51)	
Physical activity.....	Mean%	SD	Mean%	SD	Mean%	SD
... from active transportation	10	7.3	15	7.3	12.8	7.7
... at school breaks	45.3	17.3	45.9	15.6	45.6	16.2
... from participation in PE lesson	8.4	3.7	11.9	5.5	10.4	5
... from participation in school sport club	2.6	4	0.0	0.0	1.1	2.9
... from participation in private sport clubs/fitness centers/gyms	1.7	3.5	3.5	8.3	2.3	6.7
... from participation in organized sport clubs after school	8.8	12.9	5.4	14.4	6.9	13.8
... during free time after school	24	15.9	18.1	14.4	20.8	15.2
Total	100%		100%		100%	

According to the PALQ, the 57% of the sample's activity is accumulated in the school environment. However, comparing the values presented on tables 2.4.2.f and 2.4.2.j, it becomes obvious that the two measures present a different PA profile of the participants. It is important to notice that both measures indicated that the schools in Greece are the most promising places to activate the children.

Discussion

The purpose of this study was to examine the reliability and the concurrent validity of the PALQ in a sample of elementary school students and to investigate whether this sample fulfilled existing UK physical activity recommendations for health (Cavill,

Biddle and Sallis, 2001). The results supported the hypothesis that the PALQ could be significantly correlated to the accelerometer CSA and could demonstrate high test-retest reliability. These findings indicate that PALQ is a valid and reliable measure for the assessment of PA in elementary school children. In addition, the findings show that a large part of this sample fulfilled the PA recommendations for health; however, the two measures presented a different picture of their physical activity.

Reliability and Validity

The test-retest reliability of the PALQ was acceptable as the participation to PA is not a stable behaviour (Janz, 1994). The correlation coefficient was similar to the one reported for children of the secondary school ($r=.78$, $p<.001$). The PALQ was moderately correlated to the CSA in comparison with the correlation reported with secondary school students in study 4. The correlation between the two measures was higher compared to the ranking of the participants (Spearman correlation) than the absolute values obtained (Pearson correlation). The correlation is the same as other findings (Janz, Witt and Mohoney, 1995) confirming Kohl's *et al.* (2000) opinion that the CSA generally, is not highly correlated to PA questionnaires. However, recent studies showed that CSA provides an accurate estimation of children's PA levels (Ekelund *et al.*, 2001; Welk, Blair, Wood, Jones and Thompson, 2000). Consequently, its moderate correlation with the PALQ it possibly shows the weakness of the PALQ to be used as an objective method of children's PA assessment alone.

A critical inspection of the findings can explain, partially the factors that contributed to the moderate correlation between the two measures. These factors are related to:

1. The activities that are assessed for the extraction of the individual's score in each particular measure and the sensitivity of those in recording PA. Although, using questionnaires, it has been noticed that young people generally, overestimate their PA in relation to the objective methods of assessment (Sallis *et al.*, 1996) this was not confirmed in the current study. The two measures detected similar percentage of the inactive participants however, the accelerometer classified more participants to the active category than the questionnaire did. The possible reasons could be:

- a) A number of daily activities that were classified in the questionnaire as low energy expenditure (<3METs) (as for example, the activities done when children stay in the house and a number of activities in the school environment) showed that the participants and especially the boys, were much more active (for example, in a face-to-face discussion many of the boys said that when they stayed in the house they spent a lot of time wrestling with their brothers). This is one explanation why the two measures are not correlated regarding the boys.
- b) The CSA was pre-programmed to record minute by minute the subject's PA, while, the PALQ collected information for certain activities. So, the questionnaire failed to record a number of habitual activities that are performed by children in their daily life; however, these activities contribute to a large extent to the everyday activity of the child (e.g. playing intensively at home). Additionally, it must be considered that the more diffused, unorganized, and spontaneous the activity is, the more difficult it is to recall; this type of activity pattern is typical for children (Morrow and Freedson, 1994).

2. An error related to the estimation of time and intensity of PA. In the PALQ the questions that assessed the duration of the activity asked about participation in PA at least for 20 minutes. However, children's PA patterns may be best described by short bursts of activity rather than bouts of a given duration or intensity (Bailay *et al.*, 1995; Morrow and Freedson, 1994). It may be that the PALQ is moderately correlated with the CSA because of this lack of sensitivity to periods of activity less than 20 minutes. Additionally, the intensity of certain activities in the PALQ was approximately valued. For example it was supposed that in the school physical education lesson students would exercise themselves for at least 30 minutes in moderate intensity (6.0 METs). The CSA recording the participants in 15 different physical education lessons showed that the participation mean in moderate/vigorous PA didn't exceed 18 minutes for boys and 11 minutes for girls (see Table 2.4.2.g). In addition, evidence suggests that when self-reports are used in PA surveys, they may be less accurate in assessing light to moderate intensity activities than more vigorous pursuits (Welk, Thomson, Galpher and Dunn, 1997). Batty (1998) claims that this may be related to the increased difficulty of children

on recalling less intense, habitual activities (like walking) spread throughout the day, compared with structured bouts of vigorous exercise (e.g. jogging, swimming etc).

3. The cognitive development of the children. In this study it is not known if the subjects had the cognitive development needed to recognize the 20-min time length measured in the PALQ and to recall accurately this information in one week period (PALQ is a 7-day recall instrument) (see finding of the study 2, Section 2.3.2).

Finally, some manufactured limitations of the CSA, which are related to the accuracy of the measurement of PA in children, should be mentioned. The CSA activity monitor is a uni-axial activity accelerometer measuring accelerations in the vertical axis. Egelund and co-workers (2001) claim that it is unlikely that a uni-axial accelerometer detects all human movement. In addition, much of the error is due to the inability of a waist-attached accelerometer to detect arm movements, as well as activity accumulated in pushing or lifting objects, carrying one' s body weight uphill, and stair climbing. Also, the CSA cannot be used for swimming or other water sports, and it is less accurate in detecting very popular activities to children like bicycling, skating or roller (Hendelman, Miller,Baggett, Debold and Freedson, 2000). Therefore, it is possible in the present study that the children were actually more active since many boys reported that they were regularly involved during their leisure time in physical activity using bicycle, roller or skate.

Physical Activity Levels

The most important finding of this study was that a large part of this sample met the first PA recommendation for the health, which is participation for at least one hour per day in moderate intensity PA (Cavill, Biddle and Sallis, 2001). However, the large number of the girls who don't meet this recommendation shows that girls from the very young age are already a target-group for intervention programmes.

The results showed that the girls are less active than the boys. Contrary to the findings of other studies which used objective methods of PA assessment [as for example the recent study of Sleap and Tolfrey (2001) who used a continuous recording of PA by

heart rate monitors (Polar Sport Tester, PE4000) and the study of Janz, Witt and Mohoney (1995) who used the accelerometer CSA] in this study the boys accumulated significantly more moderate/vigorous PA than girls did.

The results showed that about 50% of the sample's PA was recorded at school environment; important also is that 56.5% of the boys and 17.9% of the girls met the first PA recommendation by activating themselves at school. However, this activity occurs mainly through participation in free playing and not through the PE lessons or the participation in organized school sport clubs. It is remarkable that the participation in physical education lesson contributed only to the 6.8% of the total PA of the sample which occurred in the school environment, while the corresponding amount in the CATCH study (Child and Adolescent Trial for Cardiovascular Health) was 50% (McKenzie, Strikmiller *et al.*, 2000). Also the PE lesson, which is for most students the only supervised physical activity in Greece, activates the children in moderate to vigorous intensities for a limited time concerning data from other countries (Fairclough and Stratton, 2002).

Although the school in our country is the basic environment of activating young people, the evidence has shown that it offers no opportunities for participation in organized forms of exercise. Thus, it is possible that the pupils' PA level at school will be significantly increased if: a) a number of attractive sport programs were established, b) the infrastructure for safe free play and sports were improved, and c) an increase to the hours of the physical education lesson was desirable. These suggestions are in agreement with those of other researchers (McKenzie, Marshall, Sallis and Conway, 2000; Cavill, Biddle and Sallis, 2001).

The results showed that the children do not get involved in vigorous activities after school. This happens probably due to their increased academic obligations and due to the poor environmental infrastructure for physical activity and sports. This point is supported by the fact that during the weekend children are involved in more sedentary pursuits that active play. This fact possibly indicates the safety problems that children face in cities. Besides the fact that, internationally, extensive differences in PA between weekdays and weekends were not studied (Sallis, Prochaska and Taylor,

2000), the findings of this study are in contrast with previous studies (Shephard, Jequier, Lavallee, LaBarra and Rajic, 1980).

In the present study, a few participants met the second PA recommendation for health (that is participation in PA at least twice a week, which increases and sustains the muscle strength, the flexibility and the bones' health). It is remarkable that after school, the boys accumulate daily only 5.54 minutes of vigorous PA on average, while only 2.42 minutes by girls. As it was stressed from the profile of PALQ, this could be explained by the fact that very few participants, and especially girls, were involved regularly in organized sports clubs outside the school. This is in accordance with research findings which support the view that children rarely get involved voluntarily in vigorous activity for prolonged periods of time (Bailey, Olson, Pepper, Porstasz, Barstow and Cooper, 1995; Morrow and Freedson, 1994).

Furthermore, students were involved in moderate/vigorous activity for only 30% of the time of the school physical education lesson. This finding underlines: a) the need for a critical examination of the aims and the content of the PE lesson; this fact is also supported by the instructions of *Healthy People 2010* for daily participation in PE classes which activates the pupils for at least 50% of the lesson time (USDHHS, 2000a), and b) the need for linkage of the school with organized sports and health constitutions. In addition, the profile of PA of the sample may indicate that there are limited possibilities for the students who have been characterized as "active" to remain active in adulthood since their PA is occasional and not the outcome of voluntary participation in organized sports (Vanreusel *et al.*, 1997).

The above findings support the general recommendations for applying ecological models for PA promotion in the school environment (McKenzie, 2001) and in the community (CDC, 1997; Vilhjalmssona and Thorolfur, 1998). Special emphasis must be given to the girls' attraction to organized forms of exercise in and out of school (Faucette, Sallis, McKenzie, Alcaraz, Kolody and Nugent, 1995; McKenzie, Marshall, Sallis and Conway, 2000).

Advantages and disadvantages of the two measures

A number of advantages and disadvantages were emerged with regard to the measures involved. The accuracy in PA assessment of the accelerometer was compromised up to a point because it was proved to be obtrusive for the participants. Furthermore, the daily supervision by the researchers for the control of its correct placing was significantly time-consuming, a fact that makes the use of the accelerometer problematic, when large samples are to be assessed. At the same time, the activity information provided from the CSA was limited in terms of the type and the conditions under which it had been carried out.

The low cost, the easy data collection and the multidimensional PA information provided by the PALQ should be balanced by its low accuracy on the information provided. Taking into consideration therefore, the characteristics of the two measures, it seems that for the studies in which high accuracy is required, more accurate information is collected by the accelerometer. On the other hand, the PALQ offers valuable information about the type and the conditions of the physical activity; this information is important for designing effective intervention programs targeting specific needs.

Limitations and future research

The findings of this research refer to the PA level of students living in an urban area during spring. For a more complete and representative picture of the PA level of Greek students, additional studies in larger samples and in different seasons should be conducted.

2.5.0 Summary and Conclusions

The major aim of this project was to design a self-report measure of PA specifically for use with young people in Greece which addressed some of the problems associated with current measures. The five studies described in this chapter aimed to develop and to evaluate the *Physical Activity and Lifestyle Questionnaire* in order to be a valid and applicable instrument of PA assessment of Greek young people. The findings from the two validation studies are encouraging and indicate that the PALQ could be a valid assessment of PA for the population for which it has been designed. Considering the validity and reliability correlation coefficients found in these studies, it seems that the PALQ is capable of attaining reliable and valid reports from children of 11+ years. Furthermore, the *physical activity profile* which is an innovation of this self-report appears to be useful in providing additional information of the PA behaviour of children.

Despite the encouraging evidence of the validity of the PALQ, this study revealed the limitations of developing an instrument that would overcome the problems commonly encountered in assessing PA with self-reports. These limitations are related mainly to the recalling process of the interviewees and the definition of the desired variables. The findings of the second study presented in this chapter indicated that interviewees have difficulty in recalling time and intensity of past PA episodes accurately; this indicates that self-report measures may be ineffective in providing accurate information regarding the time and intensity of PA. Therefore, PALQ should be considered with some degree of caution when used to quantify PA (in terms of time or energy expenditure), to evaluate the effectiveness of intervention efforts, to assess changes in PA over time and to identify behavioral correlates of PA.

The problem with the definition of the desired variables influenced a) the formulation of specific questions of the PALQ (for example, *20 minutes of continuous activity*, or *'huff and puff' activity*), b) the degree of association between the PALQ and the accelerometer, and c) the evaluation of the PA levels of the participants. Based on the finding of these studies a number of issues must be clarified in the future. Firstly, it is necessary to consider the intensity of PA that might be beneficial to health. Sleap and Tolfrey (2001) stated that the definition of moderate-intensity PA as "activity usually

equivalent to brisk walking, which might be expected to leave the participant feeling warm and slightly out of breath" (HEA, 1998) seems to be too broad and leaves uncertainty about the precise meaning of the term. This uncertainty is further reflected in the PALQ's questions with regard to the intensity estimation because 'huff and puff' activity covers a wide range of intensities which probably result in different health and fitness outcomes.

A second issue relates to various interpretations of the results depending on whether assessments are based on intermittent, accumulated PA, or sustained periods of PA. The PALQ requires information regarding continuous activity that lasts at least for 20 minutes. The original data obtained from the accelerometer, in both studies, indicated than children are only rarely involved in sustained periods of moderate/vigorous intensity PA and exhibit a wide range of PA levels. However, the health value of short bursts of PA has been presented in a relatively small number of studies in adults (Murfphy and Hardman, 1998). It is possible therefore, that the shift from sustained to accumulated PA in recent recommendations for young people is not underpinned by a solid base of scientific evidence (Sleap and Tolfrey, 2001; Twisk, 2001). Obviously, the clarification of these issues in the future will contribute to the creation of more reliable self-report measures.

2.5.1 What we know and what we need to know

The "Physical Activity and Lifestyle Questionnaire"

We know.....

- It is valid and reliable measure of assessing PA in children 11+ years old.

What we need to know.....

- Its concurrent validity should be examined with other more advanced measures in assessing PA (e.g. doubly labeled water and/or the Tritrac) (Bratteby, Sandhagen and Samuelson, 1997; Matthews and Freedson, 1995).
- Reliability and validity evidence should be provided for the separate sections of PALQ in representative samples of different age groups, from urban and rural areas of the country (Pratt, Macera, and Blanton, 1999).

The physical activity level of the Greek students

We know... ... ...

- The boys in all ages are more active than girls.
- Physical activity decreases dramatically as children get older, especially for the girls in comparison with other international data. Consequently, a large part of primary and secondary school children do not meet the current PA recommendations for health.
- Girls represent a high priority group for intervention, even from the primary school years.
- The school in Greece is the setting in which young people accumulate the larger part of their daily PA. However, schools provide limited opportunities for participation in organised sport activities.
- Physical education lesson in Greece provides limited opportunities to students of involvement in moderate to vigorous PA.
- Children, and particularly girls, are less involved in PA and organized sports during leisure time after school. The very low participation rates in organized sport activities, in and out of school, resulted in minimum involvement in vigorous activity. It therefore appears that children rarely undertake sustained periods of strenuous activity voluntarily.
- PA is decreasing dramatically during weekends for both genders.
- Greek children have minimum involvement in organized sports which decreases the possibility of them becoming active adults.

What we need to know... ... ...

- The PA level of Greek children based on larger and more representative samples from different ages.
- The determinants of PA that promote or inhibit the active lifestyle and the participation in organised sport activities, especially for girls.

2.5.2 Implications

Despite the limited sample involved in these preliminary studies, the findings raise important questions regarding the PA level of Greek students. There is therefore a need for further examination of the PA patterns of young people in Greece in larger

and more representative samples of different age groups. This issue will be examined in the following project. However, the evidence from these studies supports the general recommendations for applying ecological models for promoting PA both in the school environment (McKenzie, 2001) and in the community (Vilhjalmssona and Thorolfur, 1998). Finally, emphasis must be given to the promotion of organized forms of exercise in and out of the school for the increase of girls' PA levels (Faucette, Sallis, McKenzie, Alcaraz, Kolody and Nugent, 1995; McKenzie, Marshall, Sallis and Conway, 2000).

Abstract of the Project 2

In the 2nd project a *need analysis* was carried out in order to gather baseline information for the effective promotion of PA in schools. This project investigated a) the lifestyle and PA patterns of young people, b) the training needs of the PE teachers towards teaching health-related (HR) programmes, and c) the nature and extent of PA promotion in schools. This project consists of three separate studies.

The **first study** examined the lifestyle and physical activity (PA) patterns of young people and explored specific PA determinants. A cross-sectional sample of 911 students (12, 15 and 17 yrs old) was selected from 17 public schools of 5 different districts of Thessaloniki. Data was collected with an expanded version of the *PALQ*. The results showed that lifestyle characteristics of children change as they grow older. Young students, and especially girls, reported a low interest for PA and sports and high interest for social interaction. The regular involvement in sedentary leisure time pursuits (such as TV viewing, P/C games), the accessibility to the sport programmes and the improved sport infrastructure did not correlate with students' PA level. This study revealed a significant positive relationship between PA level, perceived physical competence, goal orientation, and attitude towards PE lesson. More active children tend to have more positive views about their perceived physical competence. They also tend to be more task-oriented and to enjoy PE lesson in all age groups more than inactive children. These findings are more salient in girls in every age-group. Health, enjoyment and social relationships emerged as the strongest motives for participation in PA and sport in both genders and every age-group. The participation of older students in organized out of school sport activities is very low. This sedentary behaviour increases dramatically as children grow older probably because of the increased academic responsibilities both in and out of school. Schools constitute the most important environment in activating students of all ages. The findings of this study stress the need for the implementation of ecological models of intervention to promote PA in school and community settings.

The purpose of the **second study** was to investigate the knowledge, attitudes and self-efficacy of 103 elementary and secondary PE teachers (53 male -50 female) toward teaching a HR programme. Survey method was used for the data collection. The results show that 50.5% of the respondents had positive attitudes toward teaching a HR programme. A limited percentage of the respondents felt that they had the knowledge (46.5%) and the ability (44.7%) to cope with the demands of such a programme. Perceived knowledge level and self-efficacy towards teaching HR programmes was not related to the age and the school grade of the sample. Physical education teachers' role is important in promoting effectively health and PA in the school environment. However, the results of this study show that this particular sample may face a number of difficulties to effectively implement such a programme. Therefore, the training and support of the PE teachers is a necessary precondition before the establishment of any HR initiative at the school environment. Training should focus on the dimensions of the programme taking into consideration the specific staff needs.

The purpose of the **third study** was to investigate the nature and extent of PA promotion in schools. The head teachers of 17 schools (6 elementary, 6 middle and 5 high schools) from 5 different districts of Thessaloniki completed a questionnaire which was designed to elicit information regarding a) the range, nature, quantity and quality of PA opportunities available within the schools, b) the background of the staff in issues relevant to health promotion in schools. Results showed that the PA promotion within the Greek school environment is a very low priority issue and distant from the practice followed in other European countries. More specifically, schools provided students with very limited PA and sport opportunities. The environment and policies in the majority of the schools were not conductive to PA participation and problems were evident with sport infrastructure, facilities, and links with community health and sport bodies. Taking into consideration the findings of this study and the international perspective, governors, school administrators and the schools' staff should implement a number of organizational, socio-cultural, and environmental interventions in schools in order to influence PA behaviour of young people in Greece.

3.1.0 Introduction

3.1.1 Background – Statement of the problem

The concept of a healthy lifestyle with particular emphasis on children's physical activity patterns and associated fitness levels has been examined extensively during the last decade (Allied Dunbar, 1992; Bar-Or, 1994; Paffenbarger, Hyde,Wing and Kampert, 1993; Pieron and Ledent, 1996). According to Veal (1993), the term lifestyle *"is understood as relatively stable patterns of behaviour, habits, attitudes and values which are typical for groups one belongs to, or the groups one wants to belong to"*. The lifestyle can affect personal health through habits such as alcohol consumption, diet, smoking and participation in physical activity (Bouchard *et al.*, 1990). These patterns of behaviour are strongly linked to values and to socio-demographic and psychological characteristics of the individual and may involve varying degrees of social interaction (Veal, 1993). Research findings support the view that environment exerts a strong influence in the formulation of lifestyle. Hence, the lifestyle patterns of people can be better understood taking into consideration the broad environmental context in which they live (Aaro, 1986).

The industrialized society and the technological revolution influenced the way of living and resulted in rapid changes in the human activity across the lifespan. Currently, the common assumption that young people are naturally physically active has been questioned. The technological, environmental, and social changes have altered young people's lifestyles and PA patterns to the extent that physical inactivity has become a serious public health issue in most industrialized countries (Krassas *et al*, 2001; Pieron and Ledent, 1997). The recent Sport England survey (1999) reported that only 27% of young people indicated that they preferred to do sport in their leisure time compared to other activities. Poor PA levels have been reported for children and adolescents from a number of researchers (Armstrong and Welsman, 1997; Pratt, Macera and Blanton, 1999) and Health Organizations; recently, the Health Education Authority (HEA) in England (1998) reported that only 15% of girls and 29% of boys aged 11-16 years participated in daily exercise. Taking into consideration the findings regarding the PA levels of Greek children (project 1), these statistics are of particular concern because of their long-term implications on young people's decisions to

engage in and adhere to a lifestyle that involves regular PA and positive behaviours towards health (Johnson and Deshpande, 2000).

The consolidation of the behaviours which formulate one's lifestyle begins from the preschool age and it is completed during adolescence under the dynamic interaction between the person's individual characteristics and the influence of the environment (Bouchard, Shepherd and Stephens, 1994; Sallis, 1994). Numerous studies indicated that PA behaviour patterns are established early in young people's lives (Simons-Morton, O'Hara, Parcel, Huang, Baranowski and Wilson, 1990; Stucky-Ropp and Dilorenzo, 1993). Furthermore, there is evidence indicated that behaviours learned at younger ages reflect the type of behaviours in adulthood (Janz, Dowson and Mahoney, 1999; Malina, 1996). The World Health Organization (1991) also suggested that health choices and behaviour patterns adopted during childhood are often maintained into and throughout adulthood. In a recent review on correlates of PA of young people a number of variables consistently correlated with PA across age and gender were found, supporting the view that youth PA is a complex behaviour determined by many factors (Sallis, Prochaska and Taylor, 2000). This review indicated that many of the determinant variables of PA behaviour are directly related to the school's social and physical environment (e.g. support from teachers and peers, provision of sport facilities and programs, opportunities to exercise) and indirectly to the experiences and emotions which children meet daily from their involvement in the school life and the PE lesson (self-esteem, perceived competence, feeling of success, enjoyment, achievement orientation). These findings support the view that the school is the most effective environment for promoting public health through physical activity (CDC, 1998; Johnson and Deshpande, 2000).

Three important points can be identified: Firstly, during the critical period in which children's lifestyle patterns are formulated, the vast majority of the young population attends school. The school is a very promising environment to pursue behaviour change because it is possible to intervene simultaneously in many determinant variables in a critical age targeting almost all children (Fox, 1996; McKenzie, 2001). Secondly, physical activity is an important segment of children's lifestyle because of its relation to health; however, it is a complex behaviour which is influenced by a number of factors. Thirdly, it is possible to direct children's lifestyle and PA by

intervening in specific modifiable variables, before the behavioural patterns are consolidated.

However, it has been claimed that the important socialization environments, the family and school, have lost at least some of their power to influence positively young people towards specific behaviours while those of the mass media and youth sub-cultures have increased (Telama, 1998). If this is true, additional efforts must be placed from scientists and educators in designing thoughtful and justified health and PA programmes. The efforts of influencing young people's lifestyle in the school setting must be organized based on substantial evidence with regard to the factors which inhibit or promote the behaviour and it must target strong and consistent modifiable correlates (Baranowksi, Anderson and Carmack, 1998). Thus, the schools can become the main vehicle in promoting effectively a healthy and active lifestyle by developing sound and justified health policies.

The international concern and the sporadic evidence from studies conducted in Greece stress the need to investigate the lifestyle and PA patterns of the Greek young people. Because of the lack of extensive national or local epidemiological information, the usefulness of a study dealing with the Greek youth lifestyle and PA level clearly appears in referring to the Description – Correlation – Experimentation loop proposed by Rosenshine and Furst (1973) in the educational research.

- The descriptive approach enables to identify the patterns and the level of PA behaviour of Greek young people, the importance given to various leisure activities, and key-variables related to the behaviour.
- The correlational approach contributes to identify which variables associate to the regular participation in PA and sports.
- Finally, by applying the experimental approach it is possible to intervene on some of the key-variables in order to promote effectively PA behaviour.

It is obvious that the information gained following this process will be valuable in helping to ensure that interventions effectively address the specific needs, preferences and priorities of young people in the school and the locality and also to justify the commitment of funding to initiatives (HEA, 1997). In addition, a more accurate description of the situation could be depicted and more effective intervention could be organized if additional information concerning the school, the community and the

locality is obtained. Throughout this project therefore a *need analysis* will be conducted in order to explore the lifestyle PA patterns of Greek young people and to identify key-factors for the effective PA promotion.

3.1.2 Research aims of the project 2 - Research questions

The main aim of this project is to examine the lifestyle and PA patterns of Greek young people taking into consideration specific PA determinants. The secondary aim is to gather additional data that will assist in formulating plans and proposals for the promotion of PA in the school environment. More specifically, the objectives of this project are:

1. To explore the leisure-time pursuits of Greek young people.
2. To examine the PA patterns and the PA level of Greek young people.
3. To explore the relationship between involvement in PA/sport and specific personal and environmental variables.
4. To examine teachers' knowledge, attitudes and self-efficacy towards teaching health related exercise.
5. To provide information regarding the nature and the extent of PA promotion in a sample of elementary and secondary schools in Greece.

Throughout this project the following research questions will be examined:

Main research questions

1. What are the leisure-time pursuits of the Greek young people?
2. What are the PA patterns of Greek children and how active they are? Is there a need to increase their PA level?
3. To what extent specific personal and environmental PA determinants correlate to the PA behaviour of Greek young people?

Secondary research questions

4. To what extent the school PE teachers are prepared to support health and PA initiatives?
5. What are the current PA/sport opportunities for Greek students in the school environment?

The information obtained from the secondary research questions can complement the data from the need analysis of the students, helping to inform intervention strategy and identify priorities (e.g. target groups, staff training needs, partnerships, settings).

3.1.3 The importance of the project 2

This project is important for the following reasons:

a) It offers baseline information on the lifestyle patterns, the PA level and the factors underpinning participation in PA/sport of Greek young people. This information is essential for the health and education organizations of Greece as there are no extensive national data.
b) It offers information about the PA promotion in schools. This information will help in establishing feasible and justified PA policy in the school environment.
c) It provides baseline information for the teachers' training needs in health related issues.
d) It contributes to a better understanding of European youth's lifestyle and PA patterns by providing comparative data.

3.1.4 Overall methodology - Justification of the methodology

The research questions of the 2nd project are examined throughout three separate studies (figure 3.1.4.a). The survey method was adopted as the more appropriate regarding the nature of the information requested and taking into consideration the size of the samples, the time frame of the study, and the cost.

The *need analysis* was carried out in a) a cross sectional sample of 911 students, b) 103 elementary and secondary PE teachers, and c) 17 schools. *Students* answered the PALQ in order to depict a profile of their lifestyle, PA levels, and psychological factors underpinning participation in PA/sports. The *teachers* answered a questionnaire in order to evaluate their knowledge, attitudes and self-efficacy towards teaching HR exercise (see Appendix 2.a). The schools' heads filled in a questionnaire in order to establish the nature and extent of PA promotion in the schools (see Appendix 2.b). Extensive details provided in the methodology procedure of each separate study.

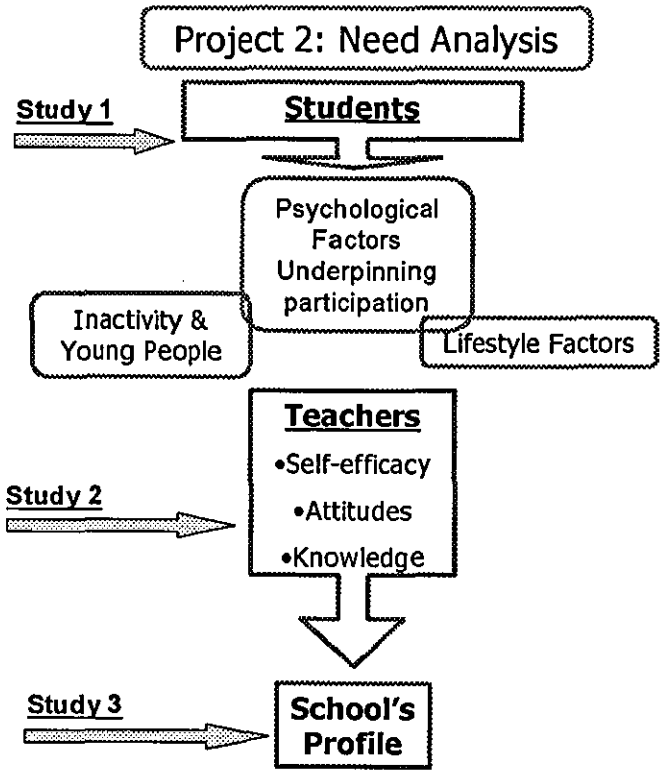
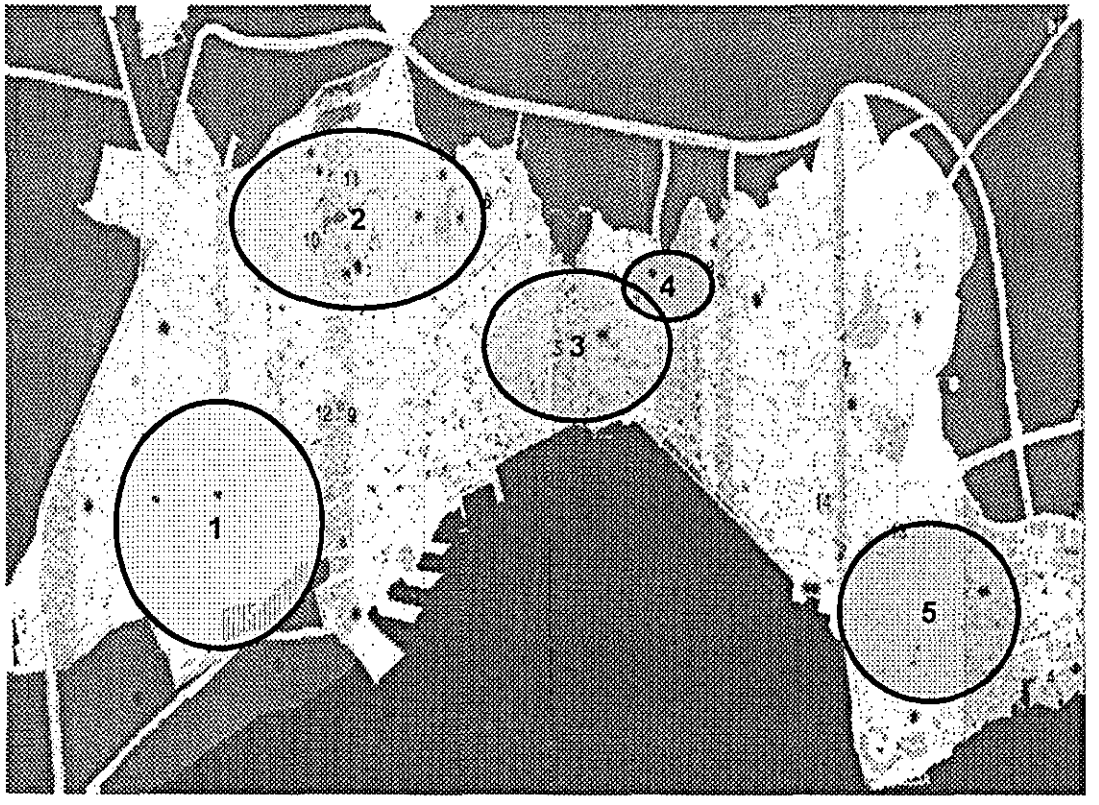


Figure 3.1.4.a: The outline of the 2nd project (need analysis).

The sample of the students of this project was recruited from 17 schools (6 elementary, 6 secondary and 5 high schools) that belong in five different administrative municipalities of the city of Thessaloniki providing a wide range of socio-economic and environmental characteristics. Schools within the municipalities were selected using random numbers (Thomas and Nelson, 1996) except one particular school which was chosen because it was located in an area where the students had direct and safe access to the most well-equipped and well-organized sport center of the city. The picture 3.1.4.a indicates the location of the schools in the five selected areas.

The information collected from these three studies is necessary: a) to establish whether the Greek young people are adequately physically active to obtain health benefits, and b) in developing a strategy for the PA promotion which address the particular needs of each sub-group of the population studied (HEA, 1997; Sallis and Owen, 1999).



Picture 3.1.4.a: Map of Thessaloniki: Schools' location. The numbers represent:

1= Industrial area – poor sport and environmental infrastructure.
2= Small industry area – well enough sport infrastructure.
3= City centre – very poor sport infrastructure & absence of areas for active leisure activities.
4= Excellent sport infrastructure – easy access to country site.
5= Advanced area – very well sport infrastructure – very well environmental infrastructure in sport facilities, play grounds and leisure areas in country site.

More specifically, throughout this process of inquiry is possible to:

1. Recognise whether the young population represents a homogeneous group or young people's needs may vary between different sub-groups, with regard to age, gender, and area of residence.
2. Identify factors that encourage to or prevent young people from becoming physically active (e.g. existence of appropriate support structures, availability of programmes, access to sport facilities).
3. Provide an indication as to what extent the PA needs of young people are being met in schools.
4. Indicate priority areas for intervention and highlight the type and the components of interventions likely to be more effective.
5. Finally, identifying the provision of PA opportunities for young people within the locality (e.g. schools, community, sports clubs and organisations) can help to: a) identify the support structure available to implement any

initiatives, and b) identify areas in which there are training needs (e.g. to teachers who implement the initiative), that should be carried out before initiatives are implemented.

3.1.5 Structure of the project 2

The literature review section presents briefly the main issues on the relationship between PA and health, the PA levels of young people, the determinants of PA behaviour, and the PA promotion in the schools. Following that, three studies associated with the research questions are presented. The final section presents a summary of the main research findings, a discussion of their implications in setting up intervention programmes aiming to promote PA in Greek young people, and recommendations for future research.

3.2.0 Literature Review

3.2.1 Benefits of PA for young people

Habitual PA has been recognized worldwide as an important component of a 'healthy' lifestyle. In the adult population, it is commonly known that physical inactivity is related to many chronic physical (Blair *et al.*, 1989) and mental diseases (DHHS, 1996; Stephens, 1988). Nowadays, the population attributable risks of physical inactivity for different chronic diseases are very high. However, Powel and Blair (1994) claimed that this risk could be prevented by being vigorously active. Even though the clinical symptoms do not become apparent until much later in life, it is known that the origin of many chronic diseases lies in early childhood. It has been argued that prevention of chronic diseases has to start as early in life as possible. This following section is dealing with the potential health benefits of PA for young people.

Even though the benefits of an active lifestyle are well established for adults, the health benefits for young people are not as clearly understood (Twisk, 2001). Existing research provides strong justification for the need to promote PA to young people by suggesting several reasons for fostering active lifestyles amongst them. These include the maintenance of optimal growth and development, alleviation of some medical disorders and the establishment of lifelong exercise patterns, to minimize the risks of adult chronic disease (Cavill, *et al.*, 2001; Riddoch and Boreham, 1995). In addition research has shown that high level of PA might be beneficial for young people both in short- and long-term view.

The short-term health benefits related to the positive effects of PA are: a) coronary heart disease risk factors, b) the improvement of quality of life and c) contribution in preventing overweight during childhood and adolescents. According to Sallis and Patrick (1994) PA can directly influence factors such as adiposity, psychological functioning, immune status and risk of musculoskeletal injury, which are all significant health concerns for young people.

A number of cross-sectional studies suggest that the association between PA and risk factors for cardiovascular disease (such as adiposity, blood pressure, glucose tolerance

and lipoprotein profile) are similar in both children and adults (Sallis *et al.*, 1988). However, longitudinal studies do not provide conclusive evidence that increasing PA in children improves their coronary risk profile during childhood and adolescence (Alpert and Wilmore, 1994; Armstrong and Simons-Morton, 1994). This contradictory evidence on coronary risk profiles during childhood and adolescents could be explained by taking into consideration the physiological differences between young people and adults. Bar-Or and Malina (1995) assert that it is more difficult to detect the effects of PA on youngsters' health because many of the physiological factors affected by activity are also affected by growth and maturation. In addition, most 'healthy' children start out with lower levels on these risk variables than adults; therefore increase(s) in PA will not alter these factors to such extent as those seen in similar studies of adults. Recent research evidence has, also, identified a favourable relationship between PA and a range of factors associated with metabolic syndromes (Kahle *et al.*, 1996).

The second health benefit related to the positive effect of PA to youngsters it entails the improvement of quality of life. Physical activity can enhance psychological well-being and reduce symptoms of depression and anxiety (Calfas and Taylor, 1994; Steptoe and Butler, 1996). A number of studies have shown that active young people have improved self-concept and self-esteem, as well as exhibited lower levels of perceived stress, and had a better moral and social development than inactive counterparts (Norris, Carroll and Cochrane, 1991; Shields and Bredemeier, 1994). Furthermore, it is suggested that participation in PA and sports enrich the quality of life and enhance well-being by providing to young people a variety of sensory experiences and enabling them to cope with every day activities more easily (Fox, 1991).

Finally, the last short-term health benefit related to the positive effects of PA has to do with preventing overweight during childhood and adolescents. It is widely acknowledged that obesity has become the most common and costly nutritional problem in developed countries during the last quarter of the 20th century (Freedman, Srinivasan, Valdez, Williamson and Berenson, 1997). The role of PA in helping to reduce and prevent obesity during childhood and adolescents is particularly important, as obesity has many negative physiological (Gortmaker, Dietz, Sobol and Wehler,

1987), social and psychological implications for young people (Goldsmith, Anger-Friedgeld, Beren, Rudolph, Boeck and Aronne, 1992). Research evidence suggests that PA plays an important role in reducing childhood obesity, along with a low-calorie diet and behaviour modification (Baranowski, Mendlein, Resnicow, Frank, Cullen and Baranowski, 2000; Epstein, 1986). Furthermore the reduction of obesity and reduced levels of other coronary heart diseases risk factors in childhood and adolescents have proven to be very important in maintaining health in adulthood life.

On the other hand the long-term benefits of PA in young people are related to a) the reduction of the risk of chronic diseases, and b) the increase of possibility of an active adulthood. Regular PA for young people may help to prevent or impede the development of several adult conditions in which inactivity is a contributory factor. These include degenerative diseases of the heart and blood vessels, obesity, and musculoskeletal disorders such as low back syndrome and osteoporosis (Bar-Or and Malina, 1995).

Studies have indicated that many children have at least one modifiable risk factor for coronary heart diseases (Boreham, Primrose, Savage, Cran and Strain, 1992). This has important implications, as there is evidence of the possible tracking of coronary heart disease risk factor over time (Lauer, Lee and Clarke, 1989). One other influence of PA in childhood and adolescence is related to obesity prevention and treatment and in the maintenance of weight loss. Despite the absence of definitive conclusions, few studies have suggested that an increase in PA can result in reduced fatness (Boreham, Twisk, Savage, Cran and Strain, 1997). Also the importance of avoiding being overweight during adolescence must be emphasized, because evidence had shown that obese young people are likely to become obese adults (Kimm and Kwiterovich, 1995). (One other) Another beneficial effect of PA during childhood and adolescence is related to the reduction of the development of osteoporosis in adulthood by maximizing peak bone mass during maturation (Bailey and Martin, 1994).

Finally, a long-term benefit of PA in young people is related to an increased possibility of an active adulthood. Retrospective surveys and relatively short-term prospective studies have indicated that inactive young people are unlikely to become

physically active adults (Malina, 1996; Janz, Dawson and Mohoney, 1999; Telama, Yang, Laakso and Vikari, 1997).

To summarize, it could be argued that an active life style in childhood that is continued into adulthood is particularly important, since effects from inactivity are more evident in adults than children (Pate, 1995). However, more research is needed to investigate a) the relationship between the PA patterns of young people and PA's contribution to health, and b) which types of PA track over time and to identify factors that affect tracking (Cavill, Biddle and Sallis, 2001). Since many health risk factors are related to a sedentary lifestyle, and thus potentially preventable, early interventions could be very valuable. It is therefore important to introduce strategies to promote active lifestyles in young people in order to reduce the development of these risk factors both in short- and long-term basis. The following section will present epidemiological data on the PA levels of young people.

3.2.2 Young people's PA levels

The main importance of knowing how active young people are and how many are meeting the current PA guidelines is because of the health benefits of PA in youth. However, currently accurately establishing how active young people are, is a difficult task because:

- Definitions of 'appropriate' activity and the methods used to measure it have been diverse. Furthermore, the interpretation of children's PA levels become(s) more complex because it depends on the criteria and the thresholds of PA used to classify individuals in activity categories (Cavill, Biddle and Sallis, 2001; Sleap and Tolfrey, 2001).
- There are many methodological problems in assessing PA patterns of young people which often can produce contradictory findings (see also 2.1.1).
- There are much less descriptive epidemiological data on trends across time in youth PA than there are for adults (Sallis and Owen, 1999).
- The monitoring of young people's PA has a relatively short history and it is not possible to use objective data to determine whether there has been a general decline in PA over time (Armstrong and Van Mechelen, 1998).

Despite the above mentioned limitations, few researchers took into consideration data on energy intake, claimed that at present children are less active than in previous generations. For example, Durnin (1992) pooled data collected from the 1930s to the 1980s demonstrated a progressive decline in the energy intake of young people in the UK whereas the body mass of both genders was almost constant across all this time. The very marked reduction in energy intake without a change in body mass must reflect diminished energy expenditure. Based on this finding Durnin concluded that young people, at least in the UK, have become more sedentary over the last 50 years. Similarly, Troiano *et al.* (1995) concluded that the increasing levels of obesity among U.S. children suggest that during the last decades children are becoming less active.

In spite of the variation in methods the available data are remarkably consistent in some findings. Firstly, the available data indicate that between the ages of 5 and 17 boys are more physically active than girls. A review of five heart rate studies in young people indicated that boys, on average, involved 23% more time in PA than girls (Sallis, 1993). With regard to the level of activity intensity both genders experienced the same level of moderate intensity but boys appeared to be more active than girls in accumulative amount of activity. The average gender difference is about 14%, with a range of 4 to 30% (Armstrong *et al.*, 1990; Sleap and Warburton, 1992; Thirlaway and Benton, 1993; Armstrong and McManus, 1994; Sport Council Survey, 1995; Health Education Authority, 1995; Pieron and Ledent, 1996; Cale and Almond, 1996; Pangrazi, 1996). Furthermore, boys appear to engage in vigorous, sustained PA more often than girls (Bailey, Olson, Peper, Porszasz, Barstow and Cooper, 1995) especially after eleven years (Blair *et al.*, 1989, Thirlaway and Benton, 1993). Sallis *et al.* (1993) studied the habitual physical activity and health-related physical fitness in fourth-grade children and confirmed that females were less active and less fit. Similar findings in the Greek population have shown that girls are less active and less fit than boys (Avgerinos *et al.*, 1994; see also 2.4.1 & 2.4.2).

Secondly, during childhood and adolescence both genders reduce their PA as they grow older, but the rate of decline is higher in girls (Van Mechelen and Kemper, 1995). However, it is not clear if this decline is due to biology or to social influence. Puberty is characterized by a more intense cutback on PA (Caspersen, Merritt and Stephens, 1994; Kimm *et al.*, 2000), especially for girls (Michaud, Narring, Cauderay

and Cavadini, 1999). Research has shown that PA level declines throughout the school years, this is more evident after the age of 12 or 13 years (Armstrong, 1998; Thirlaway and Benton, 1993; Riddoch *et al.*, 1991; Nelson, 1991; Pieron and Ledent, 1996). This decline in PA is continuing in the secondary school with a precipitous drop out in activity as children progress to secondary education. Armstrong (1989) monitored school children's PA using a telemetry system for heart rate work and found that there was not any difference between the activity levels of the primary and secondary schoolboys, but the primary schoolgirls were significantly more active than the secondary schoolgirls. In addition, Armstrong and McManus (1994) did not find any significant relationship between age and PA for boys, but found a negative correlation with age for girls. The decline in activity with age for girls appears to be particularly evident while a majority of 17-18 year old girls are 50% less active than 11-14 year olds (Health Education Authority, 1995; Aaron *et al.*, 1993). Similarly, Sallis (1993), after reviewing a number of studies confirmed a decline in physical activity with age of 2.7% per year in males and 7.4% for females and claims that the rate of decline was almost twice as steep when assessed with objective measures.

Thirdly, it is difficult to determine how much time children and adolescents spend in PA, because different studies have used different measures and definitions and there are variations by nation and season (Molnar and Livingstone, 2000). However, epidemiological studies on adults (Pangrazi, 1996) have shown that the decline in PA continues throughout the adult years as well. Whatever level of PA is found to be important for optimal health, the probability of meeting that standard decreases with each year of age from 6 to 17 years (Sallis, 1993). The harmful implications of inactivity on health are expected to have a greater impact on females because the decline in their activity levels is faster than in males; the gender gap in activity appears to widen with age. It is worth mentioning that self-reported measures have shown similar rates of decline in PA with age for both gender but studies that used objective measures have indicated that the rate of decline is about two-and-a half times greater in females than males.

Finally, young people's PA patterns appear to be sporadic (see also 2.4.2). Sustained periods of moderate to vigorous PA are seldom experienced by many youngsters (Bailey *et al.*, 1995; Morrow and Freedson, 1994). Studies on the quality (intensity)

and quantity (volume) of children's physical activity have found that few children experience voluntarily a time interval of 20 minute session of activity at the intensity associated with an improvement in fitness; however, much shorter periods of the required intensity were common (Armstrong, 1989; Sleap and Warburton, 1992; Sleap and Tolfrey, 2000).

The uncertainty that it is faced at present time in establishing how active young people are, indicates that more research is needed before any definitive conclusions can be reached on the extent of inactivity of young people and the benefits of existing PA levels of this age group. Therefore, what is required is more information on the PA levels of young people, but more importantly information which has been gathered in a systematic way by a method which is appropriate for use with young populations. The examination therefore of the PA patterns and the PA level of Greek young people will be a purpose of the first study of this project.

The results of the above mentioned descriptive epidemiology studies of youth are particularly relevant to the following chapter in which the determinants of PA are discussed. The review of a number of studies on the determinants of PA will help to explain why males are more active than females and why PA declines with age among young people. Despite the absence of data concerning the epidemiology of PA in Greece, the results of the international studies presented in this section and the findings of the two studies conducted in Greek samples in 1st project (see 2.4.1 & 2.4.2) imply that interventions are particularly needed to promote PA in older adolescents and especially among girls. Interventions are needed at younger ages in order to prevent or slow the decline in PA with age.

3.2.3 Determinants of PA in young people

The sections 3.2.1 and 3.2.2 of this review established that PA is important for maintenance of physical and mental health, and a considerable segment of young population may be not active enough to obtain these health benefits. All of this information is interesting, since it provides the motivation for individuals and government bodies to act to promote PA. But there is a big leap from identifying the

problem to solving it. This section therefore presents a brief review on descriptive research to highlight a number of factor that influence PA behaviour in young people. In order to develop effective PA interventions in youth, influences on, and determinants of, activity levels need to be well understood (DCD, 1998). According to Sallis and Owen (1999), research on determinants studies can be used in two ways to help design PA interventions. The first use is to assist in targeting interventions to high-risk groups. For example, the findings that PA declines dramatically amongst females adolescents provide a rationale for giving special attention to this group. A second use of determinants research is to guide the intervention's content by modifying those factors that control the behaviour and those changes are expected to lead to improved behaviour. For example, by providing more enjoyable activity in accessible and safe environment children could improve their competence and self-efficacy, reduce perceptions of barriers and increase the time they spend outdoors. However, it is important to note that the term *determinant* refer to observational – that is, without intervention - studies of correlates of PA and in fact it is a misnomer because correlational studies cannot lead to conclusions about causation (Sallis and Owen, 1999).

Numerous factors influence young peoples' levels of PA. A typology useful in understanding the multitude of factors which may influence children' s PA patterns, considers determinants a four levels: *the physiological level*, including factors such as maturation and growth, *the psychological level*, including motivation, self-efficacy, and sense of control, *the socio-cultural level*, including family characteristics, socio-demographics, and role models, and *the ecological level*, including the availability of facilities for activity, physical safety and climate (Lindquist, Reynolds and Goran, 1999). However, it is important to underline that this classification is simplistic because these are just some of the variables that determine PA behaviour in childhood and adolescence. Sallis *et al.* (1992) claim that no variable or category of variables is expected to account for most of the variance in children's PA; different variables may be particularly important to different groups at different developmental periods. However, this approach provides a means of isolating key correlates which may be important in the promotion of young people's PA.

In terms of biological factors, gender and age seem to be the two basic biological variables related to the degree of involvement in PA. As mentioned in the previous section, PA declines dramatically with age during youth, and boys are almost always found to be more physically active than girls. A study of high school students found few ethnic differences in overall PA, but socio-economic status was found to be important (Sallis, Zakarian, Hovell and Hofstetter, 1996); youth from families with higher socio-economic status tend to be more active than youth from families with low socio-economic status.

In terms of psychological factors, a few psychological variables have been shown to be consistently correlated with PA in young people. Self-efficacy for exercise is the most highly correlated variable among adolescent girls and boys (Zakarian, Hovell, Hofstetter, Sallis and Keating, 1994). Also self-efficacy for PA (activity) strongly predicted change in PA (Trost, Pate, Saunders, Ward, Dowda and Felton, 1997). Among a number of perceived barriers (e.g. lack of time, lack of confidence, lack of success, lack of opportunities, boredom, and loss of interest) which are inversely correlated with PA level, the lack of time is the most important barrier for adolescent young people (Tape, Duda and Ehrnwald, 1989). Zakarian *et al.* (1994) studied 28 potential correlated of PA and found that perceived benefits of PA were correlated with exercise participation, and for girls, dislike of physical education was negatively associated. In a recent review Sallis *et al.* (2000) highlight the role of fun and enjoyment as being important motives for young people to participate in PA, both among those involved in competitive sport and in general groups of young people. Indeed, these factors seem more important than the motivation to compete or win; in addition, lack of fun has been identified as a factor leading to discontinuing participation (Sports Council for Wales, 1993). Other motives for participation in PA include: improvement of health and fitness, enhancing self-image, and making new friends. Research into goal orientations has indicated that task-orientation is more likely than ego orientation to promote young people's PA and/or sustained sport participation (Duda, 1996; Digelidis and Papaioannou, 1999; Ntoumanis and Biddle, 1999b).

Young people do much of their PA with other people such as parents, siblings, classmates, and friends. The combined influence therefore of 'significant others' is

important in determining young people's attitudes towards, and participation in, physical activity; if parents or friends disapprove, PA is given a low social value (Fox, 1992). Parents can influence their children's PA by helping and supporting their children's activities, serving as active role models and providing positive encouragement and reinforcement (HEA, 1997; Taylor, Baranowski and Sallis, 1994). However, certain individuals or groups are more influential at different ages: parents are thought to be most influential for young children, and peers for adolescents (Mason, 1995). The above information highlights two significant points: a) the importance of targeting families when trying to encourage changes in the health-related behaviour of children, and b) the promotion of co-operative, group PA as well as organized activities and sports may positively influence peer pressure on PA for adolescents. Apart from parents and peers, PE teachers, community leaders and the media also exert a strong influence on young people's participation in PA (Mason, 1995).

In terms of ecological level, a variety of environmental factors influence children's and adolescents' PA behaviour. The physical environment is closely associated with physical activity. Studies in pre-school children had shown that time spent outdoors was the single best correlate of PA (Sallis, Nader *et al.*, 1993). This finding indicates that the easy way to keep young children active would be simply to send children outside more. However, this finding may also reveal the problem that faces many parents concerning safety and lack of space and sport facilities near homes. Dishman (1990) stressed the important role of facilities available to children in their local area as a factor that affects their participation. A broad range of opportunities in the local areas encourages children to take part, especially during the weekend. Sallis (1993) found that the more places children can play that are within walking distance from home, the more active the children are. Taking into account that children from families with low economic status or children living in less affluent areas have fewer opportunities for participation, the role of local, low-cost facilities is of vital importance. Weather is one other environmental variable that influence young people's PA behaviour. Research showed that PA levels of both genders of various ages were lower in winter than summer (Baranowski, Thompson, DuRant, Baranowski and Puhl, 1993). Although children spend a lot of time in daily basis watching television, there is no consistent association between viewing time and PA

(Sallis, Nader *et al.*, 1993). Accessibility and availability of PA/sport opportunities are other important environmental factors which affect PA behaviour. Blair, Wood and Sallis (1993) underline the importance of accessibility, convenience and safety of physical locations and facilities in the community. The need to provide safe and accessible sports and leisure facilities for children has been recognized by many researchers (McKenzie, 2001; Sallis and Owen, 1999). Furthermore, the convenience factor has been important for children, taking into consideration the poor independent mobility of this age group. For young people the school PE lesson and the local community programmes are the most important settings for provision of structured PA. School plays an important role in activating young people (this issue will present in details in the following section). With regard to the role of community programmes, a study by Trost *et al.* (1997) highlighted the association of participation in community sports with high levels of total PA. It is apparent therefore that environment influences on a large extent young people's PA behaviour. Baranowski and colleagues (1993) assert that the combination of gender, location, and month of the year explained more that 75% of the variance in directly observed PA. However, it is expected that environmental influences on PA behaviour will decline as children get older while some social and psychological determinants become progressively more important.

Summarizing, young people's PA behaviour is influenced by many interacting psychological, biological, environmental and social factors which called 'determinants'. Determinants are variables that are correlated with PA and that may have causal effects; although, no variable or category of variables found to account for most of the variance in children's PA behaviour. This finding support the view that youth PA is a complex behaviour determined by many factors (Sallis, Prochaska and Taylor, 2000). It also supports ecological models of behaviour that posit behaviour is influenced by personal, social, and physical environmental factors (Aarnio, Winter, Kujala and Kaprio, 1997; Sallis and Owen, 1999).

Despite the fact that a number of important determinants, such as age, sex, race and ethnicity, and genetics are not modifiable, their investigation can identify target groups in the population for being inactive. It may be more important to identify modifiable determinants that can be used to guide the design of interventions. For

young people important modifiable determinants include self-efficacy, enjoyment, social support by parents and peers, accessibility to sport programmes, and for young children, time spent outdoors. Sallis *et al.* (2000) recommends that variables classified as consistently associated with PA should be applied in priority to improve interventions. However, many scientists highlight the need for more research in this area identifying consistent determinants of PA among young people in order to maximize the effectiveness of intervention programs (Linquist, Reynolds and Goran, 1999; Trost, Pate, Saunders, Ward, Dowda and Felton, 1997; Sallis, Prochaska and Taylor, 2000).

The examination therefore of the relationship between involvement in PA/sport and specific biological and environmental variables will be an additional purpose of the first study of this project.

3.2.4 Physical activity promotion and the PE teacher

During the last years a lot of different interventions for specific health related behaviours have been carried out in the environment of pre-school, elementary and secondary education. In a large number of interventions involved the promotion of PA and healthy nutrition (Gortmaker, Cheung, Peterson *et al.*, 1999; Mannios, Moschandreas, Hatzis and Kafatos 1999; Williams, Squillace, Borrela *et al.*, 1998; McKenzie, Sallis, Kolody and Faucett, 1997); while some others involved dental hygiene (Nyandini, Milen, *et al.*, 1995), smoking prevention (Mann, Peterson, Marek and Kealy, 2000), alcohol consumption and the use of illegal substances (Allot, Paxton and Leonard, 1999), the reduction of unwanted behaviours (Rohrbach, Graham and Hansen, 1993), the prevention of various forms of cancer (Hornung, Lennon, Garrett, Devellis, Weinberg and Strecher, 2000), the promotion of AIDS-related knowledge (Boscarino and DiClemente, 1996) and a host of other behaviours related to the promotion of youth health.

Some of these interventions were carried out by PE teachers within the course of PE lesson or along with it (Mannios, Moschandreas, Hatzis and Kafatos, 1999; Renaud, Chevalier, Dufour *et al.*, 1997; Walter, 1989; Downey, Frank, Webber *et al.*, 1987; Perry, Stone, Parcel *et al.*, 1990), along with the school stuff (Gortmaker, Cheung,

Peterson *et al.*, 1999; Nyadindi, Milen *et al.*,, 1995; Rohrbach, Graham and Hansen, 1993; Allot, Paxton and Leonard, 1999; Boscarino and DiClemente, 1996; National Heart Foundation of Australia, 1995) and some others were carried out by experts (Pollatschek, Renfrew and Queen, 1986; McKenzie, Sallis, Kolody and Faucett, 1997). Despite the fact that most intervention programs aiming to the increase of PA and the promotion of positive health behaviours seem to be effective on short and medium-term basis the long-term consequences seem hard to evaluate (Sleap, 1997). However, as a general appreciation comes the view that in order to have a more complete picture the programmes must be implemented for a long period of time as part of a typical school curriculum, where they will be implemented in real schooling conditions.

According to this view the instructor seems to be the basic variable of success, since his/hers personal abilities and perceptions will reflect largely upon the programs' aims and effectiveness (Clark, 1995). Leger (1995) notes that in order for the PE teachers to cope with the interventions programs' expectations and to achieve progress in the students' behaviour, they must have abilities in a wide range of knowledge exceeding the needs of the typical curriculum. Furthermore, it is noted that in similar programmes a lot of attention should be placed not only on the context and the educational material that is used but also on the quality of the experiences the students obtain and on the relations they develop with their teachers (Samdal, Nutbeam and Kannas, 1998).

However, many researchers noted the inability of the school PE teachers to respond to the demands of such programmes. In many cases it was ascertained that the teachers had an erroneous impression about subjects related to the health promotion in the school environment, while they showed diminished abilities, knowledge and desire to implement these programmes (Nyadindi, Milen *et al.*, 1995; Leger, 1998; Walter, 1989). Furthermore, many researchers underline that the training of both staff and head teachers is a fundamental condition for the effective implementation of intervention programmes in the schools (Stone, McKenzie, Welk and Booth, 1998; Sallis and Owen, 1999; Mendlein, Baranowski and Pratt, 2000). The purpose therefore of the second study of this project will be the investigation of the necessary

preconditions that PE teachers must have in order to be effectively involved in a programme aiming to promote PA.

3.2.5 Physical activity promotion in schools

School constitutes an ideal environment for the promotion of PA and other health behaviours since it provide one of the few opportunities to address the full range of individuals in a population, in the most critical age, at no extra cost through an established and well organized education institution (Baranowski, Anderson and Carmack 1998; Fox, 1996; Department of Health, 1998; Health Education Authority, 1998). This section entails a brief review of the schools' role on promoting PA to young people.

Most individuals experience school for long periods of their lives and for much of their waking hours. During the school day students are given three opportunities to be physically active: a) PE lessons, b) extra-curricular physical activities, and c) play/break time. There are several reasons for interest in studying youth PA at school:

- First, there are substantial barriers to children obtaining adequate amounts of PA in order to get optimum health benefits. While they acquire the half of their PA in non-school environments (see also 2.4.1 & 2.4.2), many children have limited or no access to activity settings, and this is particularly evident for girls and the less affluent (Faucette *et al.*, 1995). Thus, the amount of PA activity that children accumulate in the school environment is particularly important.
- Second, even the best school PE programmes do not provide enough PA to meet pupils' health related recommendations (McKenzie, Feldman, Woods, et *al.*, 1995; see also 2.4.2). Thus, increasing PA at other times throughout the school day could help young people achieve recommended levels.
- Third, the recent rapid increase in youth obesity is an important stimulus for increased PA in numerous settings.
- Fourth, keeping students engaged in PA on campus after school has the potential to decrease risky health behaviours, delinquency and social problems that are most likely to occur in the after-school hours (MacKenzie, Marshall, Sallis and Conway, 2000).

School has, by definition, the obligation to offer a wide and balanced education aiming to promote the spiritual, cultural, mental and physical development of students (NCC, 1999; Law 1566/85). Some school curricula are currently defining in the health implementation instructions that: "Schools have the responsibility to transfer to their students accurate information in health related issues, to help them clarify the attitudes and values effecting their choices related to health and to contribute to the acquisition of positive attitudes" (NCC, 1999). Consequently, it seems sensible that schools should focus on developing lifetime PA participation with the aim of sustaining exercise participation in young people. The PE curriculum is undoubtedly a vitally important conveyor for delivering activity messages. However, as Cale (1997) notes, this is only one avenue for the promotion of PA among young people. Many other aspects of the school function can either promote or inhibit PA and, depending on what happens within and throughout the school.

Physical activity can be promoted more effectively when a number of factors related to environmental, organizational and socio-cultural aspects of the school are supportive to the messages promoted throughout the PE curriculum. Cale (2000) suggested that in order PA promotion to be effective, it should be seen as a whole school responsibility and reinforced within the *whole school environment*. According to the 'whole school approach', a Health Promoting School is expected to reinforce all those aspects of learning which can influence students to adopt a more healthy and active lifestyle. The curriculum, the environment and the wider community are the three main elements which form the basis of the Health Promoting School (Nutbeam, 1992). An Active School set as priority to give as many opportunities as possible for children (and all associated with the school) to be active by exploring all avenues to promote PA (Cale, 2000; Daley, 2002).

The role of school PE: how important is it?

It has long been argued that PE is important for the overall development of pupils, and it is seen as an essential element in young people's learning experience. The value of promoting enjoyable early life experience of PA has been supported by several studies and school PE is therefore a potentially important vehicle for fostering an appreciation of PA (Simons-Morton, Parcel, O' Hara, Simons-Morton and Parcel, 1987).

Unfortunately, the time allocated to PE is decreasing due to budgetary constraints and administrative decisions to support other academic areas (Hardman, 1998; Simons-Morton, Eitel and Small, 1999). Furthermore, studies indicated that PE classes may occur infrequently and that children often are relatively inactive in them (Simons-Morton, Taylor, Snider, Huang and Fulton, 1994; see also 2.4.2), particularly when compared to the Healthy People 2000 objectives. Increasing the frequency and duration of PE is difficult because all subject matter areas compete for a limited amount of time during the school day. Thus, it is proposed that the time allocated for PE in schools is used efficiently and that it includes a curriculum that promotes ample amounts of PA (McKenzie, Nader *et al.*, 1996)

Despite the fact that 'moderate to vigorous PA' content is very important for children's health, this content of PE lessons has been questioned (Stratton, and Armstrong, 1991); physical education has other broader aims than simply getting children active and many education policies would perhaps take the longer term view that PE should inspire lifelong involvement in activity (Fox, 1996). Within compulsory PE, it is possible to raise the levels of children's PA and fitness by working them hard at every opportunity, however, it is possible that these practices do not promote long-term lifestyle behaviours and have a negative affect on other aspects of the child's personality. The alternative, which is the promotion of "activity independence", the creation of positive experience and the understanding of the principles which underline the healthy lifestyle, may help children to develop an active lifestyle (Armstrong and McManus, 1994). Studies have shown that curriculum content and enjoyment and not high-activity content are the most influential factors in developing positive attitudes towards PA (Luke and Sinclair, 1991). These factors appear to be particularly important to females who are less inclined to PA and point to the need to create programmes that capture students' interest. It would seem therefore, that PE teachers need to work toward normalising physical exercise during PE lesson and extra curricular activities within the lives of young people so that PA becomes an inherent part of their day while at school and of their working day as adults. Furthermore, Thorpe (1996) suggests that children need more activity and broader learning opportunities than those provided by the school curriculum PE time and argues for the need to extend PE beyond the curriculum.

One important development in recent years on PE curricula has been the greater emphasis upon health-related exercise (HRE). Such lessons have tended to focus upon the 'knowledge, skills and attitudes required to promote health and well-being and to encourage active lifestyles (Harris, 1994; 1995). Daley (2002) claims that HRE as part of PE and extra-curricular programmes in schools may hold the best promise for sustained exercise participation simply because it has the ability to reach almost every person, every week, throughout their school lives.

Extracurricular PA: After school today, after work tomorrow?

Extracurricular PA represents an important source of activity for many school children worldwide (Pieron and Ledent, 1996). Moreover, extracurricular activities are not only useful in getting young people active; such activities may also play a mediating role in young people growing up into physically active adults. If young people are encouraged to participate in exercise after school, then in the long term, exercise behaviour patterns can be established, and this may manifest itself in young people being more likely to participate in exercise after work in the future (Daley, 2002).

However, despite the fact the majority of schools offer opportunities for young people to participate in extracurricular physical activities (Cale, 2000), many young people choose not to take part. This is possibly because competitive team games continue to dominate and a wider choice of activities are offered to boys than girls (Bass and Cale, 1999; Sports Council for Wales, 1995). The competitive nature and the high demands in abilities or skills of some extracurricular activities may discourage the less able children to participate. Therefore, in many schools more balanced extra-curricular programmes need be developed in order to include all young peoples' interests and abilities. Given the reduction in PE curriculum time in schools (Hardman, 1998; Simons-Morton, Eitel and Small, 1999), extracurricular PA would appear to be the ideal environment of activating children and developing long-term PA behaviour patterns.

PA during play/break time: an unattended area of school life?

Because a large proportion of young people are not meeting PA guidelines, it is worthwhile examining methods of enhancing the school environment to increase PA

throughout the school day, because virtually all students could be reached through such interventions. The promotion of active lifestyles in school in areas beyond the PE and the extracurricular activities constitute an unattended area of the school life. Physical activity that young people accrue in these environments has rarely been studied, particularly activity obtained during leisure-time periods. However, the findings of the studies presented in 2.4.1 and 2.4.2 of this thesis revealed that students accumulate in the school environment a large amount of daily PA in other times and settings than PE lesson.

Almost all schools have facilities to support leisure-time PA during the day. Primary school children spend nearly a quarter of their life at school in the playground and therefore it is worth considering whether school grounds, and especially the playground, can be developed to encourage active playing and sports (Sleap, 1997). Armstrong and Welsman (1997) recommended that schools should explore ways of using resources such as playgrounds and of making equipment (e.g. jump ropes, balls) available at break times in order to promote equitable PA. However, one recent observational study in secondary school students revealed that few students use opportunities to be physically active during leisure time at school (McKenzie, Marshall, Sallis and Conway, 2000). It seems therefore that the simple provision of equipment may be not as effective as the provision of more supervised and organized activities during these times.

The studies presented in this section indicate the importance of promoting PA and active lifestyles in schools. It became apparent that if strong health messages are to reach the majority of young people while they are at school, there needs to be greater commitment from all school staff to promote the importance of living a healthy lifestyle via a cross-curricular focus on health and PA. A whole-school approach to the promotion of lifetime participation in PA seems as the most appropriate. With this vital area of the school life will deal the third study of this project. The purpose therefore of the third study is to provide information regarding to the nature and extent of PA promotion in Greek schools.

3.3.0 Needs analysis: Students, teachers, and schools

In this section three studies associated with the research questions are presented.

3.3.1 Study 1-Part (a): Lifestyle and PA level of 11-to-17 yrs old students

This study investigates the lifestyle and the PA levels of Greek students in an urban area taking into consideration specific variables that related to the PA behaviour. More specifically, the aims of this study are:

1. To explore the leisure-time pursuits of Greek young people.
2. To examine the PA patterns and the PA level of Greek young people.
3. To explore the relationship between involvement in PA/sport and specific personal and environmental variables.

Throughout this study the first three main research questions of this project will be examined:

1. What are the leisure-time pursuits of the Greek young people?
2. What the PA patterns of Greek children are and how active they are? Is there a need to increase their PA level?
3. To what extent specific personal and environmental PA determinants correlated to the PA behaviour of Greek young people?

Methodology

This study was carried out with the approval of the Greek Ministry of Education and the consent of the headmasters of the schools and the students' parents.

Sample

A cross-sectional sample of 1050 students from 17 schools (6 elementary, 6 secondary and 5 high schools), participated in this study (Table 3.3.1.a). The schools belonged in five different administrative municipalities of the city providing a wide range of socio-economic and environmental characteristics. After the selection of the schools their infrastructure in sports facilities and play areas as well as the infrastructure of the nearby environment was recorded. The schools' infrastructure was evaluated by the answers given by the headmasters and the physical education teachers in the form of a

questionnaire (see also Appendix 2.b and study 3 of this project). The evaluation of the environmental infrastructure near school was done with a personal evaluation by the researchers and it comprised of the cataloguing of organized public recreation and sports facilities, playgrounds and recreational areas.

Table 3.3.1.a: Mean values (yrs) and standard deviations (SD) of the sample.

	Elementary school		Secondary school		High school	
	Mean	SD	Mean	SD	Mean	SD
Boys	12 (n_1=121)	± 0.5	15 (n_1=183)	± 0.7	17 (n_1=143)	± 0.5
Girls	12 (n_2=120)	± 0.6	15 (n_2=181)	± 0.5	17 (n_2=163)	± 0.4
TOTAL	N_1=241		N_2=364		N_3=306	N=911

The inclusion of three different age-groups was chosen because:

1. They coincide with changes in school grade characterised by increased academic requirements (Arabatzoglou and Antoniou, 1994).
2. They are related with a change of interests and drop-out from organised sports (Avgerinos, 1997).
3. Specifically the age of twelve coincides with the beginning of puberty, where the adoption of sex roles diversifies the interests in activities between boys and girls (Eccles, Wigfield, Flanagan, Miller, Reuman and Yee, 1989).
4. The children show a satisfactory cognitive development and can recall with precision facts in order to fill a questionnaire without problems (Baranowki, Dworkin, Cieslic, Hooks, Ray, Dunn and Nader, 1984).

Data collection - Instrumentation

In the analyses of the study the answers of 911 students were included. The rest of the questionnaires were not evaluated due to administrative weaknesses. Data were collected by the *Physical Activity and Lifestyle Questionnaire* (PALQ) which was distributed to the students during school hours and was filled in voluntarily and anonymously with the guidance of one single researcher during April and May 1999. The first part of the questionnaire involved demographic data of the students and their parents. The second part involved data regarding students' participation in leisure

activities (see also 2.3.1, 2.3.3, and 2.3.4). The third part of the PALQ examined the habitual PA of the sample.

Variables

The *independent variables* were: age (3 levels), gender (2 levels), school/home area (5 levels), and educational level of parents (3 levels- elementary school graduate, high school graduate, university graduate).

The *dependent variables* were: a) leisure-time management and b) physical activity. In this study, the classification of the participants into PA categories and their PA profile is presented.

Data analysis

The mean and the standard variations were estimated for all the variables after transforming and computing the primary variables. Principal Components Factor Analysis with oblique rotation was used on the 24 leisure-time activities to determine the best factor solution (Brynman and Cramer, 1997). The KMO test and the Bartlett's test of sphericity were used to check the sample adequacy and the appropriateness of the factor analysis. For all dependent variables normal distribution were established. Multivariate analysis of variance (MANOVA) and analysis of variance (ANOVA) were used to examine the differences between the independent variables. Between-sex comparisons on dependent variables were evaluated using independent *Student's* t-tests. Homogeneity of variance between grouped data was established using Levene's test. Post Hoc (Scheffe) test was used to examine the statistical difference between sub-groups. The effect size (n^2) was used to examine the magnitude of observed differences. Finally, Spearman's *r* correlation coefficient was used to examine the bivariate association between PA and involvement in leisure time activities. Statistical significance was set at $p<.05$.

Results

a) Leisure-time management

Table 3.3.1.b presents descriptive data of the leisure-time activities according to age and gender. The most frequent activities are those with mean higher than three and represent a 2-3 times per week involvement in those activities.

Table 3.3.1.b: Means and standard deviations (SD) of the frequency of involvement in leisure activities during the last 7 days according to age and gender.

	Elementary school				Secondary school				High school			
	B (N=123)		**G** (N=122)		**B** (N=182)		**G** (N=181)		**B** (N=136)		**G** (N=157)	
Activities	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.Going to church	2.18	1.13	2.09	1.01	1.89	.9	1.72	.85	1.41	.74	1.57	.65
2.Helping with the housework	2.59	1.38	**3.61**	1.31	2.26	1.14	**3.36**	1.44	2.19	1.21	**3.20**	1.38
3. Shopping	2.22	1.24	2.77	1.19	2.11	1.08	2.52	1.02	1.87	.83	2.19	.89
4. Going to youth or community centres	1.64	.99	1.47	.83	1.45	.83	1.32	.73	1.13	0.5	1.17	.46
5. Taking part in organised/ competitive sports	**2.98**	1.54	2.08	1.37	2.77	1.56	1.81	1.30	2.27	1.5	1.53	1.06
6. Watching Sport Events	2.85	1.54	1.89	1.38	2.75	1.47	1.57	1.19	2.36	1.31	1.27	.69
7. Taking part in recreational sports	**3.88**	1.37	**3.21**	1.45	**3.27**	1.44	2.39	1.38	2.84	1.39	1.88	1.2
8. Going to cafe, clubs, discos, pub or parties	2.23	1.21	2.21	1.12	2.52	1.29	2.55	1.05	**2.90**	1.15	**2.82**	1.08
9. Listening to music	**3.3**	1.48	**4.11**	1.23	**4.12**	1.15	**4.64**	.82	**4.46**	1.04	**4.75**	.66
10 Hanging around and talking with friends	**3.85**	1.27	**3.64**	1.46	**3.87**	1.15	**4.05**	1.11	**3.9**	1.19	**3.99**	1.16
11 Participating in private lessons for better academic performance	1.81	1.37	1.54	1.17	1.93	1.39	1.61	1.09	**3.64**	1.34	**3.62**	1.38
12 Reading for enjoyment	2.66	1.36	**3.24**	1.37	2.82	1.24	2.97	1.2	**2.99**	1.31	**2.92**	1.19
13 Learning foreign languages	**3.09**	1.28	**3.31**	1.23	**2.97**	1.32	**3.21**	1.28	2.44	1.32	2.73	1.33
14 Doing extra homework for school	2.68	1.49	**3.12**	1.51	2.13	1.24	2.51	1.21	2.06	1.29	2.54	1.32
15 Spending time alone	2.82	1.42	**3.10**	1.39	2.75	1.22	**3.22**	1.31	**3.26**	1.33	**3.21**	1.37
16 Playing music or singing in a choir	1.79	1.31	1.93	1.28	1.58	1.22	1.76	1.28	1.56	1.21	1.56	1.18
17 Doing arts and crafts	1.92	1.15	2.6	1.35	2.03	1.29	2.03	1.2	1.29	.71	1.55	1.07
18 Playing Video Games and Computers	**3.51**	1.39	2.68	1.43	**2.94**	1.26	1.96	1.04	2.29	1.29	1.78	1.01
19 Watching TV and Videos	**3.85**	1.25	**3.76**	1.35	**3.91**	1.27	**4.09**	1.17	**3.99**	1.33	**3.90**	1.25
20 Caring for pets	2.91	1.79	**3.14**	1.75	2.45	1.64	2.45	1.74	1.87	1.51	2.10	1.59
21 Doing voluntary or social work	1.82	1.15	1.68	1.08	1.49	.84	1.44	.87	1.24	.65	1.31	.71
22 Visiting relatives	2.8	1.35	**3.04**	1.34	2.27	1.08	2.3	1.05	1.93	.98	2.13	1.0
23 Going with parents for outdoor recreation	2.11	1.03	2.17	1.04	1.92	1.0	1.73	.9	1.32	.58	1.43	.61
24 Going to cinema, theatre and concerts	2.30	1.14	2.16	1.6	2.12	.98	2.03	.83	1.87	.80	1.82	.79

Notes: B= Boys - G= Girls
The scale (1-5) represents the frequency of participation per week, where: 1=Never, 2=One day/week, 3=2-3 days/week, 4=4-5 days/week, 5=Almost every day

Girls from a young age tend to be involved with house-hold chores more than boys, who spend more time in PA, sports and video games. Generally, it appears that involvement in sports and PA is not a high priority choice for girls. The interest towards active lifestyle and sports is gradually declining with age and it is shifting towards social activities (e.g. high scores in *Going to cafe, clubs, discos, pub or parties*, or *Hanging around and talking with friends*).

It is characteristic that accessorial to school academic activities such as *Learning foreign languages* and *Participating in private lessons for better academic performance* take an important part of the children's leisure time in all ages. It is also interesting to point that sedentary recreation activities such as *Listening to music*, *Watching TV* and *Hanging out with friends* are particularly popular to all children regardless of age and gender.

Factor structure of leisure time activities

Principal Components Analysis (PCA) was used on the 24 leisure time choices. On Table 3.3.1.c the pattern matrix for the 7 factors is presented, the loadings of the items for each factor, the eigenvalues and the percentage of the variance explained by each factor. No activities with loadings smaller than 0.30 are presented.

On factor one (F1) activities were grouped that are mainly related to the function of the *family*. The second (one) represents the typical *sport* factor (F2), while the third is the *social* factor in which activities characterized by strong social interaction are grouped. Participation in *private lessons relevant to school* constitutes the fourth factor (F4), while the fifth can be characterized as a factor of wider *academic activities* (F5). Participation in activities relevant to *art and culture* constitute the sixth factor (F6) while participation in *recreation activities at home* characterizes the final factor (F7).

Table 3.3.1.c: Pattern matrix of leisure-time management.

	F1	F2	F3	F4	F5	F6	F7
Going to church	.661						
Helping with the housework	.614						
Shopping	.603						
Going to youth or community centres	.405						
Taking part in organised/ competitive sports		-.822					
Watching Sport Events		-.728					
Taking part in recreational sports		-.707					
Going to cafe, clubs, discos, pub or parties			.760				
Listening to music			.647				
Hanging around and talking with my friends			.638				
Participating in private lessons for better academic performance				.786			
Reading for enjoyment					.692		
Learning foreign languages					.561		
Doing extra homework for school					.495		
Spending time alone					.479		
Playing music or singing in a choir						.805	
Doing arts and crafts						.588	
Playing Video Games and Computers							.742
Watching TV and Videos							.461
Caring for pets							.460
Eigenvalues	2.7	2.7	1.8	1.2	1.8	1.7	1.8
% of variance - (Total variance explained 51,2%)	16.1	8.8	7.6	5	4.7	4.5	4.3

Notes: N=915. Commonality; loadings less than 0.30 are not shown.
KMO = .789
Bartlett test of sphericity (df 276) = 2558.9, $p<.05$

On Table 3.3.1.d the coefficients of internal validity of the factors is presented. The low coherence of the factors is explained by the fact that they do not represent theoretical concepts (for example attitudes, views etc) but factors of leisure time management, which have a different logic in their grouping. Meanwhile for a more reliable interpretation of the correlations and the comparisons of the averages only the sport factor was used as a variable (Cronbach's *alpha*= .76).

Table 3.3.1.d: Coefficients of internal validity of the factors (Cronbach's a).

Factors	Items	Cronbach's a
1st Family	4	0.5148
2nd Sport	3	0.7582
3rd Social	3	0.5413
4th Private lessons	1	--
5th Academic	4	0.4616
6th Art and Culture	2	--
7th Recreation at home	3	0.3445

The importance of the factors according to age and sex is presented in figures 3.3.1.a and 3.3.1.b. The numeric value of each factor on the figures represents the mean value

which is the outcome (quotient) of the sum of the values from the items that compose each factor divided by the number of factor's items.

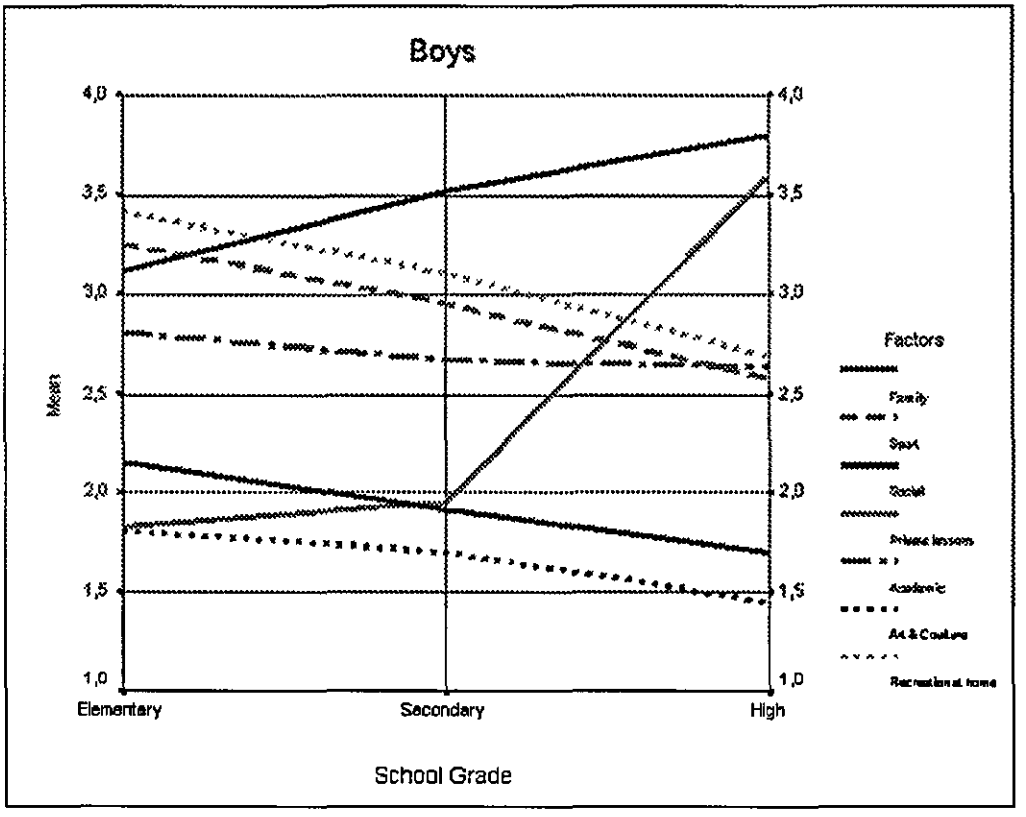


Figure 3.3.1.a: The importance of the 7 factors according to age for boys

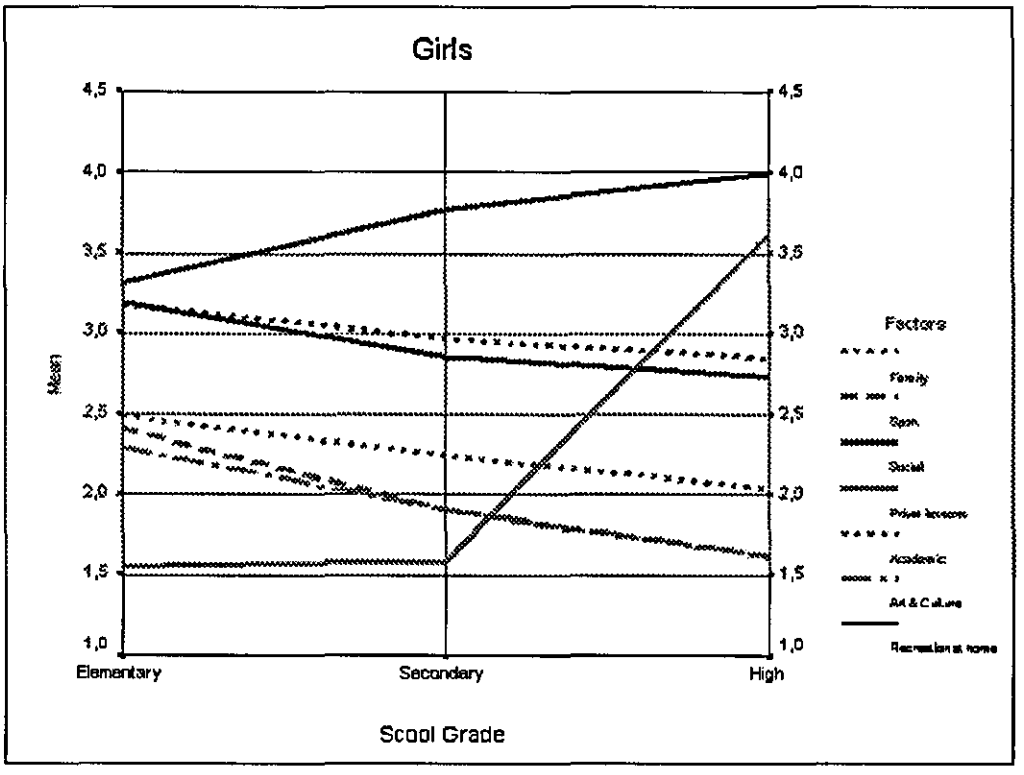


Figure 3.3.1.b: The importance of the 7 factors according to age for girls

From these figures it appears that different choices and interests characterize the two genders in their leisure time management. Physical activity as a component of leisure time is constantly declining in importance and the interest of children as they get older move towards specific social activities. These observations supported initially the first research hypothesis of the study. It is important to note that the initial choices in younger children remain almost unchangeable as they get older for both genders, except for the factor of *private lessons*, which enters decisively into the children's life at the age of high school.

The multivariable analysis of variance (MANOVA) with 4 factors [sex (2) X area of school/home (5), X school grade (3) X educational level of parents (3)] has showed the following results.

Gender had a statistically significant main influence in all the factors examined ($F_{7,750}$=44.34, p<.001, n^2= .31) while no interactions were observed. However, it is important to mention, as remarkably, only the influence on the *sport factor* ($F_{1,222}$=36, p=.001, n^2=.140 for the elementary school, $F_{1,325}$ =75.6, p<.001, n^2=.189 for the secondary school, and $F_{1,164}$ =47.7, p<.001, n^2=.225 for the high school) while the influence on the other factors was small (n^2 ranged between .006 and .32).

The *school level* (age) also had a statistically significant main influence in all the factors examined ($F_{7,706}$=42.06, p<.001, n^2=.295). The most important influence was presented on the factor/variable of *Private lessons* ($F_{2,711}$ =129.8, p<.001, n^2=.267) while the influence on other factors was small (n^2 ranged between .04 and .064). Analysis of Variance (ANOVA) has shown a statistical significant decrease in sport involvement with age, both for boys ($F_{2,433}$=14, p<.001) and girls ($F_{2,451}$=14, p<.001), and a statistical significant increase of the social factor for boys ($F_{2,429}$=18.1, p< .001) and girls ($F_{2,450}$=17, p<.001).

The *area of school* did not modify the magnitude of involvement on the factors examined. Furthermore, the sport infrastructure of the environment, contrary to expectations, did not influence the involvement in sports in any age group or sex.

The *education of parents* affected the way younger children managed their leisure time and particularly the degree of involvement in *Academic activities* and *Sports*. Specifically, ANOVA showed that children of elementary (girls $F_{2,114}$=4.92,

p<.05) and secondary school (boys $F_{2, 176}$=12.4, p<.001 and girls $F_{2, 172}$=5.01, p<.05) show statistically significant differences in the degree of involvement in academic activities related to their mothers' educational level. The results are similar regarding the *Academic activities* in reference to the father's educational level. Children of elementary and secondary school (girls) show statistically significant differences. From Scheffe test it was observed that children, whose parents have a low educational level, tend to involve less in *Academic activities* than children with high-educated parents. Also, it showed that the parents' education is related to the frequency of involvement in *Recreation activities at home* for girls ($F_{2, 172}$=7.95, p<.001). Children with parents of low education get less involved in *Recreation activities at home* than children with parents with a high level of education.

Regarding the size of involvement in the *Sport factor*, the ANOVA and the multi-comparison Scheffe tests have shown that girls with parents of low educational level (elementary school $F_{2, 175}$=5.74, p<.05 and secondary school $F_{2, 115}$=5.74, p<.05) tend to get less involved in sport activities than girls with parents of higher education. The ANOVA also showed significant decrease in the sports involvement in relation to age (for boys $F_{2, 433}$=14, p<.001 and girls $F_{2, 451}$=14, p<.001), both for the boys and girls, and an increase of the social factor [$F_{2, 429}$=18.1 (p<.001) for the boys and $F_{2, 450}$ =17 for the girls (p<.001)].

These findings indicate that participants who come from families with high-educated parents managed their leisure time differently than children with parents of lower education. It is worth mentioning the finding that participants who lived in up-graded areas with better sports infrastructure are not more active than their counterparts of the same age and gender who are living in less advantageous areas.

Many claim that the involvement in sedentary recreation activities such TV viewing or computer games resulted in a decrease in participation in PA and sports (Kohl and Hobbs, 1998; Savage, 1996). This study does not corroborate the above claim. Examining the relationship between the *Sport* factor and specific items of the free time management presented a small positive correlation to some activities with the higher correlation in the activity *Playing video games and computers* (Spearman r=.34, p<. 05). Also there was a weak correlation or no correlation to the activities: *Listening to music* (r=.12, p<.05), *Watching TV or video* " (r=-.030, p<.05), *Hanging around with friends* (r=.154, p=.05), *Learning foreign languages* (r=.129, p=.05), and *Participating in private lessons relevant to school achievement* (r=-.016, p=.05). This

correlation is generally stable regardless of the sex and age of the sample. This finding shows that the time spent by children in sedentary recreation activities is not related to the frequency of the involvement in physical activities and sports. Active children simply chose to be active combining at the same time other recreation activities.

b) Physical activity

Table 3.3.1.e presents descriptive data of the sample regarding the magnitude of the PA performed by gender and age.

Table 3.3.1.e: Descriptive data of physical activity (in Kcal • kg^{-1}• day^{-1}).

	Elementary school		Secondary school		High school.	
	Mean	SD	Mean	SD	Mean	SD
Boys	42.23 (N=114)	4.9	39.9 (N=175)	5.16	37 (N=136)	4.84
Girls	39.08 (N=106)	4.08	36.06 (N=171)	3.54	34.07 (N=154)	2.47

Table 3.3.1.f presents the sample's classification into categories of activity according to their scores in the PALQ. The students classified on the first (a) and the second (b) category does not meet the suggested guidelines (Cavill, Biddle and Sallis, 2001) regarding the PA for children and teenagers. The students of the third category (c) respond marginally, while in the last category (d) are classified students who accumulate at least one hour of daily PA during the last week and students who participated regularly in vigorous activities.

Table 3.3.1.f: Sample classification (%) into categories of physical activity

	Elementary school		Secondary school		High school.	
PA levels	B (%) (N=124)	G (%) (N=123)	B (%) (N=182)	G (%) (N=181)	B (%) (N=136)	G (%) (N=157)
a) Very inactive	0.8	1.6	3.9	18.3	20.6	35.5
b) Inactive	11.4	30.9	28.3	46.7	39	52.3
c) Moderate active	19.5	17.1	22.2	16.7	15.4	8.4
d) Active	68.3	50.4	45.6	18.3	25	3.8

Where B= boys and G= girls

The values on Table 3.3.1.f indicate that boys were more active than girls in all ages, while the PA was decreasing as children got older, especially for girls. The progressively declining percentage of active youths shows that the sedentary lifestyle is the main characteristic of teenagers in Greece. It seems that girls present even from the age of elementary school a high-risk group. ANOVA has showed that boys are significantly more active that girls in all age range (elementary $F_{1,244}=8.87$, $p<.001$ – secondary $F_{1,359}=34.05$, $p<.001$ – high school $F_{1,289}=39.8$, $p<.001$), since PA for both genders declines dramatically as children get older, especially for girls (boys $F_{2,439}=37.136$, $p<.001$, $n^2=.15$ and girls $F_{2,458}= 66.275$ $p<.001$, $n^2=.23$).

The MANOVA with factors sex (2), school/home area (5) and school grade (3) confirmed the results regarding the *sports factor* mentioned on the analysis above. Especially the *gender* ($F_{1,856}=125.73$, $p<.001$, n2=.13) and the *school grade* ($F_{2,856}=90.46$, $p<.001$, $n^2=.176$) had a statistically significant main influence on the involvement in PA and sports, while no interaction between the factors was observed. The *school/home area* seems to have no effect on the involvement in PA and sports in all ages and sexes. Tables 3.3.1.g and 3.3.1.h presents the PA profile for boys and girls respectively at each school grade.

Table 3.3.1.g: Boys' PA profile during the last 7 days.

	Elementary school (N=114)		Secondary school (N=175)		High school (N=136)	
% Physical Activity.....	Mean %	SD	Mean %	SD	Mean %	SD
... from active transportation (walking, cycling, skate etc)	10.57	5.94	15.76	9.57	23.8	13.7
... from free play during school breaks	29.75	14.04	25.47	11.5	25.66	12.8
... from participation in the school PE	8.03	4.84	9.23	6	11.77	7.42
... from participation in school sport team	6.11	7.06	1.87	4.75	2.4	5.9
... from participation in private gym or fitness clubs	3.86	8.44	3.25	8.62	2.7	9.11
... from participation in organised sport clubs	8.28	11.67	11.48	14.58	11.6	16.6
... from active play during free time after school	33.28	14.03	32.9	12.8	22.05	12.27
Total	100%		100%		100%	

Table 3.3.1.h: Girls' PA profile during the last 7 days.

	Elementary school (N=106)		Secondary school (N=171)		High school (N=154)	
% Physical Activity.....	Mean %	SD	Mean %	SD	Mean %	SD
... from active transportation (walking, cycling, skate etc)	14.59	9.81	19.90	10.46	29.17	12.68
... from free play during school breaks	30.16	14.1	27.07	12.58	28.75	11.7
... from participation in the school PE	9.84	6.18	13.04	7.7	13.8	8.6
... from participation in school sport team	1.37	3.57	.7	3.15	.88	4.11
... from participation in private gym or fitness clubs	4.16	7.86	4.39	11.6	3.8	10.78
... from participation in organised sport clubs	3.82	8.6	5.22	13.45	1.66	7.07
... from active play during free time after school	36.03	15.9	29.9	16.54	21.86	13
Total	100%		100%		100%	

From the values on these tables is evident that in all ages boys participate in a higher rate of organized forms of exercise than girls. However, it is important to emphasize that the contribution of organized sports in the total energy expenditure in PA is very low for both genders. A very interesting point is the fact that the larger part of children's PA is accumulated in the school environment and particularly on free play during school breaks, while the contribution of school physical education and school sports is small in both sexes and all ages. These findings are in accordance to the findings of the studies presented in the sections 2.4.1 and 2.4.2.

Proportionally, the largest contribution on girls' PA in all ages, in comparison to boys, seems to be the active way of transportation. As children get older, the active transport contributes even more to the total score of the participants regardless of sex, a fact which demonstrates the problem of safety in the transport in younger children.

Tables 3.3.1.i and 3.3.1.j present descriptive data of the evaluation of the PA on weekdays and weekends. The question was answered on a five- point scale (where 1= not at all exercise to 5= exercising a lot) for every day of the week separately. The

value registered on the weekday is the mean of the values from Monday to Friday while the value registered on the weekend is the mean value of Saturday and Sunday.

Table 3.3.1.i: Boys' PA during weekdays and weekend.

	Elementary school		Secondary school		High school.	
PA level	Weekdays	Weekend days	Weekdays	Weekend days	Weekdays	Weekend days
Very inactive	--	--	1,6 (SD=0,85) (N=7)	1,57 (SD=1,13) (N=7)	1,47 (SD=0,54) (N=27)	1,78 (SD=1,23) (N=27)
Inactive	2,58 (SD=0,97) (N=14)	3,32 (SD=1,61) (N=14)	2,78 (SD=1,47) (N=49)	2,84 (SD=1,34) (N=49)	2,43 (SD=0,72) (N=50)	2,25 (SD=1,09) (N=50)
Moderate active	3,05 (SD=0,92) (N=23)	3,86 (SD=1,28) (N=23)	2,99 (SD=0,75) (N=39)	3,43 (SD=1,29) (N=39)	3,02 (SD=0,67) (N=21)	3,04 (SD=1,46) (N=21)
Active	3,49 (SD=0,92) (N=80)	3,82 (SD=1,21) (N=80)	3,57 (SD=0,87) (N=81)	3,75 (SD=1,2) (N=81)	3,24 (SD=0,87) (N=32)	3,35 (SD=1,5) (N=32)

Where 1= Not at all 2= A little 3= Neither much or less
4= Exercising fairly 5= Exercising a lot

Table 3.3.1.j: Girls' PA during weekdays and weekend.

	Elementary school		Secondary school		High school.	
PA level	Weekdays	Weekend days	Weekdays	Weekend days	Weekdays	Weekend days
Very inactive	--	--	2,8 (SD=0,77) (N=32)	1,9 (SD=1,01) (N=32)	1,88 (SD=0,69) (N=54)	1,71 (SD=0,85) (N=54)
Inactive	2,44 (SD=0,75) (N=37)	2,46 (SD=1,09) (N=37)	2,39 (SD=0,78) (N=80)	2,61 (SD=1,23) (N=80)	2,34 (SD=0,68) (N=78)	2,09 (SD=1,14) (N=78)
Moderate active	3,01 (SD=0,92) (N=21)	3,4 (SD=1,34) (N=21)	3,22 (SD=0,69) (N=29)	3,56 (SD=1,47) (N=29)	3,35 (SD=0,44) (N=12)	2,57 (SD=1,17) (N=12)
Active	3,41 (SD=0,78) (N=57)	3,47 (SD=1,31) (N=57)	3,68 (SD=0,74) (N=32)	3,12 (SD=1,15) (N=32)	3,96 (SD=1.03) (N=6)	3,83 (SD=1,12) (N=6)

Where 1= Not at all 2= A little 3= Neither much or less
4= Exercising fairly 5= Exercising a lot

T-test comparisons between weekdays versus weekend days for each activity category did not revealed any statistical significant difference for both genders. This finding indicates that the participants that were characterized as "inactive" remained inactive during the weekend. It is worth noting that the standard deviation of the mean values in all cases is much higher for the weekend than for the weekdays.

Discussion

This study aimed to examine the leisure-time pursuits, the PA level, and the relationship between PA and specific personal and environmental variables of a cross

sectional sample of Greek students living in an urban area. The data indicated that the leisure-time management of the Greek students diversifies according to gender and age and its main elements draw a different profile to that identified in the findings of studies in other countries (Pieron and Ledent, 1996; Telema, 1998). This could be attributed mainly to the particular characteristics of Greek culture and to certain environmental variables such as the Greek educational system (Sallis, 1994). Lack of time is internationally an important barrier for physical activity participation (Baranowski, Thompson, DuRant, Baranowski and Puhl, 1993; Klesges, Eck, Hanson, Haddock and Klesges, 1990; Mason, 1995) and it seems to be equally important for the Greek students as the *Participation in private lessons for better academic performance* and the *Learning of foreign languages* in private institutions is a unique feature in the range of leisure-time activities for the Greek students. Results have also shown that participation in PA and sports ranks low among the activities that students enjoy being involved in, and as a result, a great percentage of students can not meet the physical activity recommendations for health (Cavill, Biddle and Sallis, 2001).

The active lifestyle of Greek students decreases dramatically with age, while at the same time there is an increase in the interest for activities of social interaction and sedentary recreation. This tendency has also been observed in other studies (Van Mechelen and Kemper, 1995; Riddoch and Boreham, 1995), but it seems that Greek students show a stronger interest for social interaction compared to students from other European countries (Pieron and Ledent, 1996). Despite the methodological difficulties that do not allow direct comparisons between international and national data, the increase in the percentage of inactive students of all age-groups examined in this study seems to be higher compared to the findings of other studies (DHHS, 1996; Rowland, 1991).

Although it was expected that leisure-time management and PA participation would correlate with the area of residence of the participants (Mason, 1995; Sallis, 1993; Sallis, 1994), results showed that accessible sports infrastructure in the area of residence does not influence the PA levels and the involvement in organized sports. This result indicates that the sports infrastructure should not be examined independently but in relation with the characteristics of sport culture in every country (Vilhjalmssona and Thorolfur, 1998). This is important because in studies access to

sports and recreation facilities is directly related to the children's level of PA (Mason, 1995; Sallis, 1993; Sallis, 1994). More specifically, the sample was chosen from the most privileged area of the city concerning sport facilities were neither more active nor did they have a different profile in PA from those in other areas.

In accordance with the findings of other studies, boys in the present study were more active than girls, in all age groups, (Sallis, Buono, Roby, Micale and Nelson, 1993; Sallis, 1993; Michaud, Narring, Cauderay and Cavadini, 1999). It was also evident that the participants' PA levels decrease with the age, especially for girls (Rowland, 1991; Van Mechelen and Kemper, 1995).

Student's PA is recorded mainly in the school environment and community organized sports programmes (Sallis and Owen, 1999). Of particular interest in this study is the fact that, although more that 40% of the sample's activity was accumulated in the school environment, the largest part of this percentage refers to free play during breaks, while the PE lesson contributes to a small degree and the participation in school sport teams is insignificant. It seems that in Greece, school is the most important setting for the promotion of PA in young people; however, there are limited opportunities for participation in organized sport activities. As a result, school can not realise its full potential to cultivate values related to sports and lifelong active lifestyle (see also Study 3 – section 3.3.4).

Participation in organized forms of exercise or private sports clubs explains only a small proportion of the sample's total PA. This lack of participation in organized sports activities in and out of school environment justifies the high prevalence of inactive students as the participation in organized sports programmes appears to be related to high levels of total PA (Trost, Pate, Saundres, Ward, Dowda and Felton, 1997; Sallis, Prochaska and Taylor, 2000). That possibly explains why students living in areas with good sport infrastructure are not differentiated from students living in less advantaged environments. Students' PA profile stress that there are limited chances for active young people to remain active throughout adulthood since their participation in physical activities is occasional and not a result of regular participation in carefully designed and organized activity programmes both in the school and in the community (Malina, 1996; Vanreusel *et al.*, 1997; Trost, Pate,

Sauders, Ward, Dawda and Felton, 1997). This finding supports the general recommendations for increase of available sports programmes in school and in the community as well as the encouragement of more young people to participate in active pastimes (Center for Disease Control and Prevention, 1997; Vilhjalmssona and Thorolfur, 1998).

Taking into consideration the lack of longitudinal data at national or local level and the weaknesses of the cross-sectional design establishing a causal relationship, it appears that lack of time due to the demanding school programme combined with the many other academic activities (Arabatzoglou and Antoniou, 1994) are possibly the main causes for the limited involvement of students in PA and sports. This barrier seems difficult to overcome since the children's out of school academic obligations are heavy, even from the age of elementary school. However, one would expect that children would be active when they had the opportunity, on weekends for instance. In the present study that was not evident since the active children remained active on weekends and the inactive chose to get involved in activities other than the PA and sports. It is important to note that in the section 2.4.2 using an objective instrument found that elementary school children were less active during the weekend than the weekdays. However, this finding was not confirmed by the PALQ. Even though the differences between the PA on weekdays and weekends were not extensively studied (Sallis, Prochaska and Taylor, 2000), the findings of the present research are contradictory to those of the other researches (Shephard, Jequier, Lavallee, LaBarra and Rajic, 1980).

Also, it appears that the sports infrastructure of the environment did not affect the participation in PA and sports contrary to the findings of other researches (Mason, 1995). Results also showed that the involvement in sedentary recreation activities, such as watching TV does not operate competitively towards the involvement in PA and sports. Children watching more TV are not necessarily less active. This finding is different to the findings of Lindquist, Reynolds and Goran (1999). Many of the findings above are unique and refer to the quest for deeper reasons for the adoption of this sedentary lifestyle by young people in Greece, such as the characteristics of the Greek culture, the environment, the family values, and finally, the particular attitudes

of Greek students towards exercise, attitudes established mainly in the school environment.

The amount of time pre-adolescent students spends outdoors is closely related to their PA level (Baranowski, Thompson, DuRant, Baranowski and Puhl, 1993; Klesges, Eck, Hanson, Haddock and Klesges, 1990; Mason, 1995). In the present study, 66.5% of the elementary school students claimed that during the last week they had never gone out with their parents for active recreation and had stayed at home instead. Taking into consideration that the safety dimension of living in modern cities may be prohibiting for the unsupervised free play of young children, it could be argued that the children are "addicted" to a sedentary behaviour from an early age (Anderssen and Wold, 1992; Taylor, Baranowski and Sallis, 1994). This happens either because their parents consider academic pursuits more important than PA, or because the parents themselves do not have the time and the interest for active recreation, thus becoming negative role-models for their children (Andersen and Wold, 1992; Taylor, Baranowski and Sallis, 1994). Despite the fact that the time spent on watching TV was not related to the students' PA levels, the use of leisure-time for sedentary recreation in weekdays and weekends is consistently related to a sedentary behaviour in young people (Sallis, Prochaska and Taylor, 2000). This fact may indicate that involvement in sedentary leisure activities clash with participation in active pursuits and that could help to explain why interventions aiming at the reduction of involvement in sedentary activities result in the increase of young people's physical activity levels (Epstein, Saelens and O'Braien, 1995).

The level of parents' education influenced the way young children managed their leisure-time and particularly the degree to which they were involved in academic activities and sports; a finding that coincides with those of other studies (Sallis, Zakarian, Hovell and Hofstetter, 1996). Specifically, parents with higher educational level seem to overload their children with additional academic activities compromising their participation in physical activities as the school and the extra-curriculum activities were already very time-consuming. Girls' participation in leisure-time and academic activities was a more complicated issue. Girls from low-educated families reported lower participation in physical activities. Furthermore, their preferences for house-hold chores, social and academic activities seem to be

influenced both by cultural and environmental factors. In addition it could be argued, that girls had limited opportunities to participate in organized sports in the local community, either because of lack of information or because the available programmes did not correspond with girls' needs, expectations and interests (Thyrlaway and Benton, 1993) (see also Study 3 - section 3.3.4).

The elements of students' personality directly related to the participation in PA and sports were not explored in this part of the study. These elements can, to a large extent, be developed and established in the school environment (Papaionnou and Diggelidis, 1996). The low interest students showed for PA and sports is possibly due to the failure of education, and particularly of the PE curriculum, in Greece to form those attitudes and values that would have contributed to a more active lifestyle (Papaioannou and Diggelidis, 1996; Trost, Pate, Saunders and Riner, 1999). However, the following study will help in understanding to some degree the association between the psychological underlay of Greek young people and their PA behaviour (see Study 1(b) - section 3.3.2).

It was also evident that leisure-time management was already developed on a stable basis for both genders in the elementary school level. Furthermore, it could be said that PA is a complex behaviour which is influenced in various ways according to age and gender by many factors. Nevertheless, it became clear that the dynamic of these factors is different in comparison to the findings of other studies and that is possibly due to the different cultural characteristics of Greek young people. These findings show the need of implementing intervention programmes to promote PA, particularly at the elementary school level, where there are more chances for successful results. The complex nature of the factors affecting the participation in physical activities supports the implementation of ecological models of behaviour change, targeting specific personal, social and environmental variables. The unique cultural characteristics presented here stress that interventions must be designed according to the specific characteristics and needs of Greek students and should not be simply adopted from practices developed in different cultural contexts.

Although, this study presents certain strengths such as the large representative sample and the use of a valid inventory for PA measurement there are certain limitations that

should be pointed out. First, even though the cross-sectional design is prevalent in similar studies it may hold the danger of arbitrary conclusions and generalisations and it does not allow the establishment of a cause-effect relationship (Sallis, Prochaska and Taylor, 2000). Second, seasonal effects should be under consideration as data collection was accomplished in late spring when the weather conditions may have a positive effect on the PA of younger children but the increased academic requirements of teenagers may have a negative influence on their level of physical activity. Third, it has been observed that self-reports of PA often overestimate the actual level of participation, particularly in younger age-groups (Bidddle and Goudas, 1996) and therefore it is possible that the percentage of inactive students in this study is even higher. Fourth, the use of an objective measure of PA may have led to different results regarding the elements of leisure-time management and those of participation in PA and sports (Trost, Pate, Ward, Saunders and Riner, 1999). Finally, it must be noted that these findings are based on data collected from the second biggest city in Greece and therefore they may not be representative to students living in rural areas.

Conclusions and Suggestions

Sedentary lifestyle has led to a worrying increase of the number of obese and overweight young people during the last years in Greece (Manios, Moschandreas, Hatzis and Kafatos, 1999). The avoidance of the physical and psychosocial negative consequences caused by inactivity could be achieved through appropriate intervention programmes in the family, school, and community settings (Johnson and Deshpande, 2000; Cale, 2000). First, the Ministry of Education should promote in the school environment the adoption of an active and healthy lifestyle by creating adequate conditions for exercise, improving sports infrastructure and offering opportunities for participation in organized exercise during and after the daily school programme. Secondly, the local communities should develop appropriate health policies, design attractive programmes and create the necessary infrastructure so that young people can move and play safely. Third, in the family environment young people should get more opportunities for participation in physical activities, and spend less time in sedentary recreation at home. The parents themselves should become positive role-models by engaging and encouraging their children to join them in active recreation.

3.3.2 Study 1-Part (b): Psychological factors underpinning participation in PA and sport.

The purpose of this part of the first study was to provide descriptive and correlational data of the psychological profile of young people's PA behaviour in Greece. For this purpose the motives of participation in PA/sport, the perceived physical competence, goal orientations and the attitudes towards PE lesson of a cross-sectional sample of Greek children were examined.

Methodology

Measures

The psychological variables used in this study were adopted from a questionnaire used in the European study *Comparative Analysis of Youth Lifestyles in Selected European Countries* (Pieron and Ledent, 1996). Four concepts were selected from the original questionnaire: *attitudes towards PE lesson, achievement goal orientations, physical self-concept* and *motives for participation in PA and sport.* These were selected because they are associated with the implementation of an active lifestyle and with personal satisfaction (Biddle and Mutrie, 2001; Pieron and Ledent, 1996).

Procedure

Students completed anonymously this part of the questionnaire following the completion of the PALQ (see also 3.3.1). The length of time necessary to collect the data varied slightly with the age of the interviewees mainly due to differences in understanding the questions. With the youngest students, the researcher had to read aloud the question one at a time, with the aid of the class teacher helping those children facing further difficulties. 14-years-old children answered at their own pace. In some instances, it was necessary to specify a few points in questions that were more difficult to appraise by children.

Attitudes toward PE lesson

Background

The objectives of school now exceed the simple transmission of knowledge (Fox, 1996). The high quality curricula provide students with strong academic knowledge which corresponds to individual needs and positively affect the young peoples'

behaviours, attitudes and social function (Johnson and Deshpande, 2000; Sherrill, 1993). Through school life pupils acquire long term benefits, including knowledge of one's body, improve long term health as a result of regular exercise and develop such personal qualities as self confidence, courage, patience and sociability (Almond, 1997). Physical education plays its own role in the global education endeavour. Physical education is the only component of the school curriculum which is directly related to health status (Stone, McKenzie, Welk and Booth, 1998), aims to alter risky behaviours (Baranowski, Anderson and Carmack, 1998), improves self-esteem (Theeboom, Knop and Weiss, 1995) as well as it can positively affect a number of other elements of young people's personality (Berger, 1996). However, at present time, there are some pessimistic analyses of the place and role of PE in schools (Hardman, 1998). This provides a challenge to any researcher involved in children's health and fitness to examine the current attitudes of students towards PE lesson. According to Fishbein and Ajzen (1975) *"attitude may be conceptualized as the amount of affect for or against some object"*. Because attitudes refer to the feelings regarding action, the examination of young people's attitude towards PA lesson may provide an indication about young people's predispositions to engage in an active lifestyle.

The questionnaire

Attitude towards PE lesson was assessed by the question "What do you think about physical education lessons at school?" Responses were rated on five point scale from *I dislike them very much* (1) to *I like them very much* (5). The use of a single evaluative item for the measures of attitudes has been proposed by Ajzen and Fishbein (1980) who stated that *"evaluation is the most essential part of attitude."* (p. 55).

Goal orientation

Background

An important mediating variable, which affects the children's choices in PA and sport, is the individual differences in goal orientation (Duda, 1996). Research findings suggest that the determination and analysis of individual goal-orientations contribute to the understanding of how students experience, interpret and value PA. The goal-perspective approach is at the crossroads of many determinants of sports and it is

related to motivational processes in sport such as attribution, perceived competence, intrinsic motivation, effort exerted, task choice and persistence in sport settings (Biddle and Mutrie, 2001). Goal-perspective theory proposes that people can define competence and success in different ways (Duda and Whitehead, 1998). A task orientation is held when success is defined primarily in terms of self-improvement and task mastery. It is highly correlated with the belief that effort will bring success (Papaioannou, 1995; Digelidis and Papaioannou, 1999). Thus, ability and success are self-referenced.

A task-orientation is linked to a focus on co-operation, is positively correlated with self-reported enjoyment of sport and it was negatively related to the amount of boredom experience. In contrast, an ego-goal orientation is held when success is defined in terms of winning and demonstrating superiority over others. This correlates highly with the belief that ability is necessary for success. The goal of outperforming others is likely to lead ultimately to feelings of incompetence, and therefore to reduce persistence when individuals are regularly successful (Duda, 1994). In this case, subjective success and perceived competence are norm referenced.

Research is consistent in showing the motivational benefits of a task orientation, either singly or in combination with an ego orientation (Duda, 1996). In a recent meta-analysis of numerous studies investigating the relationship between task and ego goals and positive and negative affect found that adopting a task goal orientation in sport and PA will lead to more positive reactions (Ntoumanis and Biddle, 1999b). Another review that examined the effect sizes for the relationship between task and ego climates and positive and negative affect in PA revealed that a task climate was associated quite strongly with positive affective and motivational outcomes (Ntoumanis and Biddle, 1999a). Therefore, the examination of goal orientation may provide important information with regard to what extent the students' view will foster personal development and enhance the commitment to lifetime sports participation and health.

The questionnaire

Goal orientation was assessed by the question 'This question is about your feelings when you are involved in sporting activities. I feel most successful in sport when:'

1. I am the one who can do the skill
2. I can do better than my friends
3. The others can't do as well as I can
4. Others mess up and I don't
5. I score the most points/goals, etc
6. I am the best
7. I learn a new skill and it makes me want to practice more
8. I learn something that is fun to do
9. I learn a new skill by trying hard
10. I work really hard
11. A skill I learn really feel right
12. I do my best

Responses were rated on a four-point scale from *I agree very much* (4) to *Disagree very much* (5). Principal components analysis shown that these 12 items represent two factors: in the fist factor 6 items were loaded (ego orientation), and in the second factor the rest were loaded (task factor) (Table 3.3.2.a)

Table 3.3.2.a: Principal component analysis for the items of *Achievement Orientation.*

	Factror1	Factor 2
I am the one who can do the skill	634	
I can do better than my friends	.770	
The others can't do as well as I can	.801	
Others mess up and I don't	.704	
I score the most points/goals, etc	.545	
I am the best	.609	
I learn a new skill and it makes me want to practice more		.675
I learn something that is fun to do		.682
I learn a new skill by trying hard		.673
I work really hard		.666
A skill I learn really feel right		.610
I do my best		.663
% Variance explained - (Total 47.38%)	29.65%	17.73%

Notes: Extraction Method: Principal Component Analysis.
Rotation Method: Varimax
Note: n=856 - KMO = .828 - Bartlett test of sphericity (df 66) =2307.8, $p<.000$

These items had been also used in a number of studies with Greek young people of various ages (Papaioannou, 1995; Diggelidis and Papaioannou, 1999). The items representing the ego- and task-orientation respectively were computed in separate

variables, that is ego- and task-orientation. The new variables were the mean values of the sum of the 6 particular items divided by the number of items. (e.g. ego variable= the sum of 6 ego items/6). Cronbach's *alpha* for the ego and task orientation by age and gender is presented in the Table3.3.2.b.

Table3.3.2.b: Coefficients of internal validity (Cronbach's a) of the *Goal Orientation*

	Boys				Girls		
	Total	Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
Ego orientation (6 items, 4 points scale)	.76	.67	.77	.72	.72	.82	.78
Task orientation (6 items, 4 points scale)	.76	.62	.76	.84	.71	.76	.75

Physical competence:

Background

The perception of physical competence is closely related to a fulfilment of the need for achievement. A high level of perceived competence in a sport activity influences the level of satisfaction found in sport involvement to a greater extent than general motivation (Biddle and Mutrie, 2001) Amongst the sources of pleasure, perception of competence and desire to meet challenges or overcome obstacles sport is of prominent importance (Duda, 1994). Those with ability at games above average during childhood are more active in later life (Kuh and Cooper, 1992) and this is probably due to their positive sporting experiences, as compared to their less able peers. Likewise, perceived competence has been identified as an important factor for determining participation in PA, with young people seeking to participate in those activities that provide a sense of competence, and avoid activities they associate with failure (Duda, 1994). Conversely, children who are unsuccessful at mastering activities often experience feelings of failure, which consequently reduces motivation (Weiss, Bredemeier and Shewchuk 1985; Digelidis and Papaioannou, 1999). Studies undertaken to examine specifically the relationship between perceived competence and enjoyment in physical activity generally support theoretical perspectives about the role of perceived competence in influencing interest and enjoyment (Williams and Gill, 1995). Similarly, the findings of few studies that have examined how perceived competence in physical education relates to enjoyment in the subject have cited perceived competence as a powerful indicator of children's selection of physical

education (Luke and Sinclair, 1991). However, it appears that these studies have not normally related perceived competence and enjoyment to activity levels and particularly to recommendations for health. More recently, Hyam's *et al.* (1995) study of leisure-time PA showed that perceived competence in high school students was significantly related to participation. Similarly, Stonecipher's study (1995) indicated that less active adolescents considered themselves to be significantly less competent than the more active adolescents. In Finland using a sample of 1108 children, Telama (1998) found that there was a moderate positive correlation for both gender aged 12 and 15 between PA and perceived competence, and a slightly lower correlation between PA and attitude to PE lesson for these age groups. Generally these studies also show that boys exhibit higher levels of perceived competence than girls (Telama, 1998; Van Wersch, 1997). Similar moderate association between PA level and perceived competence were found in a recent study in UK in a sample of 922 children aged 10-to-11 years old (Carroll and Loumidis, 2001). Studies had shown that one of the strongest predictors of future levels of PA is an individual's perception of confidence in their ability to be active on a regular basis (Reynolds, Killen, Bryson, Maron, Taylor, MacCoby and Farquhar, 1990).

Therefore, perceived physical competence seems to be an important determinant of children's participation in physical activities and PE. Thus, this concept was included in the present study in order to check for possible differences between sub-groups of participants. Such possible differences, if found, would give possible indications for the development of the intervention programme.

The questionnaire

Physical self-competence was assessed by calculating a general index from six items of the question 'Compare yourself to other girls (if you are a girl) or to other boys (if you are a boy) of your age. This combined index deal with athletic abilities, agility, flexibility, aerobic fitness, speed, and strength. Responses were rated on six couple of in reverse adjectives in 5-point scale (Lintunen, 1987; Marsh and Sutherland-Redmayne, 1994). The items representing the physical competence were computed in one variable. The new variable was the mean value of the sum of the 6 items divided by the number of items. Cronbach's alpha for this scale presented in the Table 3.3.2.c.

Table 3.3.2.c: Coefficient of internal validity (Cronbach's a) of the concept *Physical Self Concept* (6 items).

	Boys				Girls		
	Total	Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
Physical Self Concept (6 items, 5 points scale)	.79	.67	.82	.83	.75	.73	.77

Motives for participation in PA and sport: *Background*

Many researchers give particular emphasis to the factors motivating the children to participate in physical activities and sports. The motivation reflects experiences, feelings and values, which are important, both for the participation of youths and children in sports and for their everyday life (Biddle and Mutrie, 2001). It is acceptable that the type of motivation and the quality of the experience in physical education and sports have a significant effect not only on the children's quality of life but it also affects their lifetime participation (Telama, Laasko and Young, 1994). Motivation is the key factor to the participation in sports because it influences decisions on the level of effort expended and activates the individual. Descriptive research on participation motives for children and adolescents indicated that common motives are fun and enjoyment, learning and skill development, affiliation, physical fitness and shape, success and challenge (Biddle, 1999).

In children and adolescents enjoyment or fun is an important motive for adopting and adhering to PA (Buonamano, Cei and Missino, 1995; Mason, 1995; Laws and Fisher, 1999; Pieron and Ledent, 1996); the desire to experience fun and pleasure are frequently quoted as the most important motives in sports motivations studies (Scanlan and Simons, 1992). However, 'enjoyment or fun' has a broad meaning; for some young people enjoyment can be considered as an optimal psychological state associated with performing the activity for its own sake, whereas for others enjoying oneself through PA is the result of participation for other reasons (De Bourdeaudhuij, 1998). Research findings indicated that motives to participate in PA differentiated across age and gender. An extensive study in Finland twenty years ago had shown that boys and younger adolescents were more interested in achieving success in competition but by late adolescence very few showed interest in this factor (Telama and Silvennoinen, 1979). This trend was reversed for motives associated with

relaxation and recreation. Fitness motivation was strongest among those who often thought about sport and took part in sport club activities. This fitness motive was unimportant for 18-19 year olds, or for those uninterested or inactive in sport. Another study in Northern Ireland (Van Wersch, 1997) has shown that interest in physical education remains relatively constant for 11-19 year old boys, whereas during the same period interest declines sharply for girls. 'Interest' was assessed by questionnaire items pertaining to attitude, behaviour, motivation and perceptions of fun in the PE setting. Data from the English Sports Council's survey of young people and sport (Mason, 1995) showed, that from a large sample of 6-16 year olds, motives are diverse, ranging from general enjoyment to fitness and friendships. Finally, a recent European comparative study revealed that children's motives of the same age and gender were quite different across countries (Pieron and Ledent, 1996) confirming other reports from Europe that children are motivated for a variety of reasons (Biddle, 1999).

The questionnaire

The statement "Here are some different reasons for participating in sport. Please state how much you agree or disagree" was used. Responses were rated on a four- point Likert scale, from *Very important* (4) to *Very unimportant* (1) in every one of the following items:

My friends do
I wand to make a career of it
I meet new people
I can do something that is good for me
I enjoy competition
I wand to be physically fit
It relaxes me
I enjoy exercise
I like being in a team
My family wants me to participate
I can get my body in shape
I can make money in it
It is exciting
It makes me physically attractive
I can meet friends
It gives me the opportunity for self expression

Measurement Variables

Independent Variables: Age (3 levels, elementary - secondary - high school), gender (2 levels, boys - girls) and PA level (3 levels, inactive – moderately active – active) were the independent variables used in the analyses of this part of the study.

Depended Variables: Attitudes toward school, physical competence, goal orientation and motivation towards PA and sport were the dependent variables.

Computations and statistical analysis

All statistical analysis was performed using SPSS for Windows. Descriptive statistics were used to describe the depended variables across age and gender. In order to determine the associations between the various variables, bivariate correlational analyses were conducted (Spearman's coefficient correlation). Next, the influence of age, gender and PA level on attitudes towards PE lesson and physical competence were explored by employing analysis of variance (ANOVA). Homogeneity of variance between dependent variables was established using Levene's test. Statistical significance was set at $p<.05$. Between-sex comparisons on dependent variables were evaluated using independent samples *Student's* t-tests. Post Hoc (Scheffe) test was used to examine the statistical difference between sub-groups.

Results

Descriptive data of the variables

Descriptive statistics for the dependent variables are provided in Tables 3.3.2.d and 3.3.2.e.

Table 3.3.2.d: Descriptive data of attitudes towards PA lesson, achievement orientation and physical competence.

		Boys (n=441)						Girls (n=460)					
		Elementary B (n=123)		Secondary B (n=182)		High B (n=136)		Elementary G (n=122)		Secondary G (n=181)		High G (n=157)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Attitudes toward PE lesson		4.33	0.9	4.17	0.97	4.18	0.85	4.21	0.97	3.77	0.9	3.6	0.9
Goal orientation	ego	2.45	0.51	2.46	0.55	2.53	0.53	2.34	0.52	2.26	0.57	2.25	0.57
	task	3.39	0.40	2.30	0.48	3.24	0.54	3.32	.46	3.15	0.48	3.19	0.49
Physical competence		3.82	0.63	3.71	.75	3.8	0.75	3.74	0.66	3.35	.66	3.24	0.71

Table 3.3.2.e: Descriptive data of different motives for participation in sport.

		Boys (n=392)						Girls (n=323)					
		Elementary B (n=112)*		Secondary B (n=160)*		High B (n=120)*		Elementary G (n=100)*		Secondary G (n=131)*		High G (n=92)*	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Motives for participation in PA and sport	My friends do	2.52	0.99	2.34	0.82	2.07	0.71	2.19	0.79	2.03	0.73	2.08	0.64
	I wand to make a career of it	2.92	0.95	2.71	0.93	2.43	0.94	2.56	0.91	2.11	0.93	1.87	0.73
	I meet new people	3.09	0.84	2.98	0.72	2.79	0.73	2.97	0.79	2.85	0.65	2.8	0.71
	I can do something that is good for me	**3.63**	0.59	**3.42**	0.66	**3.42**	0.66	**3.52**	0.64	**3.44**	0.56	**3.41**	0.65
	I enjoy competition	3.18	0.9	3.19	0.75	3.13	0.8	2.81	0.87	2.77	0.88	2.55	0.8
	I wand to be physically fit	**3.54**	0.67	**3.47**	0.65	**3.40**	0.72	**3.39**	0.66	**3.33**	0.65	**3.26**	0.69
	It relaxes me	3.26	0.77	3.08	0.8	3.17	0.78	3.15	0.83	**3.03**	0.73	**3.16**	0.82
	I enjoy exercise	**3.43**	0.69	**3.38**	0.64	**3.31**	0.7	**3.43**	0.67	**3.18**	0.73	**3.18**	0.75
	I like being in a team	**3.54**	0.7	**3.33**	0.77	**3.24**	0.82	**3.34**	0.74	2.90	0.89	2.90	0.81
	My family wants me to participate	2.54	1.08	2.16	0.9	1.83	0.76	2.18	0.96	1.80	0.73	1.72	0.67
	I can get my body in shape	**3.37**	0.76	**3.33**	0.65	3.23	0.68	3.20	0.81	**3.30**	0.63	**3.35**	0.54
	I can make money in it	2.75	1.0	2.84	0.9	2.42	0.89	2.50	0.91	2.24	0.86	2.06	0.81
	It is exciting	3.32	0.77	3.18	0.73	**3.35**	0.61	**3.34**	0.75	3.01	0.73	**3.18**	0.69
	It makes me physically attractive	3.0	0.97	2.96	0.88	2.92	0.81	3.09	0.82	2.91	0.80	3.05	0.71
	I can meet friends	3.13	0.71	2.88	0.84	2.73	0.84	2.94	0.88	2.58	0.78	2.66	0.81
	It gives me the opportunity for self expression	3.29	0.78	3.13	0.74	3.06	0.85	3.23	0.77	2.99	0.79	3.0	0.82

*Note: Numbers in bold represent the 5 most important motives for all genders and age groups.

From the Tables 3.3.2.d and 3.3.2.e some important notes can be made.

- Both genders had very positive *attitudes towards PE lesson*, which, decline, as children get older.
- Similar rate of decline was apparent for the perceived *physical competence* for both genders as they get older.
- Both genders and age groups (except for secondary school boys), task-orientation is higher than ego-orientation. This predominance of the task-orientation gives a favourable view of these children concerning their lifetime participation in PA and sports.
- With regard to the motives of participation if PA/sports, from the Table 3.3.2.e is apparent that three common motives appeared at the top of the ranking for both genders and age groups: *health* ("I can do something that is good for me", "I can get my body in shape" and "I wand to be physically fit"), *enjoyment* ("I enjoy exercise") and *social relationship* ("I like being in a team"). Both genders

in all ages consider that *the opportunity for self expression* is a high motive for participation in PA/sports. However, boys tend to enjoy more competition than girls. It is also worth mentioning the unimportance of the social variable 'My family wants me to participate' as a motive for participation in PA/sports, even for the younger children.

Comparisons of means

Attitudes towards PE lesson: Three way analysis of variance (ANOVA) was performed in order to examine the effects of students' gender, age and PA level on *attitudes towards PE lesson*. Analysis showed main effects of sex ($F_{1, 891}=7.19$, $p<0.001$) and PA level ($F_{2, 891}=27.88$, $p<0.001$) and no interaction effects. The more active students had statistically significantly more positive attitudes towards PE lesson independently of age and gender. The post-hoc univariate analyses indicated that this difference was statistically significant for all three PA groups. Attitudes towards PE lesson decline statistically significant for girls as they get older ($F_{2, 458}=15.34$, $p<0.001$). Furthermore, with regard to gender, independent *Student's* t-test indicated that secondary ($t_{(360)}=4.06$, $p<0.001$) and high school boys ($t_{(290)}=5.59$, $p<0.001$) had statistically significant more positive attitudes towards PE lesson than girls .

Physical competence: Three way analyses of variance (ANOVA) were performed in order to examine the effects of students' gender, age and PA level on the perception of *physical competence*. Analysis showed main effects of sex ($F_{1, 863}=16.47$, $p<0.001$) and PA level ($F_{2, 863}=34.54$, $p<0.001$) and interaction effect between sex and age ($F_{2, 863}=4.87$, $p<0.05$). The more active children had a statistically significantly more favourable view about their physical competence than the low active counterparts, independently of the age and gender. The post-hoc univariate analyses indicated that this difference was statistically significant for all three PA groups. Independent *Student's* t-test indicated that secondary ($t_{(345)}=4.7$, $p<0.001$) and high school boys ($t_{(283)}=6.4$, $p<0.001$) had statistically significantly more positive perceived physical competence than girls.

Relationship between variables

Table 3.3.2.f presents Spearman correlation coefficients between goal orientation and PA level. Positive statistical significant correlations found between both orientations. However, task-orientation reveals stronger correlation with PA than ego indicating that high task-oriented children tend to be more physically active.

Table 3.3.2.f: Correlation between task-ego and physical activity (Spearman).

	Physical Activity Score						
	Total	Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
Task	.46**	.37**	.59**	.51**	.56**	.45**	.32**
Ego	.22**	.25**	.23**	.28**	--	.19*	.23**

Correlations are significant at * p < .05 and ** p< .01 level (2-tailed)

Table 3.3.2.g presents Spearman correlations coefficient between task-ego orientation and attitudes towards PE lesson. Task-orientation correlated positively with favourable attitudes towards PE lesson.

Table 3.3.2.g: Correlation between task-ego and attitudes towards PE lesson (Spearman).

	Physical Education Lesson						
	Total	Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
Task	.35**	--	.31**	.4**	.51**	.37**	.26**
Ego	.01**	-.22*	--	--	--	--	--

Correlations are significant at * p < .05 and ** p< .01 level (2-tailed)

Table 3.3.2.h presents Spearman correlations coefficient between perceived *physical competence* and *attitudes towards PE lesson.*

Table 3.3.2.h: Correlation between *physical competence* and *attitudes towards PE lesson.*

Boys (n=441)			Girls (n=460)		
Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
--	.28**	--	.33**	.34**	.36**

Correlations are significant at ** p< .01 level (2-tailed)

There is a statistically significant positive relationship between them, especially for girls in all ages. This relationship indicates that young people who perceived themselves as competent in PA and sports possibly have a more favourable attitude towards PE lesson than those who perceived themselves as less competent.

Table 3.3.2.i presents Spearman correlations coefficient between perceived physical competence and PA level. The statistical significant relationship across gender and age group indicated that positive perceived physical competence might lead to a higher involvement in PA.

Table 3.3.2.i: Correlation between *physical competence* and PA level.

Boys (n=441)			Girls (n=460)		
Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
.27**	.43**	.33**	.41**	.38**	--

Correlations are significant at ** p< .01 level (2-tailed)

In Table 3.3.2.j presented the Spearman correlation coefficient between motives of participation in PA/sports and PA level.

Table 3.3.2.j: Correlation between motives of participation and PA level (Spearman).

	Boys (n=441)			Girls (n=460)		
	Elementary B (n=123)	Secondary B (n=182)	High B (n=136)	Elementary G (n=122)	Secondary G (n=181)	High G (n=157)
I can meet friends	--	--	--	--	0.207*	--
I wand to make a career of it	0.25**	0.36**	**0.47****	**0.47****	0.29**	0.25**
I meet new people	0.215*	0.18*	0.28**	0.21*	0.24**	--
I can do something that is good for me	--	0.24**	**0.47****	**0.51****	0.4**	0.28**
I enjoy competition	0.22*	0.3**	**0.45****	--	0.30**	--
I wand to be physically fit	0.25**	0.3**	0.36**	**0.47****	0.29**	0.35**
It relaxes me	--	0.22**	0.27**	0.33**	0.38**	--
I enjoy exercise	0.28**	0.31**	0.38**	0.36**	**0.44****	0.35**
I like being in a team	0.3**	0.31**	**0.52****	0.35**	0.2*	0.22**
My family wants me to participate	--	0.2*	--	--	--	--
I can get my body in shape	0.25**	**0.4****	0.27**	0.32**	0.23**	--
I can make money in it	0.28**	0.38**	0.31**	--	--	--
It is exciting	0.27**	--	**0.41****	0.29**	0.29**	0.29**
It makes me physically attractive	0.22*	0.27**	--	0.3**	--	--
I can meet friends	--	0.16*	--	--	--	--
It gives me the opportunity for self expression	0.3**	0.19*	0.28**	0.35**	0.32**	0.26**

*Notes: - Motives in bold are significantly correlated with PA level across all genders and age groups.
- Correlations are significant at * p < .05 and ** p< .01 level (2-tailed).

The more consistent associations found across age and genders refer to the motives related to *health, enjoyment, social relationship,* and *career in sports.* Health and enjoyment are the motives with the strongest relationship with PA level for girls. Health, social relationship and excitement from participation in competitive sports are the motives with the strongest relationship with PA level for boys. Important also is the fact that there was no relationship between the social variable 'My family wants me to participate' and the level of PA, even for the younger children.

Discussion

The purpose of this part of the study was to provide descriptive and correlational data of the psychological component of PA behaviour of a cross-sectional sample of Greek young people with regard to gender, age and PA level. In summary, the results of this study revealed a significant but moderate positive relationship between PA level, perceived physical competence, goal orientation, and attitude towards PE lesson. More active children tend to have more positive view about their perceived physical competence (Carroll and Loumidis, 2001; Hyams *et al.*, 1995; Stonecipher, 1995; Telama, 1998), be more task-oriented and enjoy PE lesson more (Telama, 1998) in all age groups. These findings are more evident in girls in all age-groups. Greek boys also exhibit higher levels of perceived competence than girls, a finding similar to the findings of Telama (1998) and Van Wersch (1997). Health, enjoyment and social relationship emerged as the strongest motives for participation in PA and sport in both gender and age groups.

Attitudes towards PE lesson and perceived physical competence

The results of this study emphasize the possible important association of perceived competence in attitudes towards PE lesson; the results support the hypothesis that those who perceived themselves as more competent would participate in more PA and enjoy PE more. The findings of this study also support the hypothesized gender effect on perceived competence, and this is similar to the results found by Van Wersch (1997). Boys perceived their competence to be higher than girls. This is possibly stressed through the gender difference in the amount of time devoted to participation in PA.

However, the general trend is that Greek students have a favourable attitude towards school PE lesson. This is in line with findings from other studies conducted with secondary school children in Greece (Kioumourzoglou, Heva and Mavromatis, 1991). This is due to the fact that school's PE lesson represents an important environment for active play, self-expression, and socialisation for the Greek children taking into consideration their PA profile (see also 3.3.1). Boys had a more positive view towards PE lesson than girls in all ages; however, this positive view decreases as children get older, a finding which is corroborated by other findings from studies in other countries (Pieron and Ledent, 1996). Importantly, this decline seems to be sharper for girls; this should be interpreted in relation with the Greek PE lesson characteristics as well as the particular motives towards sport of each gender.

In Greece the National Physical Education Curriculum, both for elementary and secondary school (National Ministry of Education, 1990; 1996) is based on the teaching of a range of motor activities in which team sports predominate. Less emphasis is given to other subjects such as athletics, dance and gymnastics. A number of researchers in Greece believed that the absence of clear aims and objectives is the basic drawback of the Greek National Curriculum (Papaioannou, Theodorakis and Goudas, 1999; Papaharisis, in press). The large number of aims, the non-existence of directive guides, and the unclear teaching pursuits has resulted most of the times to poor and un-coherent lessons. Furthermore, the insufficient time allocated to PE lesson (2 hours of 45 minutes lesson per week) and the more emphasis given to the skill acquisition necessary for playing efficiently team games, makes the teaching process difficult, mainly when large variation exists in ability levels among students; this is evident between genders in secondary education. The activities included into the Greek National Curriculum in their majority are competitive and they are mainly addressed to physically gifted students. However, despite the fact that these elements may fit to boys' interests and abilities, they do not correspond to girls' characteristics because they are less attracted by competitive situations (Van Wersch, 1997).

Numerous studies had shown that when an individual has a strong desire to be successful in sport activities, the experience of failure could lead to disappointment, to lack of enjoyment and to drop-out (Papaioannou, 1995). Consequently, less physically

gifted children or girls will possibly to lose their interest because they understand that PE lessons offer minimum opportunities for success and achievement (Duda, 1994; Digelidis and Papaioannou, 1999). It could be argued, therefore, that a likely cause of girls having less favourable attitudes towards PE lesson, in comparison to boys, is because of their lower perceptions of their ability. This view is strengthened by the positive association found between physical competence and attitudes towards PE lessons, and it has also been stressed by many other researchers (Carrol and Loumidis, 2001; Luke and Sinclair, 1991; Williams and Gill, 1995; Telama, 1998). In addition the results concerning the positive association between PA levels, perceived competence and attitudes towards PE lessons have also been corroborated by the findings from Hyams *et al.* (1995), Stonecipher (1995), and Telama (1998).

Goal orientation

In all gender and age groups task-orientation is much stronger than ego-orientation. This difference is in agreement with data from the international literature (Pieron and Ledent, 1996; Digelidis and Papaioannou, 1999). Task is supposed to foster personal development and enhance the commitment to lifetime sports participation and health. It is not surprising, therefore, those high task-oriented students are more physically active and have more positive attitudes towards PE lesson than ego-orientated students, independently of gender and age. Papaioannou and Goudas (1999) have demonstrated that pupils are influenced by the goal perspective when it is promoted in the class. The findings of this study underline the important role of teachers in creating positive classroom motivational climates by setting challenging goals and reinforcing values of personal achievement and co-operation (Ntoumanis and Biddle, 1999a; Treasure and Roberts, 1995). However, the findings also indicate that PE teachers in Greece must put in more effort in order to create a stronger task-involving atmosphere in their classes.

Motivation towards PA/sport

Health, enjoyment and social relationship have a positive relationship with PA levels in both gender and age groups. These findings are in accordance with other studies (Biddle, 1999; Pieron and Ledent, 1996). It appears that most young people understand the fitness and health benefits of regular participation in PA. The overwhelming importance of the item "being physically fit" or "expecting something

good for themselves" is evident. However, there are two particular trends when considering differences between gender and age groups. Firstly, with regard to health, the motives of enjoyment and social interaction had a stronger association with PA levels for elementary school girls than for boys of the same age. However, girls progressively become less motivated when they lose interest towards sports and turn to other leisure pursuits. As a consequence, the relationship between motivation and PA levels also progressively decreased. On the other hand, the situation was different for boys where the social interaction and enjoyment obtained from being member of a team had the highest correlation with PA level. The finding that girls progressively become less motivated towards sports, and at the same time form a less favourable view about their physical competence is worrying. Secondly, boys are more motivated by competitive situations and the social aspect of sports than girls, who are motivated from activities which offer relaxation and recreation. For girls, enjoyment of competition had significantly lower importance than the exercise itself. This fact may explain to an extent the low participation of girls in sports clubs outside of school and their massive drop-out from competitive activities at the age of 10 to 12 years old (Avgerinos, 1997).

Family does not influence children's involvement significantly (Pieron and Ledent, 1996). This finding should be viewed within the area of socialisation into sport and children's influence by their parents participation (Coakley, 1987). However, recent reviews on determinants of PA confirmed the low importance of this social variable for children's PA behaviour (Sallis, Prochaska and Taylor, 2000).

Conclusion – Suggestions

This part of project 2 adds to the body of knowledge on the association between PA levels and the psychological variables of perceived competence, attitudes towards PE lessons, goal orientation and motives for participation in PA/sport of a large cross-sectional sample of Greek children. This study supports the link between these variables and physical activity participation. The findings are important for physical education teachers and health professionals who work with young people towards the achievement of the recommended activity levels for health benefits.

Though it is certainly important that young people are active, it is even more important that they will become physically active and informed adults. The health consequences of physical inactivity are much more evident in adults than in young people. Therefore, PA programmes for children should be organized according to how they might influence long-term activity behaviour. Consequently, based on the finding of this study, a number of recommendations should be made on how young people could develop and establish a positive lifetime perspective for PA. Family, school and the community can play a determinant role towards this objective. The youth activity programmes should provide children with enjoyable lifetime activities and give them the opportunity to develop skills and obtain positive experiences throughout a supportive learning environment. Opportunities for elementary and particular middle scholars to receive more and quality PE is extremely important because children progressively accumulate less PA as they get older, both in and out of the school environment.

Taking into consideration the findings of this study and the recommendations made in other relevant studies (Cale, 2000; McKenzie, 2001; Sleap, 1997) school PE lessons must be characterized by the following elements, especially for girls:

- Physical activities must be enjoyable and increase students' feelings of competence. The PE curriculum must consist of a range of individual and team activities offering opportunities for success and self-expression. These activities must be differentiated according to gender preferences providing equity in opportunities for PA.
- It should provide a secure, supportive environment that rewards participation and personal effort and does not overemphasize competition and winning.
- It should be developmentally sound and well-linked to the age-specific interests, motives, and abilities of each gender and age group. Teachers must be reinforcing students' confidence by giving positive feedback.
- Teachers have to provide the right environment for children of all abilities to develop a wide range of skills. This environment can produce a motivational climate (Biddle, 1999), where enjoyment and perceptions of competence are enhanced or decreased. Therefore, teachers must promote task-orientation and avoid competitive

situations, or situations in which students' performance is norm-referred (Treasure and Roberts, 1995). The highly competitive environment may lead to a decrease in the confidence of low ability children, and may often cause feelings of incompetence, which may lead to failure.

3.3.3 Study 2: The role of PE teachers in promoting health and PA

The forth research question of this project which is related to the extent of PE teachers being prepared to support health and PA initiatives will be thoroughly examined in this study. The purpose is to investigate the knowledge, attitudes and self-efficacy of a sample of elementary and secondary school PE teachers in teaching a HRE programme.

Background

The attitudes towards a behaviour express the positive or negative estimation of the behavior (Ajen and Fishbein, 1980). The attitudes towards a behaviour are an important factor in determining whether the person will finally get involved in the particular behaviour. So, it makes sense to expect PE teachers to choose the implementation of a HRE programme that they are positive towards (Asthon, 1985; Ashton, Webb and Doda, 1983). Self-efficiency is the confidence one feels in specific circumstances and refers to the personal beliefs regarding the ability to organize and carry out a series of activities required for the achievement of a specific result. Self-efficiency also determines the choice of an activity (Bandura, 1997). Research among teachers has shown that high self-efficacy is positively associated to the higher achievement of students, and to the ability of managing the class. Furthermore, the PE teacher's self-efficiency for the achievement of specific goals in a PE lesson was positively related to the evaluation of the importance of those goals (Biddle and Goudas, 1998).

Methodology

Sample

In this study 103 participants (53 men and 50 women) took part who were PE in service teachers appointed in elementary (n_1=50) and secondary (n_2=53) education. The sample was randomly chosen from 74 schools in the wider area of Thessaloniki. The researcher himself visited the PE teachers personally during school hours and after verbally explaining the aim of the research he/she then handed out the questionnaires, which were completed anonymously and then returned in enclosed sealed envelopes. The completion of the questionnaires was voluntary.

Instrumentation and measurements

The data was collected by a questionnaire created for the *needs analysis* of the teachers. The questionnaire included four categories of questions (see Appendix 2.a). The first category of questions involved the recording of: a) the demographic data of the interviewees, b) their academic qualifications and their experience in education.

The second category of questions involved the evaluation of the participants' attitudes towards the implementation of a new HRE program in the school. According to the theory of "Reasoned Action" (Ajzen and Fishbein, 1980) the attitudes towards a behaviour express the positive or negative degree of appreciation of the particular behaviour. For the evaluation of attitudes the participants answered the question "For me, the implementation of a new PE program at school is....". The answers were given on a 7 points scale, in four couples of adjectives, that is i) Difficult (1) - Easy (7), ii) Repulsive (1) - Attractive (7), iii) Tiresome (1) - Refreshing (7), iv) Useless (1) - Useful (7).

The third category of questions involved the evaluation of the participants' self-efficacy regarding the organization and the implementation of a HRE program, and more particularly the evaluation of the ability to influence the behaviour of their students in matters of nutrition, tobacco and alcohol consumption, and participation in PA and sports.

Finally, the participants' perception of their knowledge for a successful implementation of the program was evaluated by answering the following question. "My level of knowledge regarding the organization of a new HRE program at school is..." The answers were given on 10 point scale, where by 1 was evaluated the answer "No knowledge" and by ten the answer "Plenty of knowledge".

Pilot research – Validity and reliability studies

Before the collection of the final data the questionnaire was: a) examined and corrected by two specialists, b) evaluated for the comprehension of the questions by personal interviews with 7 PE teachers, and c) distributed to 14 in service PE teachers

(9 men and 5 women) twice within a week for the evaluation of its reliability. *Cronbach's a* for the two measurements is presented on Table 3.3.3.a.

Table 3.3.3.a: *Cronbach's a* for the depended variables for the 1st and 2nd measure.

Variables	Question	1st Measure Cronbach's a	2nd Measure Cronbach's a
Attitudes (4 items)	For me to implement a new program of physical education in my school is	0.71	0.84
Self-efficacy (8 items)	How sure are you that you can organize a HRE programme in your school?	0.89	0.90

Data management and Statistical Processing

Sex (2 categories), experience in education (3 categories, that is 1-8 years, 9-15 years and more than 15 years), the educational grade the participants served (two categories, that is primary and secondary school) were the independent variables. The dependent variables were: a) attitudes towards the implementation of a new HRE program in school, b) self-efficacy, and c) level of knowledge in teaching a HRE program. The four items for the evaluation of the attitudes and the 8 items for the evaluation of self-efficiency were computed in one value which was the quotient of the sum of the items by the number of the items. The MANOVA and the dependent samples *Student's* t-test were used to examine the dependent variables. Levene's test was used to examine the homogeneity of the sample for all three dependent variables ($p>.05$). Statistical significance was set at $p<.05$ level.

Results

The results showed that 46% of the sample claimed participation during the last years in at least one scientific congress per year relevant to sports and physical education. 82.5% participated annually at least in one seminar relevant to their status as coaches. 92.3% claimed they wished to attend seminars specialized in school physical education. 28% of the interviewees reported that they are competent in a language other from Greek to a satisfactory level, and only 14% of them know to use a computer and relevant new technologies (e-mail, internet) to a satisfactory level. On

Table 3.3.3.b the descriptive data from the answers regarding the knowledge, attitudes and self-efficiency of the people interviewed are presented.

Table 3.3.3.b: Descriptive data of the dependent variables.

	Male (n=53)				Female (n=50)			
	Elementary (n_1=26)		Secondary (n_2=27)		Elementary (n_1=25)		Secondary (n_2=25)	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Attitudes	5.04	1.02	5.18	0.7	5.08	0.88	5.13	0.75
Self-efficacy	4.94	0.84	4.82	0.93	4.8	0.82	4.6	0.72
Knowledge	7.24	2.18	7.56	1.63	6.04	1.97	7.48	1.64

Regarding the organization of a HRE programme in school, it would appear that 46.5% of the interviewees thought they had sufficient knowledge; 50.5% of the interviewees had a positive attitude towards its implementation in a school environment; and 44.7% believed that they were capable of responding to the demands of such a program and of influencing the students' behaviour positively.

Multivariate analysis of variance (MANOVA) with three factors [sex (2) X experience in education (3) X the educational grade the participants served (2)] showed that there is no significant statistical difference or any interaction between sex, teaching experience and teaching level, and the attitudes, knowledge and self-efficiency for the organization of a HRE program ($p>.05$). Table 3.3.3.c shows a positive correlation between the depended variables.

Table 3.2.4.c: Correlation between the dependent variables (Spearman r).

	Self-efficacy	Knowledge	Attitudes
Self-efficacy	--	.27*	.34*
Knowledge	.27*	--	.24*
Attitudes	.34*	.24*	--

* $p<0.05$, (two-tailed)

Discussion

The aim of this study was to examine of the possibility of implementing a HRE program by in service PE teachers appointed on the primary and secondary level of education. The PE teachers who participated in this study showed a high level of real disposition to get informed and trained in subjects related to their job and they expressed the desire to participate in specialized issues relevant to a PE lesson. However, this training is only carried out due to the personal motivation of the interviewees that is generated mainly by an interest in information regarding competitive sports, an area where a large part of this sample offer their services as coaches, rather than as part of their school-teaching.

The PE teachers' ability to influence their students effectively in health related issues and to successfully implement a HRE programme seems to be limited. This stems from the fact that half of the interviewees claimed to have inadequate knowledge. The fact that 45.6% of them claimed to have adequate knowledge seems to be related more to their perceived abilities than their true knowledge in HRE issues. This claim is based upon the following arguments:

a) The philosophy that underlies the HRE model is radically different from the logic of competitive sports.
b) The model has been present on the educational scene since the last decade without being implemented in Greek schools.
c) In Greek schools there is no regular in service training for appointed PE teachers. Furthermore, as the results have shown, the majority of the interviewees have no access to international literature or the Internet due to limited skills with regard to language and computer use.

In summary, the PE teachers' training represents a fundamental condition for the successful implementation of any HRE programme in the school environment.
It is remarkable that the people questioned universally showed interest in training in specialized physical education issues (92.3%).

As far as their attitudes are concerned, the results showed that almost half of the interviewees were positive about the implementation of a new program. This may be related to the fact that as the students grow older they are gradually losing interest in

PE lessons (see also section 3.3.2). This negative fact is observed by the PE teachers in their daily practice (Diggelidis and Papaioannou, 1999).

The positive correlation observed in the dependent variables shows that PE teachers who perceived they had the necessary knowledge to implement a HRE programme felt greater confidence concerning the positive effects of the program on their students' behaviour. This fact justifies, up to a certain point, the high percentage of people who are viewing the implementation of a new program with scepticism. The PE teachers who felt they lack knowledge and information in HRE issues had a less favourable attitude towards the implementation of similar programs. This correlation possibly shows that the adoption of more positive attitudes towards the implementation of new programs could come with an increase in the level of knowledge and the acquisition of skills which are considered necessary conditions by the instructors in order to become more effective in innovative teaching approaches.

To summarise, the training of teachers seemed to be the basic condition for the implementation of the programme. The findings of this study indicate that teacher training should focus on:

a) The philosophy, contents and helpfulness of the HRE programs so that they will be convinced of their importance and treat them positively.
b) The acquisition of specialized knowledge and practical skills for teaching the contents of such a programme.
c) The creation and the provision of the necessary recourses that will considerably help the planning and the implementation of the teaching.

Furthermore, the training program can be a unified entity, and not a diversified one according to the experience of the PE teachers, the educational level they serve and their sex, since no differences were observed in these variables. On the disadvantages of the study, we must mention that the PE teachers treated the study with reservation. It is a revealing fact that almost 20% of the people who were approached initially refused to fill out the questionnaire believing that the results of the research could possibly be used in the ministry's current attempt to introduce the evaluation of the educational effort. This percentage possibly misquotes the above estimations.

3.3.4 Study 3: Physical activity promotion in Greek schools

Throughout this study, the fifth research question of this project will be examined and its relationship to the PA promotion in the school environment. The purpose of this study was to provide information regarding the nature and extent of a PA promotion in a sample of elementary and secondary schools in Greece.

Methodology

Sample and instrumentation

The sample of this study consisted of 17 schools (6 elementary, 6 middle and 5 high schools) from 5 different administrative municipalities of the city of Thessaloniki (see also 3.1.4). A questionnaire was designed to elicit descriptive information regarding a) the range, nature, quantity and quality of PA opportunities available within the schools, and b) the background of the stuff in issues relevant to health promotion in schools (see Appendix 2.b). The questionnaire was addressed to the head teachers because these individuals hold, by law, the main administrative responsibility for every programme or initiative running within the school environment. In order to determine the different avenues through which schools were promoting PA or health related matters, the school masters should provide, through the questionnaire, information concerning:

- school policies and school ethos;
- the formal PE curriculum;
- the informal curriculum (extra curricular activities-sport clubs);
- the environment (e.g. sports facilities, play/recreation space, audio-visual equipment);
- community links;
- Support – Other health programmes

Furthermore, PE teachers gave additional information in a semi structured interview concerning the PE lesson, the school ethos, and PA policies within each particular school. Data were collected by the researcher by having an appointment with the school heads and PE teachers.

Data analysis: Descriptive statistics were used to analyze the questionnaires. However, due to length restrictions, only the selected and most relevant findings are present in this study.

Results

School policies and school ethos

None of the school had a policy for the promotion of PA/sports beyond compulsory PE lessons. PE clothing was compulsory in all schools. Showers were not in use in the majority of the schools. In terms of the recognition given to sporting achievement within the schools, PE teachers (58%) claimed that they regularly report the results of school sport competitions in the school's news letter or on notice boards. Also, only 10% of the PE teachers reported or displayed details of sport events which were taking place out of school. PE teachers report that 25.8% (SD 12.8) of elementary school students and 21% (SD 10) of secondary school students participate regularly in a sports club out of school. However, this percentage varied significantly between schools in different districts of the city (between 8% and 35%).

The PE curriculum

Physical activity promotion within the PE curriculum was considered in terms of the time allocated for PE and the types of activity offered to pupils within PE lessons. The time allocated to PE per week was two non consecutive hours per week (two sessions of 40-45 minutes) both for elementary and secondary schools. All PE lessons were practical in nature. Just one elementary school reported health related lessons which took place both in the gym/play ground and in the classroom..The main activities promoted throughout the PE lesson were: team games (70% and 80% for elementary and secondary school respectively), athletics (10%), dance (7%), gymnastics (5%) and, on some occasions, circuit training, skipping, game activities, and aerobics.

The informal curriculum

In terms of PA promotion throughout the informal curriculum, none of the schools offered extra-curricular activities. All elementary schools and 60% of the secondary schools had more than three school sports teams that participated occasionally in the local league between schools. However, no extra time was allocated for the training of these teams. The most common activities offered in these sports teams included

football, basketball, handball and athletics. It is important to note that none of the schools offered gymnastics, dance, swimming, racket sports or outdoor education.

The environment

How conducive the school environment was in the promotion of PA was determined by considering the range and quality of sporting and other facilities, and opportunities available. Figure 3.3.4.a illustrates the sport infrastructure and facilities schools had.

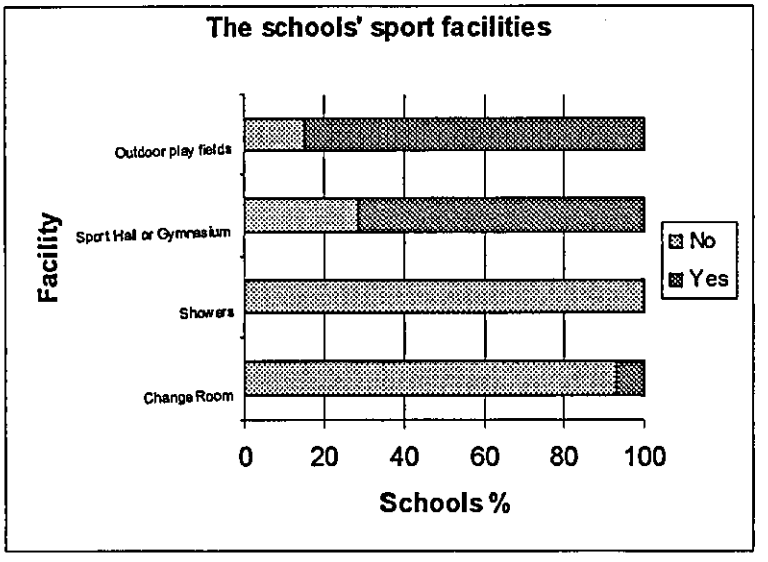


Figure 3.3.4.a: The schools' sports facilities

Concerning the outdoor playgrounds, the school masters and PE teachers reported that only 64% of them were safe and in good condition. Most, however, felt their outdoor facilities were either adequate (62%) or poor (14%). Furthermore, 42% of the interviewees reported the management and maintenance of their indoor facilities and sport equipment to be poor. The changing and showering facilities were reported to be scarce. In terms of the other facilities and opportunities which the schools would be provided with and which would encourage PA, only 15% provided sports equipment for the use of pupils at break times. None of the schools provided cycle sheds and none had secured traffic-free areas around school. Finally, 42.9% of the school buildings and infrastructure were more than 20 years old. It is worth mentioning that new school buildings (less than 5 yrs old) were also provided with poor sport facilities, and especially limited indoor facilities (gyms or sport halls).

Support – Other health programmes

With regard to the support available to schools which might impact upon PA promotion, information was sought on staff training and support and the running of other optional health programmes within the school timetable. On the issue of staff training and support, 83.3% of school masters and 58.3% of teachers during the previous or current academic year attended at least one training course. However, only 20% of the interviewees attended at least one seminar relevant to health education. In half (50%) of the schools a number of extra educational programmes were run. 28.6% of these programmes concerned general educational subjects (e.g. environmental education, Olympic education, consumer education, Socrates) and 21.4% were relevant to health education (e.g. healthy food, smoking prevention, PA promotion).

Community links

Despite the fact that 28.6% of the schools head teachers reported the existence of quality sport areas near the school (e.g. sport clubs, local leisure/sports centres, private sport/fitness/dance clubs) none of them had established links with them. Furthermore, head teachers and PE teachers reported that none of the schools had link with any health or sport bodies.

Discussion

The purpose of this study was to provide information regarding the nature and extent of PA promotion in Greek schools. Despite the very limited number of schools involved in the study, the findings show that PA promotion within the Greek school context is a very low priority matter and far away from the practice followed in other European countries (Cale, 2000; Harris, 1995; Mason, 1995). Whether this was due to a lack of awareness of the potential of the whole school for promoting PA or to other factors, it is not know at present. This conclusion is supported by the findings presented in the sections 2.4.1, 2.4.2 and 3.3.1 with regard the PA profile, and in particular the contribution of PE, extra-curricular activities, and school sport clubs in the overall PA level of students.

Although the fact that 21.4% of the schools run health related programmes is an encouraging finding, it is a disappointing fact that none of the schools have any programmes or health policy to promote PA among children. The findings indicated that PE lessons are the only regular and supervised activity offered to students within the school environment. However, a number of fundamental facilities which typically accompany PE, such as changing and showering routines, were scarce or not in use. Taking into consideration the adequate and problematic sport infrastructure, it is apparent why many young people are turned off by the subject, especially older girls (Mason, 1995; see also section 3.3.2). It was encouraging to find that more than the half of the PE teachers reported or displayed the results of school sports competitions in the school's news-letter or on notice boards. However, in very limited schools, PE teachers reported or displayed details of sport events which were taking place out of school. Therefore, by not providing such information clearly students tended to receive responsible information about the sport opportunities in the locality. Indeed, raising students' awareness of community opportunities may be important to facilitate the participation of young people in sport. It is worth mentioning the finding that despite the limited information provided by the schools and the absence of extra-curricula activities, a significant percentage of students participate in local sport clubs or private gyms out of school (see also section 3.3.1). It is possible, therefore, to make many more students participate in community sports if schools establish a constant link with community sport bodies.

The findings show that the key avenue through which to promote PA in schools is in the PE curriculum. However, due to the limited time allocated to the subject, the predominance of team sports, and the absence of clear aims concerning the promotion of health and PA (see also section 3.3.2) decrease the possibility of any positive message the lessons may have to students, parents and other school stuff. In terms of carrying out HRE, the findings suggest that this did not represent an important area of the PE curriculum. Despite the fact that HRE is an important component of the PE curriculum in other countries (Harris, 1994; 1995) and many experts emphasized the importance of the PE lesson in promoting positive health behaviours and active living (Daley, 2002; Fox, 1996; Jonhsong and Despante, 2000). In Greece this vital area is underestimated. Finally, it is important to mention the predominance of team sports and competitive games on the PE curriculum. The appropriateness of these activities

with children has been brought into question after taking into consideration the differences among students in terms of ability, gender preferences, motives and impact towards lifetime participation. There is, therefore, a need for the PE curriculum to introduce additional forms of lifetime physical activity and sports. Such activities are valuable in terms of their contribution to enhance health and well-being of young people and can offer positive and enjoyable experience, which is a vital predisposition for participation in a PA in adulthood (Malina, 1996; Sallis and Owen, 1999).

The absence of extra-curricular activities is very disappointing. This characteristic is unique in the PE curricula in European countries (Mason, 1995; Pieron and Ledent, 1996) and, consequently, it deprives the school of the potentiality to promote vigorous activity and participation in organized sports. Despite the fact that in the majority of the schools there are sports teams, the participation rate is very low, as indicated from the PA profile of children. However, the absence of extra time allocated for participation on these teams results in a minimum contribution in activating students, especially girls. Furthermore, the emphasis on competitive games, may be excluding many pupils (most notably the less able and girls) from participation in these sports (see also section 3.3.2).

As indicated earlier (see 2.4.1, 2.4.2 and 3.3.1) in the school environment Greek children accumulate almost half of their daily PA. However, the results of this study suggest that the environment in many schools was not always helpful to PA participation. The main problems identified are relevant to the deficient indoor and outdoor sport facilities, the rare provision of changing and shower facilities, and the poor provision of equipment or opportunities for active play during break times. Furthermore, it is disappointing the fact that none of the schools provided cycle sheds and traffic-free areas around the school, making cycling an impractical mode of transport to school.

It is encouraging to find that a high rate of the school staff attended training seminars last year (see also section 3.3.3) and the fact that in half of the schools optional education programmes run. These findings indicated the readiness of the staff to upgrade their knowledge and to actively participate in educational innovations.

However, only a limited number of the school staff participated in health education programmes, and consequently, few health programmes run in their schools. This finding may indicate a low interest for health promotion in the school environment. Therefore, it appears that a first step towards the promotion of health and PA programmes in the school environment is informing the staff about the importance of such programmes and, secondly, the organization of relevant seminars. This is fundamental as PA can be promoted more effectively when there is support from all key players in the school, including the senior management, the school governors and other staff (Cale, 2000).

Finally, another fact that inhibits PA promotion within the school environment is the absence of any link between schools and outside health and sporting bodies and organizations. This fact decreases the important help that schools could obtain from these organizations in order to promote PA effectively and other health behaviours in the school environment. Successful links have many potential benefits both for the staff and the pupils. Such links may encourage pupils to continue participation outside schools and widen teachers' opportunities to offer quality PE lessons in a well equipped environment.

Conclusion and suggestions

Taking into consideration the findings of this study and the recommendations by other researchers (Cale, 2000; Daley, 2002; McKenzie, 2001; Sleap, 1997; Harris, 1995; Mason, 1995), governors, school administrators and school staff must proceed in a number of organizational, socio-cultural, and environmental interventions in schools in order to influence PA behaviour of young people in Greece.

Firstly, a number of organizational interventions should be made. The PE curriculum should be updated, taking into consideration the current needs of Greek young people in the international trends in the subject (see also section 3.3.2). On a weekly basis, more time must be allocated to the PE lessons (McKenzie, 2001) and more opportunities for participation in extra-curricular activities and school sport clubs must be created. In addition, school head teachers and staff must be better informed about their role in promoting health and PA through participation in staff development

programs and be given continuous support from experts. Schools must also establish regular links with community health and sporting organizations in order to benefit from their support and experience in promoting PA.

Secondly, schools must create a health and sport culture within the school environment in order to motivate pupils towards PA an active lifestyle. The establishment of a written health and sport policy, the provision of information about the PA/sport opportunities available to pupils, the display of the results of school sport events, and the regular participation of the school staff in PA, are only some suggestions that may cultivate a sport culture. Taking into consideration the findings presented in sections 3.3.1 and 3.3.2, a special interest should be given in specific groups of children such as girls, older children and the most inactive. In order to motivate these target groups the activity opportunity must be enjoyable and attractive.

Finally, a number of environmental interventions must be made in order to promote PA both within and outside school environment. Schools must create the fundamental conditions which typically accompany PE such as changing and showering facilities, and upgrade the indoor and outdoor sport infrastructure. School playgrounds must be safe and supervised. Furthermore, by providing sport equipment for use during breaks, pupils can have access to large amounts of enjoyable activity (McKenzie, Marshall, Sallis and Conway, 2000). Dale *et al.* (2000) suggest that it is imperative to make stringent efforts to provide children with plenty of chances to be active over the duration of the entire day. Finally, community governors must create secured traffic-free areas around schools in order to encourage students to travel by walking or cycling. In other words, a whole school approach is required in order to effectively promote PA and sport in Greek schools.

3.4.0 Summary of the main findings

In the second project of this PhD a *need analysis* was carried out in a sample of students, in-service PE teachers, and schools in order to: a) to establish whether or not there is a need to increase the participation levels of young people, and to identify their specific PA needs and b) to examine the current PA opportunities for the young in the school environment. Throughout this project three separate studies that aimed to answer the following research questions were presented:

1. What are the leisure-time pursuits of the Greek young people?
2. What are the PA patterns of Greek children and how active are they? Is there a need to increase their PA level?
3. To what extent do specific personal and environmental PA determinants correlate to the PA behaviour of Greek young people?
4. To what extent are the school PE teachers prepared to support health and PA initiatives?
5. What are the current PA/sport opportunities of Greek students in the school environment?

The information collected in these studies was necessary in developing a strategy for the PA promotion which addresses the particular needs of the young population.

The **first study** (sections 3.3.1 and 3.3.2) related to the first three research questions. In terms of leisure-time pursuits of the Greek youth, the findings showed that:

- The leisure-time management of the Greek youth diversifies according to gender and age and its main elements draw a sedentary profile, particularly for females. Physical activity as a leisure time pursuit decreases dramatically with age, while at the same time there is an increase in the interest for activities of social interaction and sedentary recreation. Participation in PA and sport ranks low among the activities that Greek adolescents enjoy being involved in and, as a result, a great percentage of youth are being classified as sedentary.
- Many of the findings refer to the quest for deeper reasons for the adoption of this sedentary lifestyle by young people in Greece, such as the characteristics of the Greek education system, family values, and the restrictions of the environment.

In terms of PA patterns and PA level of Greek young people, the findings have showed:

- A large proportion of the children are not active enough to obtain health benefits. This finding justifies the need for intervention programmes to promote PA among Greek youth, already from the age of elementary school.
- Physical activity levels decrease dramatically with age, especially for girls. The findings have shown that Greek adolescents, in particular females, are a high risk group concerning health problems related to inactivity.
- Boys are more active than girls, in all age groups.
- There is a significant drop out from participation in PA and organized sports as children move from elementary to secondary school. This minimum participation in organized sports activities in and out of the school environment justifies largely the high prevalence of inactivity among students as the participation in organized sports programs appears to be related to high levels of total PA.

In terms of PA determinants of Greek young people, the findings have showed that PA is a complex behaviour which is influenced by many factors. The findings indicate that:

- Lack of time is an important barrier in an active lifestyle. Greek students are hard working to cope with their school and out of school academic obligations and this is possibly the main cause for their limited involvement in PA and sports. However, at present this barrier seems difficult to overcome since the children's out of school academic obligations are heavy, even in elementary school.
- Schools are the most important setting for the promotion of PA in young people as more that 40% of the sample's activity was accumulated in the school environment. However, a PE lesson offers limited opportunities to children for moderate/vigorous activity and there are rare opportunities within the school timetable for participation in organized sports. As a result, schools cannot realize their full potential to cultivate values related to sport and lifelong active lifestyles.

- Sports infrastructure of the environment does not associate with participation in PA and sports. This may relate to the children's limited time available for visiting these places, or because the available programmes do not correspond to children's needs, expectations and interests.
- The involvement in sedentary recreation activities (e.g. watching TV or playing video games) does not function competitively towards the involvement in PA and sports. Children watching more TV are not necessarily less active.
- The active children remain active on weekends and the inactive choose to get involved in activities other than the PA and sports. Taking into consideration that the safety dimension of living in modern cities may be a prohibiting factor for the unsupervised free playing of the young children, it could be argued that Greek children are "addicted" to a sedentary behaviour. This happens either because their parents consider academic pursuits more important than PA, or because the parents themselves do not have the time or the interest to help their children to be active.
- Parents' educational level influences the way young children manage their leisure-time and particularly the degree to which they are involved in academic activities and sports. Parents with a higher educational level seem to overload their children with additional academic activities compromising their participation in PA, whereas girls from low-educated parents are reported to participate less in PA and sport. Parents also have a significant influence on the participation levels of their children (especially elementary school children) by helping them to be active outdoors.
- Females' PA behaviour is a more complex issue than males. Their preferences for household chores, social and academic activities seem to be influenced both by cultural and environmental factors. In addition, it could be argued, that girls have limited opportunities to participate in organized sports in their schools and the community, either because of lack of information or because the available programmes do not correspond to their needs.
- A significant but moderate positive relationship is found between PA level, perceived physical competence, goal orientation, and attitude towards PE lesson. More active children tend to have a more positive view about their perceived physical competence, are more task-oriented and enjoy the PE

lessons more in all age groups. These findings are more evident for girls in all age groups.

- The PE teachers need to emphasize task-oriented goals. Physical activities must be enjoyable and increase students' feelings of competence.
- Health, enjoyment and social relationship emerged as the strongest motives for participation in PA and sport in all genders and age groups. However, the two genders are motivated by different motives in different ages. This finding must be into consideration in designing appropriate intervention programmes according to the age and gender characteristics of the recipients. The finding that girls progressively become less motivated towards sports and, simultaneously, form a less favourable view about their physical competence needs special consideration.
- The low interest students show for PA and sports is possibly due to the failure of school, and particularly of the PE curriculum, to form those attitudes and values that would have contributed to a more active lifestyle.

The **second study** (section 3.3.3) related to the fourth research question of this project. In terms of the extent of PE teachers being prepared to support health and PA initiatives the findings have showed that:

- The PE teachers' ability to influence their students effectively in health related issues and to successfully implement a HRE programme seems to be limited. The PE teacher training represents a fundamental condition for the successful implementation of any HRE programme in the school environment. It is remarkable that the people questioned universally expressed interest in training in specialized physical education issues.
- As far as attitudes are concerned, the results showed that almost half of the interviewees were positive to the implementation of a new program. The association found between attitudes, self-esteem and knowledge possibly indicates that the adoption of more positive attitudes towards the implementation of new programs could come with an increase in the level of knowledge and the acquisition of those skills, which are deemed as necessary conditions by the instructors, in order to become more effective in innovative teaching approaches.

The **third study** (section 3.3.3) is related to the fifth research question of this project. In terms of the PA/sport opportunities provided by the schools the findings have show that PA promotion within the Greek school context is a very low priority. Whether this is due to a lack of awareness of the potential of the whole school for promoting PA or to other factors cannot be suggested by the findings of this study. This view is supported by the following findings:

- None of the schools had any programme or health policy to promote PA among children.
- PE lesson is the only regular and supervised activity offered to students within the school environment. However, a number of fundamental facilities which typically accompany PE such as changing and showering routines are rare or not in use.
- Only a limited number of schools PE teachers create a sport ethos to raise students' awareness of community PA and sporting opportunities in order to facilitate their participation in sport.
- None of the schools had extra-curricular activity programmes. This characteristic deprives the school of the potential to promote vigorous activity and participation in organized sports. Despite the facts that in the majority of the school sport teams that run, the participation rate is very low, especially for girls. Furthermore, the emphasis on competitive games discourages many pupils from participating in these sports.
- The physical environment in many schools is not always conducive to PA participation. The main problems identified are relevant to the deficient indoor and outdoor sport facilities, the scarce provision of changing and shower facilities, and the poor provision of equipment or opportunities for active play during break times.
- The absence of any link between the schools and outside health and sporting bodies and organizations inhibits PA promotion within the school environment. Such links may encourage pupils to continue participation outside schools and widen teachers' opportunities to offer quality PE lessons in a well equipped environment.
- Despite the fact that many schools have access to quality sports areas near the school (e.g. sport clubs, local leisure/sports centres, privet sport/fitness/dance clubs) none of them have used these facilities on a regular basis.

The findings so far indicate that the key avenue of PA promotion in schools is the PE curriculum. However, the limited time allocated to the subject, the predominance of the team sports, and the absence of clear aims concerning the promotion of health and PA decrease the possibility of any positive message the lesson may have to students, parents and other school staff. Despite the fact that HRE is an important component of the PE curriculum in promoting positive health behaviours and active living, in Greece this vital area underestimated. Finally, the PA profile of students indicated that the key-provider of PA for young people in the locality is the school, while other sport conveyors such as the community, sports federations and the private sector have a limited contribution to youth PA. This is more evident in females in all ages.

This part of the study revealed that Greek young population do not represent a homogeneous group and their PA needs vary between different sub-groups. Furthermore, a number of biological, psychological and environmental factors are identified associated with PA behaviour. These findings indicate specific priority areas for intervention in each sub-group (e.g. gender, age) and they highlight the type and the components of intervention likely to be more effective.

3.4.1 What we know and what we need to know

We know... ... ...

- Greek young people, apart from the differences related to common age characteristics, have demonstrate lifestyle differences in comparison with their counterparts from other European countries.
- The family, the school, and the physical environment appear to exert a strong influence in the formulation of lifestyle behaviours.
- Both genders reduce their PA as they get older. This decline is more remarkable in girls than boys, and is steeper in adolescence than in childhood.
- Young people participate in PA and sport for different reasons with regard to gender and age. Enjoyment, health and social interaction are particularly important motives and are consistently associated with participation in PA.
- Lack of time is a key barrier for regular involvement in PA.

- Accessibility to sport infrastructure had no association with PA level.
- Parents' education associated to children PA behaviour.
- The PE teachers' training represents a fundamental condition for the successful implementation of any HR programme in the school environment.
- Schools in Greece are the most promising environment for the promotion of PA, as a large part of young people PA is accumulated during school hours. However, schools offer minimum opportunities for participation in supervised and organized PA and sport.

What we need to know... ... ...

- ... The long lasting changes on the PA level and the determinants of PA of Greek young people. This research should involve different methods and disciplines including quantitative, qualitative and multidisciplinary approaches. Also, we need to know more about the PA level of Greek children based on larger samples from different ages and areas of the country.
- ... About the role of specific socio-economic, environmental, cultural, developmental and behavioural determinants in the formulation of the PA behaviour.
- ... Which factors inhibit girls' PA and sport participation as they get older.

3.4.2 Implications of the findings on students' health

The high rate of inactivity indicates that this particular sample decreases the possibility to obtain the benefits of an active lifestyle (Cavill, Biddle and Sallis, 2001; Riddoch and Boreham, 1995). Furthermore, students' PA profile indicated that there are limited chances for active young people to remain active throughout adulthood (Malina, 1996; Vanreusel *et al.*, 1997; Trost *et al.*, 1997). The harmful effects of inactivity are already evident taking into consideration the prevalence of obesity among Greek youth during the latest decade (Manios *et al.*, 1999).

The avoidance of the physical and psychosocial negative consequences caused by inactivity could be achieved through appropriate intervention programmes (Johnson

and Deshpande, 2000; Cale, 2000). The findings of this project support the general recommendations for increasing available sport programmes in school and in the community as well as the encouragement of more young people to participate in active pastimes (Center for Disease Control and Prevention, 1997; Vilhjalmssona and Thorolfur, 1998).These findings indicate the need of implementing intervention programmes to promote PA, particularly at the elementary school level, where there is more chance for successful results. The complex nature of the factors affecting the participation in PA supports the implementation of ecological models of behaviour change, targeting specific personal, social and environmental variables. The unique cultural characteristics presented here stress that interventions must be designed according to the specific characteristics and needs of Greek students and should not be simply adopted from practices developed in different cultural contexts.

3.4.3 General conclusion and recommendations for interventions

The gradual decline of Greek children and adolescent's PA levels should raise considerable attention. A number of health problems that are witnessed in adulthood, and are related to inactivity, seem to have their origin in childhood. Therefore, parents, teachers, and state authorities must collaborate closely to overcome this challenge. Public awareness of the importance of increasing children's PA patterns needs to be raised. Attitudes towards an active lifestyle are formulated at early age, and as a result, parents and school have the prime responsibility to provide a positive role model, and to encourage children to engage in both spontaneous and formal PA.

Given the importance of PA as a health habit, and considering the prevalence of the sedentary way of life of young people in Greece, a tendency towards the engagement in appropriate PA and attitudes should be pursued. Schools play a vital role in encouraging more active lifestyles among young people, but they cannot achieve this alone. Liaison with outside agencies and parents is essential if the end goal of increased lifelong participation is to be achieved. Physical activity can be better promoted if it be seen as a whole school responsibility and reinforced within the whole school environment (Cale, 2000). Based on this view, the notion of 'Active School' has begun to attract increased interest recently. An 'Active School' acknowledges the value of all types of PA; while the promotion of health is the

primary objective, the many other benefits provided by sport and PA are recognized and valued (McGeorge, 1997). Establishing such a foundation, students will progressively become independent and decision-makers, who can plan, develop, and implement individual activity programmes.

In the light of the findings of this study, teachers and parents should place special attention on girls to make them more active. In this study it is proved, to some extent, that early in their lives girls were stereotyped through the expectations of others. Furthermore, differences in the levels of participation between girls and boys in sporting activities outside school started from an early age and continued through high school. These findings support the view expressed by Greendorfer (1983) some years ago that inequalities in PA opportunities for girls can begin early on in life and have a long-lasting impact. Parents should therefore give equal opportunities and freedom to their daughters to develop their athletic potential as to sons. This inequality between genders may be further accentuated in the school setting, by offering those sporting activities that are closer to boys' interest than to girls. Therefore, schools must play a major role in offering equal opportunities for PA and sport among genders.

Throughout the PE curriculum and extra curricular activities students should experience a wide variety of individual, partner and team activities. The emphasis should be placed upon developing a sound foundation of motor skills that can contribute to enjoyable activity experiences both in the present and in the future. Current practices in PE in Greece are not consistent with this. What is needed is a major change in its current philosophy and practice that emphasises motor skills and sports, to one that emphasises physical activity education. Hence, the findings of this project so far recommend that school PE should be health oriented. The Greek PE curriculum should incorporate components that provide students with the knowledge and skills which enable them to make responsible decisions about their lifestyle and PA choices. Given the limited amount of time available for PE, a reorientation of its content is necessary in order to promote PA. The notion of health-related physical education has been advanced, its main goal being to prepare children and adolescents for a lifetime PA (Cale, 1997; Cale and Harris, 1998; Cale, 2000). Reaching this goal would require the implementation of curricular and instructional strategies that are substantially different from those provided in traditional sport-oriented programmes.

Furthermore, schools need to promote out-of-class activity, introduce extra curricula activities, and modify the school environment so students, and in particular girls, have opportunities to be active in playgrounds outside PE, and work to develop PA linkages in the community.

A classroom teacher's role seems to be of great importance and this emphasises the need for well-trained, informed and skilful school staff members. However, the findings have showed that the PE teachers' ability to influence their students' behaviours effectively and to implement a HRE programme successfully seems to be limited. Therefore, PE teachers' training is a condition for the successful implementation of any HRE intervention in the school environment. This finding is in accordance with the findings of other researchers who claimed that the training of teachers is a fundamental precondition for the effective implementation of intervention programs in the school environment (Stone *et al.*, 1998; Sallis and Owen, 1999; Medlein, Baranowski and Pratt, 2000). Therefore, the state's responsibility is to ensure the allocation of the adequate resources and in-service training opportunities in physical education to all PE school teachers involved in the subject.

Moreover, the role of local authorities in the promotion of PA should not be underestimated. In co-ordination with school authorities, they should focus their attention on promoting attractive and challenging programmes, training personnel, and constructing the necessary environmental infrastructure (HEA, 1997). Attractive programmes and accessible sports facilities need to be made available, ones that can be used by children in certain times bearing a reasonable cost. The community should provide adequate, safe and clean play areas to children to enable them to raise their activity levels.

This study attempted to provide valid and comparative information regarding the patterns of PA and leisure-time management of Greek people. However, the lack of a common research PA instrument limits the comparability of the findings to those of other studies conducted in the European Union and creates difficulties in the comparison and development of common health prevention and promotion policies within the European Union (Hosman, 2000; Pieron, Telema, Almond and Da Costa, 1997). Therefore, there is need for appropriate, common measures of PA for the

European countries (Kohl, Fulton and Caspersen, 2000) which could be used in epidemiological international studies enabling the direct comparison and the credible interpretation of the findings. Such findings are necessary for the design, implementation and evaluation of inter-cultural intervention programmes, the promotion of scientific knowledge regarding health issues and the better understanding of the influence of cultural differences in the prevention and promotion of healthy and active lifestyles across Europe.

3.4.4 Setting the intervention scheme

In sections 3.3.1 and 3.3.2 a number of factors were found to be associated with children's PA level. These findings can be used in two ways to design a PA intervention (Sallis and Owen, 1999): the first is to assist in targeting intervention to a high-risk group; the second use is to guide the intervention's content by modifying those factors that control the behaviour. Taking into consideration the findings of the *needs analysis*, this section deals with the decision process of an intervention strategy to promote PA among young people.

The next step after the evaluation and presentation of the findings of the *need analysis* (see Fig. 1.10.a) was the formation of a relevant *forum*. Four experts in the field from the Department of PE and Sports Science of the Aristotle University of Thessaloniki, four school head teachers, six PE teachers, two officials of the municipality, six representatives of parents' unions, and three officials from different local sport federations participated in the forum. All those people had an interest or involvement in the promotion of PA/sport to young people and discussed a potential strategy from the planning stage. This forum helped to explore possible ways for the effective promotion of PA across a range of settings, and to encourage involvement and commitment from other partners (e.g. community, sport federations). The forum developed an initial frame of a PA promotion strategy taking into consideration:

- The findings of the needs analysis and their implications for the development of a feasible and justified intervention.
- Target groups, priorities and preference of young people.
- The overall PA and sport provision in the locality.
- The possible involvement of relevant partners.

After this exploratory forum, the next step related to the creation of a *strategy team* in order to formulate the definitive frame of the strategy. After two sessions a summary of the key points of the strategy was established:

- A statement of the rationale for promoting PA to young people in the locality.
- A statement of the aims and objectives.
- A list of the possible partners.
- A summary of principles and values underpinning the strategy.

Those decisions were based on: a) a review of the evidence for the effectiveness of other relevant international initiatives based on the school environment (see also section 4.2.0), b) the findings of the *needs analysis*, c) the suggestions as they were formulated by the participants in the forum, and d) a budgetary analysis of the estimated cost of the intervention.

The following step aimed to develop the *implementation plan* of the strategy in detail, taking into consideration a number of key-parameters as they were proposed by major health organizations (HEA, 1997; Centers for Disease Control and Prevention, 1997). Table 3.4.4.a presents the main decisions in summary.

Table 3.4.4.a: Key-considerations in organizing the strategy of the *implementation*.

	Finding	Decision	Considerations
1. Setting	- Schools in Greece play key-role in activating young people. *However the findings showed:* - Limited access to community programmes - Lack of time prohibits regular involvement with PA and sport - Safety reasons may be important for younger children.	Proposed a School-based Physical Activity intervention programme – Adoption of the *Whole School Approach* for the promotion of PA.	***Why school based? Because.....*** o It is the primary social institution with responsibility for promoting health and PA. o It can introduce students to opportunities available in other settings (youth clubs, sport clubs, leisure centres, and local community facilities). o It target all student population o There is specialized staff o There is the necessary infrastructure in a safe and supervised environment. o There are four potential areas for promoting PA (curriculum, extra-curricular time, break time, and links with other settings). o The initiatives in the school environment are more cost-effective.

2. Target groups	- High rates of inactivity already from the elementary school.	▪ Target elementary and secondary school students	o Intervening in early age provides more possibilities for a more effective PA promotion.
	- Females are a particularly inactive group.	▪ Target groups are females in all age range.	o Females' PA behaviour needs special attention because it is appearing to be influenced by many personal, social and environmental factors.
	- Extensive drop-out from organized sports during adolescence.	▪ Emphasis to the promotion of organized sport in secondary school.	o More opportunities for involvement in vigorous activities within the school and the community.
3. Appropriate intervention (*Address specific needs – Provide continued support*)	- No extra-curricular activity. - Limited hours of PE per week. - Limited vigorous activity in PE lessons. - Limited provision in sport equipment during school breaks.	▪ Provision of PA & sport opportunities in the school environment	o More hours in PE lessons. o Provision of sport equipment during school breaks. o Provision of extra-curricular activity. o More opportunities for supervised activity in the school environment. o Promotion of less known sports. o School sport league, sport festival. o Tester days in new sports. o Visit sport events.
	- Decrease of PA during weekend	▪ Provision of PA/sport opportunities during the weekend – Cooperation with parents of younger children - Decrease of sedentary leisure at home.	o Participation in team games/sports organized by schools and the community. o Participation in special events ('run for my heart health', 'skipping rope') organized by the schools. o Give guidance to parents to help their children to be active during the weekends.
	- Poor quality of PE lesson (in terms of content, teaching approach, equipment, sport facilities)	▪ Introduction of new sporting activities. ▪ Emphasis to particular needs and preference. ▪ More opportunities for moderate/vigorous activity	o Introduce HRE. o Introduce lifetime activities o Enrich PE contents, o Equal opportunities for both genders o Less emphasis to competitive games. o Improve/enrich sport facilities.
	- Decrease of positive attitudes towards PE lesson with age. - Different motives for participation in PA/sport by age and gender.	▪ Developmentally sound and well-linked motives to the age-specific interests, and abilities of each gender and age group - Special emphasis to girls and less motivated people.	o Provision of enjoyable PA that increase students' feelings of competence. o Opportunities for success and self-expression. o Provide secure, supportive environment that rewards participation and personal effort. o Task oriented teaching o Cultivation of sport ethos in the school environment.
4. Partnerships	- Absence of any link between school and outside health and sport bodies and organizations	▪ Provision of PA & sport opportunities out of the school environment	Establish links with: o Community sports o Sport clubs o Private sport/fitness centres o Local education authorities o Health authorities o Youth services o Institutes of higher education o Regional governing bodies of sports
5. Training	- Limited ability of PE teachers to implement a HR programme effectively and influence students' behaviours.	▪ Provide any training needed to underpin the intervention. Training is important to ensure that delivery is of a high standard and that those involved are appropriately qualified.	o Organize a training programme taking into consideration the teachers' needs and the objectives and contents of the intervention. o Provide continuous support and information o Develop the necessary resources

6. Priorities	- Deficient indoor and outdoor sport facilities - Scarce provision of changing and shower facilities - Poor equipped school play grounds	▪ Improve quality and quantity of indoor and outdoor facilities.	These factors are priority areas. However, intervention in those factors depend on: o The resources available (finance, time etc) o Circumstances on each particular school
7. Costs	- Need for personnel training - Need for creating resources	▪ Organize personnel training programme ▪ Produce HRE resources	o Training cost (teaching staff, materials etc). o Resourcing cost
8. Publicity	*Effective publicity is crucial to the success of initiatives aimed promoting PA to youth.* However, found ..... - Deficient school ethos related to health and sport.	▪ Develop policy and school ethos relevant to PA, sport and health.	o Organization of promotional events (activity days, tester sessions, games and sport competitions, health days) in order to increase awareness of students, parents and community. o Creation of leaflets, posters and booklets in order to raise awareness, provide information and reinforce messages. o Broadcasting at local level using TV, radio and local newspapers. Such promotions could be targeted either at the young people themselves or at parents/guardians, who have an important role to play in encouraging and supporting their children to become more active.
9. Performance Indicators	- As a part of the implementation plan it is important to identify specific indicators that can be used to measure the effectiveness and the appropriateness of the intervention programme. - These performance indicators will help in monitoring and reviewing the intervention programme.	*Indicators must be related to the aims and objectives of the initiative:* ▪ *Students:* Changes in Students' behavioural variables ▪ *Teachers:* Changes in their ability to be involved in HR initiatives ▪ *Schools:* Changes in the number and quality of PA opportunities, school ethos. ▪ Quality of the *programme*. ▪ *Site effects:* Impact of the intervention in other areas of the school's life and the community	o PA level, psychological measures, physiological measures, knowledge etc. o Knowledge, self-efficacy, attitudes o Extra curricular activities o Number of young people taking part in the new PA opportunities. o Number of parents taking part in sport and health events in school. o Number of events o Feasible – attractive – innovative – enjoyable etc o Other staff o Curriculum time and events o Health policy and ethos

Finally, a detailed research proposal and a budgetary analysis of the estimated cost were composed; this document was submitted for approval and funding in the Greek National Ministry of Education (see Appendix 4: Cd_1-1). After a few modifications of the initial planning the programme was approved and funded.

In the following section of this thesis the philosophy, the structure, the application and the evaluation of a school based intervention programme entitled "Sports education

and Health" is described. This programme was organised based in the findings and considerations presented above and it was applied in a number of schools in Thessaloniki.

Abstract of Project 3

The 3rd project examined the effectiveness and applicability of a school-based intervention programme to promote PA and sport. The specific objectives of this project were to describe the methods and materials of the "Sports Education and Health" intervention programme and to present baseline data and key-outcomes of the programme on students, teachers, and schools' ethos.

The "Sports Education and Health" was designed to: a) promote students' participation in physical activity and sport and to enhance their knowledge on health related (HR) issues, b) increase teachers' knowledge and effectiveness on teaching HR exercise. The *decisions* about the intervention contents and priorities were based on the findings of the *need analysis* taking into consideration the cost and the resources. A multi-component intervention was applied including HRPE curriculum, classroom lessons, extracurricular activity, links with community sport clubs, re-construction of the school playgrounds, school policy, HR materials, resources, special teachers' training and support. Emphasis was given to girls and most inactive students. A multi-dimensional evaluation involved students, teachers and materials used. Process measures were obtained throughout the study and outcomes were assessed at the end of the programme. An external evaluator oversighted the entire study on a monthly basis.

The *intervention strategy* and the *implementation process* focused on: a) teachers' training, b) creation and provision of necessary resources (PE curriculum, a handbook and a CD-Rom for the teachers and two books for the students), c) creation of a positive and enjoyable learning PE environment, and d) co-operation between school and out of school health and sport alliances. The *intervention programme* was applied in 9 elementary and 5 secondary schools for a period of six months and involved 15 PE teachers. A quasi-experimental design with a control group was applied (experimental group N_1=699 and control group N_2=213).

A number of different parameters were estimated at the beginning, during and at the end of the program. The intervention process was being *monitored* in a weekly basis by the author and the school teachers. The *effectiveness* of the intervention was evaluated in terms of: a) students' behaviour, fitness, self-efficacy, intrinsic motivation, intentions, and attitudes related to PA, b) teachers' knowledge, attitudes and self-efficacy on teaching HR issues, and c) the broader impact of the programme on school ethos.

The findings support that overall, the intervention was appropriately designed and implemented while both boys and girls seemed to enjoy, put effort and feel competent equally well during the programme. In addition, the training programme proved effective while the PE teachers improved their knowledge and skills towards teaching HRE; finally, all experimental schools expressed a real disposal to promote health and PA while they created the necessary predispositions and ethos to promote healthy behaviours and an active lifestyle among students. Furthermore the report provided by the external evaluator highlighted some important points concerning the applicability of the intervention and the generalizability of the findings.

4.1.0 Introduction

4.1.1 Background – Statement of the problem

In recent years, a number of interventions and initiatives aiming to promote a healthy and active lifestyle have been applied worldwide in the school environment (Gortmaker *et al.*, 1999; Mannios, Moschandreas, Hatzis and Kafatos, 1999; Mann, Peterson, Marek and Kealy, 2000; Allott, Paxton and Leonard, 1999) following the prompts of health professionals (Bar-Or and Malina, 1995) and health organizations (NASPE, 1998; HEA, 1997; Centers for Disease Control and Prevention, 1997). Recent reviews on the effectiveness of these efforts revealed important issues in designing more effective interventions (Baranowski, Anderson and Carmack, 1998; Stone, McKenzie, Welk and Booth, 1998; Hosman, 2000). The new *Guidelines for School and Community Programmes to Promote Lifelong Physical Activity Among Young People* (1997) list ten recommendations for school and community programmes to promote PA. These include policy, environment, PE classes, health education curricula, extracurricular activities, parental involvement, and community programmes as well as other areas. Under extracurricular activities there is a recommendation to link schools and students to community PA programmes and to develop effective systems for referring youth from schools to community agencies. Physical education classes can teach behavioural skills and foster participation in community-based programmes and sports.

The previous two projects identified when and where young people's PA occurs and provided to some extent an understanding of the conditions that facilitate or hinder it. Numerous psychological, biological, environmental and social factors were identified to be associated with children's PA and the findings justified the need for intervention. The key-considerations were also identified in organizing a PA promotion strategy (Table 3.4.4.a) indicating that the school is the most appropriate setting for this attempt; furthermore, a number of priority areas and preconditions for a justified intervention were highlighted. The findings supported the view that ecological models may be more appropriate for PA promotion while they pursue behavioural modification in personal, social, and physical environmental factors

(Aarnio, Winter, Kujala and Kaprio, 1997; McKenzie, 2001; Sallis, Bauman and Pratt, 1998).

The 'Sport Education and Health' was a school based intervention programme which was designed to contribute to the upgrading of the school and PE's roles as vehicles of health by reinforcing students' interest towards an active lifestyle. Furthermore it introduced the idea of lifetime participation in PA and sports as part of a healthy lifestyle. The 'Sport Education and Health' programme was developed based on the principles of the 'Active School' (McGeorge, 1997), the international experience from other successful initiatives (McKenzie, et al. 1996; Sallis et al. 1997), the recommendations of health professionals (Baranowski, Andrerson and Carmack, 1998; Stone, McKenzie, Welk and Booth, 1998), the recent *Guidelines for School and Community Programmes to Promote Lifelong Physical Activity Among Young People* (1997), the needs of Greek students, and the features of the Greek school. The programme's philosophy adopts the *whole school approach* to promote PA, which is based on having as key-components, the PE curriculum, personnel training, the creation of the necessary resources for students and PE teachers, the modification of the school environment, parental involvement, and the link with community programmes.

4.1.2 Research aims of the project 3 - Research questions

The overall aim of this project is to examine the effectiveness and the applicability of a school-based intervention programme to promote PA and sport. The specific objectives of this project are:

1. To describe the methods (philosophy - design – development – contents - implementation – evaluation) and the materials of the "Sports Education and Health" intervention programme.
2. To present baseline data and key-outcomes of the programme on students, teachers, and schools' ethos.

Throughout this project the following research questions were examined:

Research questions

1. How effective the 'Sports Education and Health' was in terms of: a) students, b) teachers, and c) the broader impact of the programme on the school ethos?

2. What are the main issues for the applicability of an intervention programme in promoting PA activity and sport in the Greek school environment?

4.1.3 The importance of the project 3

Taking into consideration:

- The emerging need for intervention programmes to promote an active and healthy lifestyle among Greek youths (Hassapidou and Fotiadou, 2001; Krassas, Tzotzas, Tsametis and Konstantinidis, 2001; Lionis, Kafatos, Vlachonikolis, Vakaki, Tzortzi and Petraki, 1991; Manios, Kafatos and Mamalakis, 1998; Manios, Moschandreas, Hatzis and Kafatos, 1999).
- The absence of a national health policy for the introduction of health education in schools as a means of combating the rising rates of morbidity resulting from chronic diseases.
- The minimal experience from health-related initiatives in young people in Greece.
- The recommendations regarding the need for studies on the effectiveness of environmental and policy changes to increase PA in schools (Baranowski, Anderson and Carmack, 1998; Epstein, 1998; Hosman, 2000; Stone, McKenzie, Welk and Booth, 1998).

The "Sport Education and Health" intervention programme is important for the following reasons:

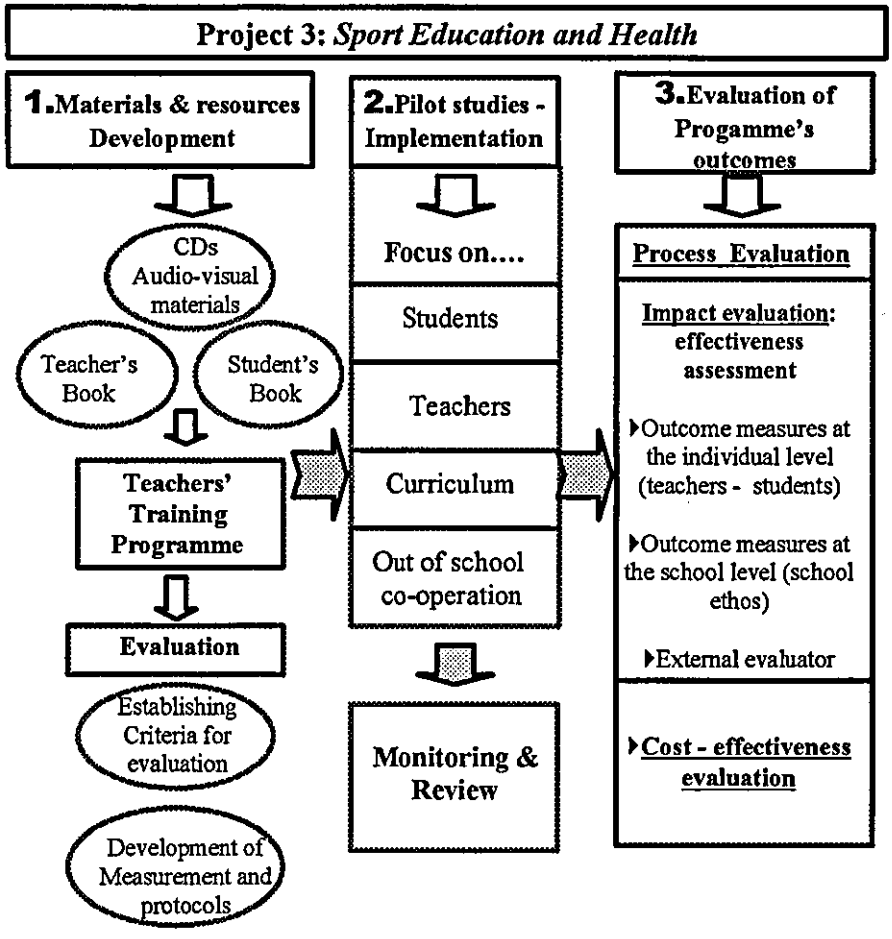
- It represents the first attempt in Greece to explore the applicability and the effectiveness of a PA activity and health initiative in Greek schools which was designed based on the specific characteristics and needs of Greek young people and was evaluated following a vigorous procedure of enquiry.
- It provides information on the extent to which Greek young people's PA behaviour can be influenced by intervening in specific modifiable determinants. At national level this baseline information is valuable to ensure that future interventions effectively address the specific needs of young people and also to justify the funding of larger initiatives.
- The 'Sport Education and Health' programme is an attempt to upgrade a) the schools' role on health matters, and b) the PE curriculum contents and context in order to make the PE lesson a positive learning experience for all pupils.

- Finally, throughout this intervention programme a number of useful educational and research material has been developed that can be further used in the future:
  - HRE resource package (a Student's Books and a Teacher's Book).
  - Lesson plans, instructional manual of the programme implementation, and supportive teaching materials (photos, CDs).
  - Recourses for teachers' training (analytical teachers' training programme, one CD-Rom on HR issues, training materials).
  - Validated research instruments (questionnaires and protocols of measurements).
  - A detailed budgetary analysis of the cost of each particular component of the programme.

4.1.4 Overall methodology – Justification of the methodology

The 'Sport Education and Health' programme was created following three main phases of development (see Figure 3.1.4).

Figure 3.1.4.a: The outline of the 3rd project.



The preparatory phase aimed to meet all the necessary preconditions for the implementation of the intervention programme. The second phase dealt with application of the programme in the schools, while the third phase dealt with the evaluation of the findings and the critical examination of the main problems derived during the implementation period. This process was followed in order to ensure:

- The necessary preconditions before the intervention implementation (establishing regular contact with schools and out of school health and sport bodies, development of materials and resources, provision of sport facilities where necessary, satisfaction of teachers' training needs, development of instruments for monitoring and evaluating the intervention programme).
- A feasible timetable for the implementation.
- A realistic and justified set of measurable objectives.
- An efficient monitoring and review process.

The information gained from this process was useful to indicate both the strong and the weak elements of the programme and it also revealed a number of shortcomings which should be considered more carefully in the future.

4.1.5 Structure of the 3rd project

The literature review deals briefly with the interventions to promote PA in schools and discusses the role of the PE curriculum in exercise promotion and also examines the key-characteristics of specific school based interventions to promote PA levels. The following three sections deal with the development, implementation and evaluation of the 'Sport Education and Health' programme. The final section presents a summary of the main findings and considerations of the effectiveness and applicability of the programme, and recommendations for future research.

4.2.0 Literature Review

The focus of this section is to examine briefly a number of international projects to promote PA in schools, to discuss the role of the PE curriculum in exercise promotion and to examine the key-issues of school based interventions to promote PA. This review attempts to frame critical questions about the outcomes and the effectiveness of these programmes to generate further participation in purposeful PA.

4.2.1 International projects to promote PA in schools

Studies from 1985 to 1999 were identified using a search in electronic data bases, bibliographies from prior reviews (Almond and Harris, 1998; Baranowski, Anderson and Carmack, 1998; Sleap, 1997; Stone, McKenzie, Welk and Booth, 1998), and published studies in referred journals. In this review the studies which satisfied the following criteria were included: a) the sample was school age, b) use of a quantitative assessment of PA, c) use of a control group, d) intervention in a school setting, and e) published in the English language. In addition to the studies that meet the inclusion criteria, several pilots or small studies with PA outcomes were identified. These studies were finally excluded from this review because they provided limited information about the methodology used (design, evaluation criteria, and outcome measures). The studies reporting HRPE programmes that have been implemented and evaluated in the school environment and meet these criteria are presented in chronological order in Table 4.2.1.a.

Table 4.2.1.a: School-based PA interventions

Study	Design	Intervention	Objectives	Dependent variable (s)	Outcomes
A total concept of physical education (Pollatschek, Renfrew and Queen, 1986).	- Elementary school - U. K. - 399 students - 9-11 yrs old - 1 year intervention - Quasi experimental	- Special PE programme including a section of 'active health' - PE specialists with PE school teachers	- Increase motor fitness - Improve body measures - Improve attitude to school	- Fitness - Attitude	- Increase fitness components - Non significant more positive attitude to school
Know Your Body Program (Markus, Wheeler, Cullen and Crane (1987).	- Elementary school - U.S.A. - 1400 students in 18 schools - Grades 4, 5. - Quasi	- Social influences – Social Cognitive Theory - 2/45min sessions/week	- Increase knowledge and beliefs about health. - Increase PA behaviour	Self reported knowledge, beliefs and PA	Increased knowledge and PA

	experimental				
Olso Youth Study (Tell and Vellar, 1987)	- Elementary school - Norway - 562 students in 6 schools - Grades 5, 6, 7 - Quasi experimental	- Social influences - Curriculum for diet, smoking, and PA. - 2 yrs intervention - Follow-up assessment	- Increase knowledge and attitudes for PA - Increase PA - Increase VO_2	- Self reported knowledge, attitudes and PA - V O_2 max	- Increased knowledge - Increased PA (boys) - Increased fitness (boys)
Slice of Life (Perry, Klepp and Halper, 1987)	- High school - U.S.A. - 270 students in 1 school - Grade 9 - Experimental	- Social Learning Theory - Curriculum led by experts and peers - Policy changes - 10 sessions in 1 semester period.	- Increase PA levels - Increase knowledge and attitudes for PA	- Self-report for PA - Knowledge and attitude tests for PA	- No effect on intervention group on PA - Increased knowledge and attitude towards PA (girls)
Stanford Adolescent Heart Study (Killen, Telch, Robinson, Maccoby, Taylor, and Farquhar, 1988)	- High school - U.S.A. - 1447 students in 4 school - Grade 10 - Experimental	- Social Cognitive Theory - Curriculum for PE - 3 sessions/week – intervention time 7 weeks - Follow-up assessment	- Reduce risk of cardiovascular disease - Increase levels of aerobic PA - Increase knowledge on heart risks	- PA checklist - Knowledge test relevant to a) heart risks and b) PA	- Increased aerobic levels of PA - Increased knowledge on heart risks and PA
Go for Health (Parcel, Simons-Morton, O' Hara, Baranowski and Wilson, 1989)	- Elementary school - U.S.A. - 409 students in 4 schools - Grades 3, 4 - Quasi experimental – No random assignment	- Social Learning Theory - Curriculum changes in PE and school lunch - 2 yrs intervention	Increase knowledge, attitudes and self-efficacy for PA - Increase MVPA during PE lesson	- Self report knowledge, attitudes, self-efficacy, and PA - Observation in PA during PE lesson	- Increased knowledge, attitudes and self-efficacy - Increased MVPA in PE
Nebraska School Study (Donelly, Jacobsen, Whately *et al.* 1996)	- Elementary school - U.S.A. - 200 students in 2 schools - Grades 3, 4, 5 - Quasi experimental	- Social Cognitive Theory - Curriculum changes in PE, school lunch and policy -2 yrs intervention	- Reduce obesity and improve fitness by promoting PA. - Improve PE	- PE (observation) - PA checklist - Fitness tests	- More PA during PE - No fitness changes
Cardiovascular Health in Children (CHIC) (Harrell, Murray, Bangdiwala, Frauman, Ganksy and Bradley, 1996)	- Elementary school - U.S.A. - 1274 students in 12 schools - Grades 3, 4 - Experimental	- Social Cognitive Theory - American Health Association curriculum and specially designed PE -2 yrs (2 week/yr for curriculum) intervention	- Reduce cardiovascular risk factors in children throughout PA and healthy lifestyle	- PA checklist - Test of knowledge - VO_2 fitness - Body composition (% body fat)	- Increased PA and knowledge - No fitness changes
Child and Adolescent Trial for Cardiovascular Health (CATCH) (McKenzie, Nader, Strikmiller, *et al.* 1996)	- Elementary school - U.S.A. - 5106 students in 96 schools - Grades 3, 4,5 - Experimental	- Social Cognitive Theory - Curriculum, lunch, PE, family, policy - 2.5 yrs food service and PE intervention - Follow-up assessment	- Increase MVPA in PE - Increase out-of-school PA - Improve cardiovascular fitness.	- PA in PE (observation) - Self-report PA - Fitness test	- Increased MVPA in PE - Increased out-of-school vigorous PA - No fitness change
Daily Physical Education (Pieron, Cloes, Delfosse and Ledent, 1996).	- Elementary school - Belgium - 3500 students in 14 schools - 5-11 yrs old - Quasi experimental	- Daily PE lesson - PE school teachers and PE specialists - Development of curriculum materials - 3 yrs intervention	- Increase fitness - Increase motor performance - Improve perceptions for PE lessons and attitudes towards sports	Students: - Motor performance - Skill tests - Attitude for school & PE lesson - Co-operative behaviour Teachers: Perceptions towards their profession and the programme's materials	Students: - Positive difference in motor domain, in attitudes and behaviours Teachers: They had more positive perceptions of PE
Sports, Play and	- Elementary	- Social Cognitive Theory	- Increase PA in	- PA in PE	- Increased

Active Recreation for Kids (SPARK) (McKenzie, Sallis, Koloby and Faucett, 1997)	school - U.S.A. - 955 students in 7 schools - Grades 3, 4,5 - Quasi experimental	- PE specialist & trained teachers led PE curriculum - Self-management curriculum - 2. yrs intervention for PE - Follow-up assessment	PE lesson - Increase out-of-school MVPA - Improve fitness.	(observation) - Caltrac, self-report PA - Fitnessgram tests	MVPA in PE both for PE specialist and trained PE teachers - No change in out of school PA
Project Active Teens (Dale, Corbin and Cuddihy, 1998)	- Elementary school - U.S.A. - 599 students - Grades 9 - Quasi experimental	- Social Cognitive Theory and cognitive evaluation theory - Conceptual PE, PA labs, classroom curriculum - 2 semesters intervention	- Increase PA - Change PE - Reduce inactivity	- Inactivity - Youth Risk Behavior Survey	- Reduced inactivity - Increased moderate PA - Increased weight training activity
Pathways (Caballero, Davis, *et al.* 1998)	- Elementary school - U.S.A. - 2000 American-Indian students in 40 schools - Grades 3 - Quasi experimental	- Classroom and PE curriculum - School food service - Family involvement - 3 yrs intervention - Quasi experimental	- Increase PA - Reduce fat intake	- Body composition (BMI) - PA (self-report & Tritrac accelerometer) - Self-reported dietary assessment - Knowledge, attitudes, and behaviour	- No reported
Health & Nutrition Programme of Crete Island (Manios, Moschandreas, Hatzis, Kafatos, 1999)	- Elementary school - Greece - 6 yrs program - 5716 students in 40 schools - 6-12 yrs old - Quasi experimental	- Social Learning Theory - Development of HRE recourses - PE curriculum specially designed. - Teachers' delivered programme with special training and assistance - Involvement of parents -2 hours/week (60 sessions per yr for 3 yrs intervention	- Increase PA - Increase MVPA - Improve fitness - Improve anthropometric measures - Improve biochemical measures	- Self-report for PA - EUROFIT fitness battery. - Knowledge for health and PA	- Improved PA level - Increased MVPA - Favourable BMI - Increased knowledge - Positive biochemical measures (serum lipid level)

In this review 13 completed studies were included. The majority of these studies were conducted in the United States while only four were conducted in European countries.

Main characteristics of the studies reviewed

Designs

The majority of the studies reviewed used quasi-experimental rather than random assignment designs. CHTCH was the only randomized trial while most studies randomized or assigned schools rather than students to intervention conditions. The studies in the review used classroom students both in control and experimental (s) group (s) and they involved qualitative measures in pre- middle- and post- measures. Importantly, follow-up measures were included in a few studies. Consequently, for the most studies there is not substantial evidence about their impact on the dependent variables examined in the follow-up period. The number of schools involved varied with one school in *Slice of Life* (Perry, Klepp and Halper, 1987) to 96 schools in the CATCH study. Accordingly, the number of students ranged from over 5000 in the CATCH study to 200 students in the *Nebraska School Study* (Donelly, Jacobsen,

Whately *et al.*, 1996). All of the studies included both genders and some of them were designed particularly for a minority population such as *Pathways* (Caballero, Davis, *et al.*, 1998).

Intervention Components

The *social cognitive theory* and *social learning theory* were the dominant theoretical approaches in the studies reviewed. However, considering the outcome measures it is apparent that a number of studies used multiple theoretical constructs. A major characteristic of these projects was the use of multi-component interventions targeting several aspects of a healthy lifestyle (e.g. healthy diet or smoking prevention). Some of the components included were related to classroom HR curricula, augmented or re-designed PE programmes, resources and materials developed especially for the programme objectives as well as out-of school PA. Some interventions were implemented by school PE staff whereas in some others, PE specialists delivered all or part of the intervention programme. In only a few studies was parental involvement or policy components included (Manios *et al.*, 1999).

However, it is important to note the difficulty faced in the evaluation of the intervention components related to ascertain the exact nature of interventions, particularly in regard to the time spent in the lessons or an overall programme. The most obvious distinction that can be made, is between 'daily' PE programmes (for example *Daily Physical Education* by Pieron *et al.*, 1996) and 'standard' programmes (which usually comprise between one and three lessons per week), often with extra time allocation (for example *Health & Nutrition Programme of Crete* by Manios *et al.*, 1999). In addition to time devoted to PE, studies and programmes have a wide diversity of characteristics. PE programmes may be supplemented with after-school activities and some programmes have a classroom component to promote PA outside of school. This point is particularly important in terms of the evaluation of the relative effectiveness of each intervention context. Effective interventions applied throughout 'standard' PE programmes are of particular interest as they present a more feasible option than 'special interventions' which involve specialists, extra time, expensive facilities or ideal situations. This diversity and the relatively small number of interventions make a fair comparison across studies difficult.

Objectives and dependent variables

In studies reviewed a variety of objectives were pursued relevant to: a) the PA promotion in and out of school, b) increase MVPA in the PE lesson, c) increase fitness, b) decrease inactivity and cardiovascular risk factors, e) enhance knowledge on HE issues, improve self-esteem and attitude towards PE, f) improve biochemical health profile and anthropometric measures. Consequently, the respective dependent variables were assessed using a number of:

⇒ Objective measures (e.g. Tri-trac, Caltrac, observation systems, fitness batteries) to assess *behavioural outcomes* (physical activity) and *physiological outcomes* (e.g. aerobic capacity, muscular strength and endurance, flexibility).

⇒ Self-report measures to assess *behavioural outcomes* (dietary habits, activity levels), *cognitive outcomes* (knowledge and understanding) and *affective outcomes* (attitudes towards school, PE lesson or PA, self-esteem).

⇒ Clinical measures to assess *anthropometric outcomes* (body composition, BMI) and *biochemical outcomes* (blood pressure, blood lipids).

The variability on the dependent variables and the measures involved is one other factor that makes comparisons among interventions which pursue similar objectives difficult.

Outcomes

Health related PE programmes in primary and secondary schools can affect positively a number of important health-related variables and other outcomes. Positive changes have been found in either physiological and clinical outcomes, in PA levels during PE lessons, favourable results in dietary modification, positive cognitive changes (HR knowledge) and more positive attitude towards PE and PA. Daily programmes have been found more effective in terms of PA level, fitness, and attitudes enhancement (Pieron *et al.*, 1996). Furthermore more positive results have been obtained from PE specialists than from school PE teachers. Specifically, SPARK and CATCH studies found that PA in lessons was greater for children taught by PE specialists compared to those taught by trained classroom teachers and those in control classes.

One of the main objectives of the interventions reviewed was to physically activate the participants; therefore, a fundamental question that emerge is how 'significant' is the statistical significant difference in PA involvement which was observed in post-measures. In resent reviews authors' conclusion is that a substantial number of interventions had little or no important impact on PA behaviour (Baranowski *et al.* 1998; Stone *et al.*, 1998). The correspondence between targets and outcomes in Table 4.2.1.a shows that almost all programmes 'achieved' the objectives pursued; in other words, if the intervention programme were appropriately changed at school towards a specific direction, more positive outcomes were obtained in this direction. This is particular interesting concerning the PE programme; when the PE programme offered more PA opportunities or pursued more MVPA at school, more PA was obtained and more MVPA was performed.

Taking into consideration that participation in PE lesson is obligatory for students, increasing the programme time (hours per week, the lesson length or introducing more extracurricular activities) or focusing on more intense contents, an increase in PA (in total or in MVPA) should be expected. Furthermore, very little is known about the programme's impact on children's voluntary involvement in PA and sport after the implementation of the intervention while only a few studies had follow-up measures. It is reasonable therefore to hypothesize that a 'statistical significant change' in PA level may be not a robust indication of the programmes' effectiveness when this change is expected, at least in the end of programme. Furthermore, the absences of extensive data from follow-up measures, especially on behavioural, cognitive and affective measures, enhance the confusion about the programmes' quality to inspire long-term participation in PA. Therefore, if the programmes objective is to promote lifetime PA than simply activate students for a specific time frame, then mediating variables that predict future participation in PA should be more appropriate indicators. This view is in line with Baranowski *et al.* (1998) who suggested priority for more effective interventions should be placed on research that enhances our understanding of the impact of interventions on these mediating variables. However, this issue needs further research taking into consideration that some studies that measured out-of-school PA found no difference (e.g. Go for Health, SPARK, and Slice of Life) or a decrease (*Nebraska School Study* and Pieron's *et al.* study (1996) for the intervention group.

Furthermore, from the studies reviewed it is not clear what component (s) of each programme produced the observed changes and how each particular programme influenced specific groups as the most inactive and the less or unmotivated participants. Thus, it is not clear which components should be valued and how to help children increase PA outside of school. Also, there has been little attention devoted to the role of PE in stimulating further participation within and beyond the school. Finally, the reviewed intervention programmes offered limited information about the type and the components of in-service training for teachers to enhance the quality of their teaching in HRPE.

Intervention programmes with particular interest

There are a number of studies that need to be presented in greater detail. The first study comes from Belgium and this is followed by two other studies conducted in United States. Finally the main characteristics of the 'Active School' (McGeorge, 1997) are analyzed because the development of the 'Sport Education and Health' intervention programme is based in this initiative.

- ***Daily Physical Education*** (Pieron *et al.*, 1996).

In 1991 a pilot programme was launched in Belgium in order to increase the time allocated to PE in kindergarten and primary schools. This project was important because it was a multi-component initiative and representative of augmented PE curricula, applied for a long period in a large number of schools, involved school staff and parents, and it used a multi-dimensional evaluation procedure involving the students, the teachers and the curriculum materials. The main objective of this study was to assess the effects of daily PE on children (see also Table 4.2.1.a). The basic principles of this project were: a) at the elementary school level every child should engage in PA for at least one daily session, b) motor development should be embedded in a process of total education, c) teaching tasks should be set by a team involving a qualified PE teacher who would work in close collaboration with the classroom teacher, and d) information should be provided to parents as well as other members of the education community. The research approach used in this study

resulted in a number of positive outcomes and revealed a number of important practical considerations.

Students in experimental groups: a) achieved better performance in most fitness tests than controls, with their superiority more evident in motor skills than physical fitness, b) showed significantly more favourable attitudes towards school, PE and homework, c) appeared to be in better mood to complete their tasks, d) developed co-operative behaviour, and e) indicated less pronounced negative attitudes as they grow older than those in control groups. This initiative seemed friendly to girls who were found to be particularly receptive to the programme and this is a very important finding taking into consideration that females worldwide are a target group in PA interventions (Stone *et al.*, 1998). In addition, a positive influence on teachers' perceptions of their work was also observed. From this study two other interesting findings emerged: firstly, the effect of the daily PE programme became evident only after some delay of implementation. Secondly, children in experimental group felt a lower need for participation in out of school sport with more children from control schools involved in sports clubs. However, some negative aspects were identified, including more problems in the pilot schools in terms of practical organisation of the programme.

- *CATCH* (McKenzie, Nader, Strikmiller, *et al.* 1996).

The *Child and Adolescent Trial for Cardiovascular Health* study reserves particular attention because it was one of the few programmes which utilized an extensive evaluation model based on social scientific principles; furthermore, it was the only multi-center randomized trial having four field centers, a co-coordinating center, and a leading team for study administration. The emphasis was upon giving 8-11-year-old children skills training to encourage healthy eating, increase PA and avoid initiation of smoking. The intervention was multi-factorial and, in addition to PE interventions, included interventions to tobacco, food, classroom learning on cardiovascular health, school policy and a home/family component. The PE intervention included curriculum content and materials, teacher training and on-site consultation to teachers. A notable feature of the CATCH trial is the extensive evaluation model. Three categories of evaluation have been selected:

1) Process evaluation

Process evaluation documents program feasibility; it assesses structure and process components to be delivered as part of the programme and how well the programme delivered fits the original design and study goals (Windsor, Baranowski, Clark and Cutter, 1994). Health intervention programmes in the past have often only considered the outcomes of intervention and little attention has been paid to the implementation process. This kind of evaluation is important because implementation can be affected by a numerous factors and these can have substantial effects on the results. The CATCH study was investigating the following intervention components: School staff characteristics, training and support of school staff, implementation process, pupil participation, and pupils' characteristics.

2) Impact evaluation

A number of psychological and behavioural measures have been adopted to evaluate the impact on children of the intervention procedures including PA, diet assessment and smoking behaviour.

3) Outcome evaluation

Physiological measures collected for each participant at baseline and after completion on intervention including anthropometric measures, biochemical measures and fitness tests.

- ***SPARK*** (McKenzie, Sallis, Koloby and Faucett, 1997)

The *Sports, Play and Active Recreation for Kids* programme was designed to promote and teach high levels of PA and movement skills that are enjoyable in elementary school pupils. In this programme three groups of lessons were created. Some children were taught the SPARK intervention only by PE specialists and others by classroom teachers who did not specialize in PE. In addition, there was a control condition in which typical PE was continued. The SPARK has highlighted the advantage of employing specialists to deliver PE in elementary schools and the need for extensive professional development for classroom teachers involved in the delivery of PE. When assessing the effects of a health related PE programme on quantity and quality of lessons, specialists were found to have the best outcomes followed by trained classroom teachers both of whom were better than non-trained colleagues. This suggests that the type of teacher is important in promoting health-related activity in PE lessons.

- ***The Active school***

A number of health-related initiatives have been developed over the past ten years focusing on the increase of understanding of health benefits and on helping more young people to become more active. The 'Active School' is an example of an effective school-based health-related initiative. Children's low activity levels and a decline in PE time have meant that PE has shifted towards more emphasis on stimulation of further participation in PA beyond PE lesson times (Harris, 1997). The Active School is a national promotion programme to encourage schools to formulate and implement an action plan for increasing the participation of students in PA both within and outside of school (Almond and McGeorge, 1995). Related objectives include forming action plans to increase enjoyable and quality PA amongst pupils, staff and parents, and the initiation of healthy and sport bodies that facilitate the promotion of HRE in young people. There are a number of features that are considered important in an Active School philosophy and that are relevant to the intervention in the following five key-areas:

1. *Policy:* Development of a comprehensive school PA policy (in terms of PE lesson, school ethos, sport and health events, regular involvement of staff and parents).
2. *Curriculum*: Effective fulfilment of the National Curriculum requirements – Opportunities for all pupils to experience a range of activities – Utilization of appropriate resource packs to enhance activity opportunities – Pathways from the curriculum into extracurricular and community PA/sports.
3. *Extracurricular*: Development of an extracurricular programme that is a natural progression of the curriculum (individual activities, team games, and competitive opportunities) – Encouraging as many pupils as possible to take advantage of extracurricular opportunities – Providing extracurricular PA opportunities that cater for the needs and abilities of all pupils.
4. *Links with community and other schools*: Involvement of activity leaders from the community – Establishment of links between extracurricular clubs and local sport clubs – Information of activity opportunities in the community readily available to pupils – Organizing meetings between local schools.
5. *Training and resources*: Provision of regular opportunities for all PE staff to take part in relevant in-service training – Provision of adequate resources for all pupils to be actively involved in lessons and clubs.

Issues arising

One of the issues arising from this review is the concern for increasing the amount of time devoted to school PE, hence daily or augmented PE has been focus of most of the research. Nevertheless, it is quite clear that worldwide insufficient time is being provided for PE in the curriculum (Armstrong and McManus, 1994). A number of studies showed that time allocation for PE have been continually decreasing (Hardman, 1998; Simons-Morton, Eitel and Small, 1999). One to three hours PE lesson per week is unlikely to bring about health benefits, improve fitness, and help students to accomplish PA recommendations for health or to reach other affective or cognitive aims. Despite the fact that daily PE would be the ideal situation in order to promote health and lifelong aspirations for a healthy lifestyle, the realistic view at present time is to look for more feasible solutions to promote PA either in school and out-of-school settings. The following suggestions represent starting points to this direction:

- Increase the number of PE lessons each week from two to three.
- Introduce PE contents that activate students for more time in MVPA during the lesson.
- Introduce attractive extracurricular activity.
- Offer more opportunities for active play during school breaks.
- Re-design school playground environment to make PA safe and accessible.
- Develop school policy and establish reward structures that stimulate more participation outside school.
- Develop links with community programmes to stimulate more participation in outdoor recreational pursuits during the weekends, especially for the more inactive and adolescent girls.

Obviously, many of these suggestions included in the Active School framework of PA policy.

A second issue related to the mediating variables that support long-term participation in PA. One objective for school PE programmes is nearly always the development of 'healthy' habits for adulthood. Although the assumption that behaviours learned in childhood and adolescence will transfer into adulthood seems reasonable, evidence to substantiate it is mixed (Biddle and Mutrie, 2001). However, a longer lasting

commitment to being active in the studies reviewed is not explored. In addition, it is difficult to ascertain what kind of influence in school can be associated with specific changes in the domains of behaviour, affective and cognition which are fundamental for a long last commitment for active living.

A third issue refers to the minimum use of qualitative analyses in the evaluation process of these studies. Consequently, few studies provide any detail about the type of experience that pupils encounter in the programme, or the effectiveness of different components or learning approaches in the promotion of purposeful PA in specific target groups or diverse school environments. This is an important weakness of the studies reviewed because qualitative research within an interpretivist perspective may provide access to important insights.

A fourth issue refers to the school staff training; in few intervention programs (e.g. CATCH, SPARK) the teachers' training represented an indicator of the program's success or it was associated to the programme's outcomes (Perry *et al.*, 1990; Nyadindi, Milen, Palin-Palokas and Robison, 1997; Rohrbach, Graham and Hansen, 1993). Therefore there is a need for more information about the types of in-service training and the support provided during the implementation period of the programme in order to enhance teachers' abilities in HR matters.

The final issue refers to the generelizability of the findings. Intervention studies performed in ideal environments or interventions that require unbearable cost may not be at present feasible in the mainstream school context. As almost all interventions reviewed proved effective in terms of the objectives pursued, a criterion of their applicability for wide implementation related to their cost and demands in curriculum time, environmental changes, and staff's support is required.

4.2.2 Suitability of Greek PE curriculum for promoting lifetime PA

Physical Education has an important part to play in physical development and promotion of the benefits of an active lifestyle. However, the relevance of current PE curricula for the development of active lifestyles in adulthood has been questioned. For example, Coakley and White (1992), in a qualitative study using semi-structured

interviews with British adolescents, found that participation in community programmes was experienced by past experiences in school PA classes. In particular, negative experiences centred on boredom and lack of choice, feeling of incompetent, and receiving negative evaluation of peers. Taking into consideration that exercise participation is associated with perceptions of competence, intrinsic motivation, enjoyment, achievement goal orientations and motivational climate, the findings presented in section 3.3.2 indicated that Greek PE lesson has limited possibility to inspire lifetime participation in PA. It is possible therefore, that an alternative PE curriculum that incorporates contents and teaching practices that promote high perceptions of autonomy and competence (Biddle and Chatzisarantis, 1999) may have much more possibility to inspire lifetime PA. Furthermore, the class climate may need reappraising so that all pupils are valued for their own efforts.

4.2.3 Implications for interventions

Taking into account the points emerged from this review and the recommendations by health professionals (Almond and Harris, 1998; Biddle and Mutrie, 2001; Baranowski *et al.* 1998; Stone *et al.* 1998) a number of key-characteristics should feature feasible approaches in order to improve existing intervention practices in the school environment.

- Design: Quasi-experimental or random assignment design including experimental and control groups.
- Intervention: Multi-component interventions including: HRPE curriculum, development of HR recourses, extracurricular activity, links with community, and school policy. Intervention should preferably take place within the 'standard' PE curriculum with extra time allocation when necessary.
- Staff: Well trained staff, preferably the school teachers and not PE specialists. Support and resources should be provided throughout the intervention process.
- Time: Enough time to realise the effects of the programme.
- Objectives and dependent variables: Measurable objectives that target changes in mediating variables associated consistently with a longer lasting commitment to being active.

- Evaluation: Use of extensive evaluation models that include process evaluation, impact evaluation and outcome evaluation with regard to students, teachers, and programme components; use both qualitative (objective measures and self-reports) and quantitative evaluation procedures to examine the impact of the programme in specific group of children and the side effects with regard to school ethos, parents' appreciation and community. In addition, follow-up measures should be inherent part of the programme.

The following section presents the development, implementation and evaluation of 'Sport Education and Health' programme. This intervention attempts to embody some of the positive elements and characteristics discussed in this section.

5.1.0 Overall discussion

This final chapter provides a summary of the research problems and an overview of the studies that have been conducted throughout the three projects of this thesis. In addition, the implications of the studies are considered and general recommendations are made for further study.

5.1.1 Summary of the main issues of the projects 1, 2, and 3

This thesis addressed two main research questions. The first question was related to the examination of lifestyle and PA activity patterns among Greek young people. The second was related to issues that need to be considered in order for school based intervention programme aiming at promoting PA activity and sport to be effective and applicable. For the valid examination of these research questions the *Physical Activity and Lifestyle Questionnaire* was developed.

The development of an alternative self-report measure of PA for Greek young people was the main concern of the first project in this thesis. The measure aimed at addressing as many of the problems associated with current self-report measures as possible in an attempt to provide a valid estimation of PA. The decision to design a new questionnaire of PA assessment stemmed from the need to create an instrument applicable to the cultural characteristics of Greek young people. The findings from the two validation studies were encouraging and indicated that the PALQ can be a valid assessment of PA for the population it was designed for.
Considering the validity and reliability correlation coefficients found in these studies, it seems that the PALQ was capable of attaining reliable and valid reports from children of 11+ years. Furthermore, the *physical activity profile*, which was an innovation of this self-report, appeared to be useful in providing additional information of the PA behaviour in children. Despite the encouraging evidence of the validity of the PALQ, the studies conducted in the first project revealed the limitations of developing an instrument that would overcome the problems commonly encountered in assessing PA with self-reports. These limitations are related mainly to the recalling process of the interviewees and the definition of the desired variables.

In the second project, a *need analysis* was carried out in order to establish whether there was a need to increase PA level of Greek young people, and to consider the conditions for the development of an intervention programme aiming to promote PA through the school setting. The findings showed that lifestyle characteristics of children change, as they grow older. Young students, and especially girls, reported a low interest for PA and sports. The regular involvement in sedentary leisure time pursuits, the accessibility to sport programmes and the improved sport infrastructure did not correlate with students' PA level. Furthermore, a significant positive relationship between PA level, perceived physical competence, goal orientation, and attitude towards PE lesson was found. These findings were more salient in girls. Health, enjoyment and social relationship emerged as the strongest motives for participation in PA and sport in both genders. The participation of older students in organized out of school sport activities was very low. This sedentary behaviour increases dramatically as children grow older probably because of the increased academic responsibilities both in and out of school. The high rate of inactivity indicated that this particular sample had limited possibility to obtain the short- and long-term benefits of an active lifestyle (Cavill, Biddle and Sallis, 2001) as well as limited chances to be active in adulthood life (Mallina, 1996). The findings indicated that schools in Greece constitute the most important environment in activating students of all ages.

In this project, the knowledge, attitudes and self-efficacy of school PE teachers toward teaching a HR programme was also investigated since their role is fundamental in promoting an active and healthy lifestyle. The findings showed that PE teachers in Greece might face a number of difficulties to effectively implement HRPE programmes. Therefore, their training and support is a necessary precondition before the establishment of any HR initiative at the school environment. Finally, the second project investigated the nature and extent of PA promotion in schools. Results showed that PA promotion within the Greek school environment was a very low priority issue while schools provided students with very limited PA and sport opportunities. The environment and policies in the majority of the schools were not conductive to PA participation and problems were evident with sport infrastructure, facilities, and links with community health and sport bodies.

The information collected in the second project was necessary in developing a strategy for PA promotion, which addresses the particular needs of the young population. The findings of the second project are in line with the general recommendations for increasing available sports programmes in schools and in community as well as the encouragement of more young people to participate in active pastimes. The complex nature of the factors affecting participation in PA support the implementation of ecological models of behaviour change (McKenzie, 2001), targeting specific personal, social and environmental variables. The unique cultural characteristics of Greek students stressed that interventions should be designed according to the specific characteristics and needs of the population.

In the third project of this thesis the methods and materials of the "Sports Education and Health" intervention programme were described, and the key-outcomes of the programme on students, teachers, and schools' ethos were presented. The 'Sport Education and Health' was a school based intervention programme, which was designed to contribute to the upgrading of the school and PE's roles as vehicles of health by reinforcing students' interest towards an active lifestyle. The programme's philosophy keeps up with the *whole school approach* to promote PA having as key-components PE curriculum, personnel training, creation of the necessary resources for students and PE teachers, modification of the school environment, parental involvement, and the link with community programmes. A multi-dimensional evaluation involving students, teachers and materials as well as an external evaluator was used. Process measures were obtained throughout the study and outcomes were assessed at the end of the programme implementation.

The findings support that overall the intervention was appropriately designed and implemented while both genders seemed to enjoy, put effort and feel competent equally well during the programme. The training programme proved effective while PE teachers improved their knowledge and skills towards teaching HRE. All experimental schools expressed a real disposal to promote health and PA while they created the necessary predispositions and ethos to promote healthy behaviours and an active lifestyle among students. The programme was also treated very positively by the parents and the authorities from which co-operation had been requested. They all

appraised the importance of the project for public health purposes and offered unlimited support. The encouraging findings of the intervention can be mainly attributed to the effectiveness of the intervention strategy. Furthermore, the adoption of the *Active School* principles to promote PA and the involvement of the school staff, the parents and the local community also played an important role. The evaluation of the results in post- measures and the evaluation provided by the external evaluator were very encouraging and indicated that the *Sport Education and Health Programme* may be a feasible approach to promote PA and sport in Greek school children.

5.1.2 What we know from this thesis

The studies presented in this thesis provided essential information that can be used to formulate a documented national health policy for PA promotion for young people in Greece. This thesis also provided information about the role of specific determinants on PA behaviour, and contributed to some extent to a better understanding of European youths' lifestyle and PA patterns. Furthermore, the implementation of the *Sport Education and Health* intervention programme revealed a number of issues that could assist the formulation of other multi-factorial initiatives in the school environment in the future. More specifically, from this thesis, we know that:

- The PALQ is a valid measure for assessing PA in children 11+ years old.
- Greek young people, apart from differences related to gender characteristics, have also demonstrated lifestyle differences in comparison with their counterparts from other European countries. Boys in all ages are more active than girls. Girls represent a high priority group for intervention, even from the primary school years.
- Physical activity decreases dramatically as children get older. Consequently, a large part of children's population does not meet the current PA recommendations for health. This decline is more remarkable in girls than boys, and is steeper in adolescence than in childhood.
- Schools in Greece are the most promising environment for the promotion of PA while a large part of young people's PA is accumulated during school hours. However, schools offer minimum opportunities for participation in supervised and organized PA and sport. Inclusion of extracurricular activity on the formal

school programme is an urgent need in order to effectively promote PA in schools.

- Young people participate in PA and sport for different reasons with regard to gender and age. Enjoyment, health and social interaction are particularly important motives and are consistently associated with participation in PA. However, lack of time is a key-barrier for regular involvement in PA.
- At present time, the PE teachers' training represents a fundamental condition for the successful implementation of any HR programme in the school environment.
- The *Sport Education and Health Programme* offers a feasible and effective approach to promote PA in the Greek school environment. However, prior the initiation of any HR intervention programme in schools, a number of conditions must be established relevant to financing, infrastructure, staff training, and support from external bodies.

5.1.3 Future research

Considering the results, conclusions and limitations of the studies presented in this thesis, there are several recommendations for further study. Firstly, the concurrent validity of the PALQ in assessing PA should be examined with other more advanced measures involving samples of different age groups, from urban and rural areas of the country. Secondly, more studies should be conducted on the PA level of Greek children based on larger and more representative samples from different ages, and more research is required on the longitudinal changes of PA level, and determinants of PA for Greek young people. This research should involve different methods and disciplines including quantitative, qualitative and multidisciplinary approaches in order to examine the role of specific determinants of PA that promote or inhibit active lifestyle and participation in organised sport activities, especially for girls. Finally, more research should be made in the future to examine the effects of different strategies for school-based PA promotion programmes in order to examine the effectiveness of different components in the promotion of purposeful PA in specific target groups or diverse school environments.

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Ridley, Dollman and Olds (2001)

APPENDIX 1a

Physical Activity and Lifestyle Questionnaire: Instructions' Manual

PHYSICAL ACTIVITY & LIFESTYLE QUESTIONNAIRE

(Avgerinos, 2000)

PROTOCOL AND INSTRUCTION MANUAL

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PHYSICAL ACTIVITY AND LIFESTYLE QUESTIONNAIRE

1. Why create a new Physical Activity questionnaire?

The "Physical Activity and Lifestyle Questionnaire" (PALQ) was created to offer to researchers and physical education teachers a comprehensive tool for the evaluation of the students' physical activity (PA), which correspond to the particular cultural characteristics of Greece. The need for its creation stems from the following facts: a) several of the most known questionnaires have been constructed for specific research purposes and they are functional in a cultural context different from the one in Greece, b) some of them are not established accurately regarding their validity and reliability and c) the development of reliable and valid measurement tools for the evaluation of PA still remains a research priority, since it would help the understanding of the relation of PA with health and also it would contribute to the creation of effective intervention programs (NIH,1996).

Although PA can be evaluated by many different methods (direct observation, use of sensory detectors and recording of the cardiac function, isotope doubly labeled water, measurement of the calorie consumption, reports given by people of the children's direct environment), the method of the questionnaire is the most common, because it can collect data from a large number of people fast, easily, and inexpensively.

2. Questionnaire description

The PALQ was designed for Greek students between the age of 11-18 years and includes three sections. Specifically:

In *part one* the interviewee gives demographic information regarding himself/herself and his/her family (questions 1-7).

In *part two* the participation in free time activities is evaluated. There the interviewee has to report the frequency of his/her participation in 25 (or 26 for first and second level high school with the addition of the choice "I spend my time with my boyfriend/girlfriend") different activities (question 8). The questions cover a wide range of activities in which children and teenagers are regularly involved in their free time, regarding the participation in cultural

activities, academic activities, physical activities and recreation activities. The list of activities has been organized based on the Pieron & Ledent questionnaire (1997) and adjusted to the characteristics/ features of our culture and education. The interviewees' answers can be used either separately or in groups with the use of Factor Analysis (Principal Components Analysis). The components analysis usually extracts seven (7) factors with eigen values higher than one. More information about this particular part of the questionnaire and the statistical analysis of the answers are presented in a published article (Avgerinos, Stathi, Almond,and Kioumourtzoglou, 2000).

In *part three* the interviewee's participation in sports and PA is evaluated. This evaluation includes:

- Ways of transport
- PA and sports in school
- Participation in recreation PA
- Participation in sports clubs/private gyms during free time after school
- Participation in PA and sports during weekends

This information refers to a) the evaluation of the time of participation in PA and sports, b) the intensity of the participation, c) the type of activity and d) the frequency of involvement on a weekly basis.

The questionnaire records information about a typical week and more specifically about the last 7 days. The questionnaire consists of a total of 30 questions. It is completed either individually or under the instruction of the class teacher in a period of 15-25 minutes depending on the age of the interviewee.

3. Validity and reliability of the questionnaire

The most important obstacle for the creation of valid tools for the evaluation of physical activity for children and teenagers is the lack of a valid criterion/ standard of comparison (Aaron, Kriska, Dearwater, Cauley, Metz & LaPorte, 1995; Montoye, Kemper, Saris & Washburn, 1996). Therefore, the examination of concurrent validity is used to establish the validity of the new measure for the assessment of physical activity. Concurrent validity is the degree of accordance with other widely used and acknowledged PA measures. Moderate to high correlations between different measures is a strong indication of the concurrent validity.

The process of evaluating the reliability of a measure usually takes two consequent measurements for the same sample within a week. For high school students the PALQ correlation, in two consecutive measurements within a week (test-retest reliability), was r=.77 (Avgerinos, Argiropoulou, Almond & Mihalopoylou, 2001). Its validity was evaluated on students of primary and secondary education in two different studies. In the first study, which involved a sample of 40 high school students (23 boys and 17 girls) aged 13.65 years old (±0.9), the PALQ was compared to "the Four by one-day Recall Physical Activity questionnaire"(Cale, 1994) and also to a measure of objective PA measurement, the CSA accelerometer (Computer Science and Applications Inc, 7164, shalimar, Florida), which is valid and reliable for children 10-15 years of age (Computer science and Applications, 1995). The correlation between the PALQ and the questionnaire was r=.79 (p<.001) and for the CSA it was r=.63 (p<.01).

In the second validity study where the sample was 51 elementary school students (24 boys and 27 girls) aged 11,5 years (±0.6) the PALQ was compared to the CSA accelerometer. Based on the subjects classification the correlation between the two tools was r=0.56 (p<.01). The results of these two studies present a satisfactory first indication of validity and reliability of the PALQ for the evaluation of the PA of elementary and secondary school students in Greece.

4.0 Advantages and innovations of the questionnaire

The new questionnaire has the specifications that should characterize the contemporary questionnaires for the evaluation of PA because:

1. Its' validity has been evaluated by other valid PA measurement tools.
2. It evaluates all the parameters of PA behavior (that is the frequency of the PA on a weekly basis, the intensity, the duration, the type, the aim and the setting of the PA).
3. It uses an objective system of evaluation of PA and classification of the participants
4. It divides the day into periods to facilitate recall of the information (PA before school, during school hours, after school).
5. It evaluates different aspects of everyday PA (transport, free time activities, participation in organized sports).
6. It is accompanied by specific instructions for the completion and the evaluation of the participant's performance.

7. It can be used to a broad range of age-groups
8. It comprises activity tables facilitating thus the participants' recall of PA events.
9. It is easily codified and statistically analyzed.

The novelty of this PA evaluation tool is based on the fact that it introduces the idea of portraying the PA profile of the subjects. The PA profile expresses in percentage (%) the ratio of all the forms of physical activity carried out by the subject in moderate and high intensity in relation to their score in these activities- (for the depiction of the PA profile the energy cost that derives from the subjects involvement in light intensity activities and sleep is not counted). Therefore along with the qualitative and quantitative data of activity important information regarding the kind of activities and the environment where they take place and also their contribution to the subject's total score is also presented. As a result, the priorities of the intervention programs are highlighted better, while the activities in which a child participates are evaluated not only according to their contribution to their total performance but also according to their possible contribution to the adoption of lifelong exercise (Vanreusel *et al*; 1997; Janz, Dawson & Mohoney, 1999).

5.0 Questionnaire Management for data collection

5.1 Questionnaire presentation to the interviewees

Before the beginning of the process of completing the questionnaire it is important that the interviewer should follow certain instructions:

1. Introduce himself / herself to the students stating his/her status and the organisation he/she represents or works for.
2. Explain to the students why it is important to complete accurately the questionnaire (stressing for instance the usefulness of the test to the research of the relation between exercise and obesity, the increase of opportunities for exercise in the school environment, the organisation of programs for the increase of PA etc). Explain that the aim of the questionnaire is to record how young people (of the specific sample's age) use their free time and how active they are. Diversify the presentation of the questionnaire and the arguments when addressing it to high school students or to elementary school students.

3. Explain that anyone who doesn't wish to participate doesn't have to fill the form. Since participation is voluntary interviewers should stress that they consider the data presented totally true. Interviewers should NOT allow students, who don't want to fill the questionnaire, to leave the classroom. They should ask them to remain silent during the completion of the questionnaire.
4. Emphasise to the students that:
    - .... the data they will give will be used EXCLUSIVELY for research purposes, which they are anonymous and totally confidential and that no one other than the researchers will have access to them. They should also emphasize that the answers will be analyzed by a computer.
    - .... the questionnaire asks for information regarding their participation in PA and sports during the LAST SEVEN DAYS including last weekend.
    - ... all questions must be answered and extra information to the questions should be given when necessary.
    - ... there are no right and wrong answers! The questionnaire is not a school exam! They MUST NOT co-operate; instead they must fill the questionnaire individually.
    - ...the students must not feel guilty if they didn't participate in some (or in all) of the activities included in a question. They just have to go on and answer the next question.

5.2 Administration of the questionnaire

Before the students begin to read and complete the questionnaire ask them to fill the demographic data and the exact date of birth (day -- month - year). This is very important in case of repeated measurements in the same sample. Interviewers should ask students to read carefully each question, to think and then circle the choice that best describes them, explain anything that they don't understand or is not completely clear. Students older than 14 years (second high school grade) can fill in the questionnaire individually without guidance. On the contrary, it is better to guide elementary school and first grade high school students, in order to avoid misunderstandings. Generally, it has been observed that children with some experience infilling in questionnaires have fewer difficulties in filling in this questionnaire and give more accurate answers. So it would be best, when it is possible, for the teachers, in agreement with the interviewer, to initiate their students in filling such forms (or multiple questions) BEFORE

the research. Interviewers. Therefore before their entrance in the classroom interviewers should get informed by the class teacher about the existence of students who might possibly need added help or who should be excluded from the research.

5.3 Instructions to the interviewer

General comments

- DON'T lead children to specific answers! DON'T pressure them and give them adequate time to think before they answer. If you find that some are rushing, check whether they reply randomly or whether they think before answering. On the contrary, if some are too slow, especially in cases where time estimate is required, explain to them that the estimate doesn't have to be exact but just as accurate as possible.
- In general, children tend to forget faster important events related to PA and more easily than adults. It is useful to urge them to think carefully before answering, especially regarding activities that do not belong to their particular weekly program (for instance questions referring to free time PA).
- AVOID distributing the questionnaires:
  - ✓ ..... during the last hours of the school day because children are tired and they don't fill out the questionnaire with enthusiasm nor do they answer the questions accurately.
  - ✓ ..... during the time of PA class because it was observed that children resent or they try to answer as fast as possible so they can get to the gym and participate to the PE lesson.
  - ✓ ..... on occasions when the weather conditions are no typical for that particular time of year (for example in cases of prolonged rainfall, or heat wave or extreme weather conditions).
  - ✓ ..... BEFORE or AFTER school holidays, brakes or school exams. The data collected during that time do not depict the real PA image of the children.

Questions demanding extra explanation or guidance

In questions where they must state their participation in a series of activities (questions 8, 26) stress that they must read carefully and report ALL the activities, regardless if they didn't

participate in many of them during the LAST WEEK. Students (particularly the younger ones) tend to mix up their answers regarding their participation in organized sports activities in the school (school team, question 15), in out of school organized sports activities (member of a sports club, question 17) and in private sports centers (gyms, clubs etc, question 21). IT IS IMPORTANT to explain to the interviewees, before filling the questionnaire, the difference and to ask them to state by raising their hands in which of the above categories (none, one or more) they participated during the LAST WEEK. During the completion of this particular part remind them to answer the right questions regarding to their activity.

Questions of time and intensity estimate

- Explain to participants that in the questions of estimation of the intensity of the activities they participated (questions 12, 25, 27) "high intensity" is when they "puff and huff", their heart beats much faster and they sweat a lot.
- You will probably be required to assist the interviewees (particularly the elementary school children) with their time estimate (questions 10, 19, 23, 26, 28). Children often face difficulties in estimating the time of involvement in an activity particularly if it was not carried out recently (for example yesterday or the day before). Assist them by giving some supplementary information comparing them with other activities of established duration (for example the school break, the duration of a favorite TV program etc). Also make sure that the time the participants state for an activity include the time of their real involvement and not the time of transport to the sports center, the change of clothes, the time spent chatting to other athletes etc.
- Explain to the participants that their answers refer to a "typical" week. STRESS that in cases when a certain event has diversified their behavior (for instance a local or national holiday, interfered with the school function or operation of the sports facilities, a birthday or a name day, celebration etc) during the last week they should mention what usually occurs and report the proper choice in question 30, that is "was there anything that stopped you from participating to your usual PA and sports during the last 7 days?".

Completion and inspection of the questionnaire

When a student finishes the completion of the questionnaire he/she must deliver it personally. It is important to check the answers in all pages. In case you find there is lack of data or misunderstandings ask the participant either to fill in the specific questions or to correct his/hers answers after giving the necessary explanations. When you gather all the questionnaires don't fail to fill in the codes for the school and the classes that participated, particularly when you are gathering data from a large number of schools, or if you wish to repeat the PA assessment .

6.0 Data management – Calculations

6.1 Participant's classification

The primary data of the questionnaire can be used to ascertain the following PA dimensions:

1. The average daily energy cost/ expenditure for each subject (in Kcal. Kg^{-1}. Day^{-1}).
2. The average daily amount of time involvement in PA of moderate intensity.
3. The average daily time and the weekly frequency of involvement in vigorous PA and sports, which probably causes an improvement in certain parameters of physical condition.
4. The profile of physical activity.

The information above offer the ability of comparison of the subjects' PA level (time and frequency of involvement in moderate and high intensity PA, type of activity) in relation to the recent recommendations regarding PA for health. Specifically for young people (5-18 years) the following recommendations are suggested (Cavil, Biddle & Sallis, 2001):

- All young people (aged 5-18 years) should participate in PA of at least moderate intensity for one hour per day. Young people who currently do little activity should participate in PA of at least moderate intensity for at least half an hour per day.
- At least twice a week, some of these activities should help to enhance and maintain muscular strength and flexibility, and bone health.

Furthermore, based upon the the subject's responses, he/she is classified in one of the four categories of activity; *very inactive, inactive, moderately active* and *active*. This classification

is based on the process of calculation of the energy expenditure/cost described by Blair (1983) in "7 Day Recall" and used by Cale (1994) in "The Four by One-Day Physical Activity Recall".

6.2 Calculations of the interviewee's energy cost

The activities in which the subject participates are expressed in METs based on the classification suggested by Ainsworth and co-workers (Ainsworth, et al., 1993; Ainsworth, Haskell, Whitt, Irwin and Swartz, 2000). The data used for the calculation of the average daily energy cost concern the time (in hours) of participation in PA, which is multiplied with the metabolic cost (MET) values for every activity. One MET represents the metabolic rate of an individual at rest and is set at 3.5 ml of oxygen consumed per kilogram body mass per minute, or approximately 1 kcal/kg/h. For example activities that require 3 METs will spend approximately 3 kcal per kg per hour. Thus, these summary estimates of energy expenditure are calculated without consideration of the individual's body weight. The method assumes that a task performed by a heavy individual raises the metabolism to the same extent (in percentage terms) as the same task performed by a lighter individual, even though the caloric expenditure might be different.

The activity categories and the corresponding energy values in METs for the questionnaire are the following:

- Sleep = 1 MET
- Light intensity activity = 1.1 – 2.9 METs
- Moderate intensity activity = 3- 6 METs
- High intensity (vigorous) activity = > 6 METs

- *Moderate intensity PA:* Activity usually equivalent to brisk walking, which might be expected to leave the participant feeling warm and slightly out of breath. Such activity is often defined as activities within the 3 to 6 METs (multiples of resting metabolic rate) range.
- *Vigorous intensity physical activity:* Activity usually equivalent to at least slow jogging, which might be expected to leave the participant feeling out of breath and sweaty (6 METs and above).

- In the calculations we assume that the interviewee sleeps 8 hours per day (metabolic cost 1 MET). The rest of the activities during the 24hours we assume that they are of *light intensity* with metabolic cost 1.1 – 2.9 METs. In the calculations described below we consider that the light intensity activities have an average metabolic cost of 1.5 MET.

The calculations concern the previous seven (7) days of recorded PA. Finally the average daily energy expenditure is extracted, assuming that during the weekends the subjects are as active as on the weekdays.

6.3 Calculating the energy expenditure

Following, wherever it is necessary, there are tables with the most habitual physical activities in which the young people of our country participate along with their respective energy costs in METs. For activities or sports, which are not included, the energy cost can be found in the tables of Ainsworth and colleagues (2000). The calculation of the energy expenditure is based upon the answers concerning:

1. The PA from active transport (walking, cycling, roller skating etc)
2. The PA at school during weekdays
   - a) PA during school breaks
   - b) PA in school physical education lesson
   - c) PA from the participation in school sport teams
3. The after school PA
   - a) PA from participating in organized sports clubs
   - b) PA from participating in private gyms or fitness centers/clubs
   - c) PA from participating in PA and sports during free time

These calculations can be carried out by hand for a limited number of subjects or by PC (for example in programs such as Excel, SPSS/PC etc). The primary data of the subjects' answers are coded, so that can be used in the residual calculations. Below the process for extraction of the subject's individual activity score for every group of questions is described step by step and an example is also given. The hypothetical example refers to a senior elementary school student who is an athlete in the school team, and is also an athlete in gymnastics in an out of school sport club, who is training in a private gym where he regularly participates in martial arts (karate) while he is quite active in his free time.

Calculation of PA from *active transport*

10. How many minutes per day do you walk and /or cycle going to school, to the after school classes, shopping or for other reasons?

1= Less than 15 minutes
2= Between 15-30 minutes
3= Between 31-45 minutes
4= Between 46-60 minutes
5= More than 60 minutes

Recode: 1=15 min 2= 23 min 3=37 min 4= 53 min 5= 70 min

Where walking/cycling = 3 METs

Calculation a:
[time (min) X 3 METs] / 60 min = energy expenditure of transport in kcal.Kg^{-1}. day^{-1}

Example: The subject in our example tick the choice "3" which when recoded corresponded to 37 minutes of walking per day, that is (37 min X 3 METs) / 60 minutes = 1.84 Kcal.Kg^{-1}. day^{-1}. Also the subject accumulates from his transport approximately 37 minutes of moderate intensity PA per day.

Calculation of school PA: *PA during school breaks*

11. How active were you last week during school breaks?

1 = Usually I was sitting and reading, talking or doing school work
2 = I was standing up or walking in the school yard
3 = I was playing a little or I was running lightly
4 = I was playing and running quite hard or I was practicing a sport
5 = I was playing and running intensively or I was practicing a sport most of the time

Recode: 1= 1,5 METs 2= 2 METs 3= 4 METs 4= 6 METs 5= 8 METs

Where the duration of each break is calculated to 10 min and the total time of the breaks to 60 min (six of ten minutes breaks)

Calculation b:
[60 min X METs (based upon the answer)] /60 min = the energy expenditure of the breaks in kcal.kg^{-1}. day^{-1}

Example: The subject in our example has noted choice "2" which when recoded corresponds to 2 METs activity, that is, (60 minutes X 2 METs)/60 minutes=2 kcal. Kg^{-1}. day^{-1}. This is an activity of light intensity.

Calculation of school PA: *PA during P.E. lesson*

12. How many times did you participate last week in the physical education lesson in your school?

1= Never 2= Once 3= Two times 4= Three times

Recode: 1= 0 min 2= 30 min 3= 60 min 4= 90 min

Where: School physical education = 6 METs and the real time of participation in a school hour is 30 min

Note: 6 METs were chosen arbitrary as an illustrative average value of the activities carried out in the course of physical education in school (that is sports, dances, gymnastics, track and field activities etc). The 30 minutes

were chosen as an average value of the students' activity time after a 15-hour evaluation of class PE taking into consideration data from the Greek bibliography for the academic learning time (ATP) in the physical education lesson.

Calculation c:
[[(time in min) X 6METs] / 7 days energy expenditure of the course of physical education in kcal.kg^{-1}. day^{-1}

Example: The subject in our example noted choice "3" which when recoded corresponds to 60 min PE lesson per week (or 8 min PE lesson per day or 0.14 hours of PA lesson per day) that is, (8.5 min X METs)/60 minutes = 0.84 Kcal.kg^{-1}. day^{-1}. The subject also accumulates from his participation in the course of PE lesson approximately 8.5 minutes of vigorous PA per day.

Calculation of school PA: *PA from participation in school sport teams*

16. If you ARE NOT a member of any school team go to question 17. If you are a member of a school how many times have you trained or played during the last 7 days?

0= I AM NOT A MEMBER OF A SCHOOL SPORT TEAM
1= Never 2= Once 3= Two times 4= Three times

Recode: 0=0 1= 0 min 2= 45 min 3= 90 min 4= 135 min

Where: The duration of real exercise time in training session with a school team has been arbitrarily defined to 45 min and the average energy cost of these activities is 8 METs.

Calculation d:
[[(time in min) X 6 METs]/ 60 min]/ 7 days = energy expenditure from the participation in school sports teams in kcal.kg^{-1}. day^{-1}

Example: The subject in the example has noted choice "2" which when recoded corresponds to 45 practice time per week (or 6.4 minutes of practice per day or 0.1 hour of practice per day) that is (6.4 minutes X 8 METs)/ 60 minutes = 0.85 Kcal.kg^{-1}. day^{-1}. The subject also accumulates from his participation in the school sports team approximately 6.4 minutes of intense PA per day.

PA from *participation in organized sports activities out of school*

18. If you ARE NOT a member of a sports club or team out of school then go to question 21. If you actively participate as an athlete how many times did you train or compete the last seven days (weekends included)?

(exercise frequency / week)

0= I AM NOT A MEMBER OF AN OUT OF SCHOOL SPORTS CLUB
1= Never 2= Once 3= Two times 4= Three times
5= Four times 6= Five times 7= Six times

Recode: 0=0 1=0 2=1 3=2 4=3 5=4 6=5 7=6

19. How much time does your training in the sports club usually last?

(exercise duration/ week)
0= I AM NOT A MEMBER OF AN OUT OF SCHOOL SPORTS CLUB
1= Approximately 30 minutes 2= between 30 minutes and one hour
3= Between 60 and 90 minutes 4= More than 90 minutes

Recode: 0=0 1=30 min 2= 45 min 3= 75 min 4= 90 min

20. Which sport are you practising? Please write down the sport (or sports) in which you participate out of school.

SPORTS	METs Values
ROWING	5 METs
TRACK AND FIELD	8 METs
SWIMMING – WATER-POLO	8 METs
DANCE – RHYTHMICS	6 METs
FOOTBALL	7 METs
VOLLEYBALL	3 METs
BASKETBALL	6 METs
HANDBALL	12 METs
TENNIS	7 METs
SAILING	15 METs
MARTIAL ARTS	10 METs
GYMNASTICS	4 METs
OTHER	See compendium of PA

Calculation e:
[[(frequency) X (duration in minutes) X METs of activity] /60 min]/7 days = the energy expenditure of the participation in organised sports activities outside school in kcal.kg^{-1}. day^{-1}

Example: The subject in our example is a gymnastics athlete in a sports club (4 METs). He ticks choice '5' in the question about the frequency of training, which when recoded equals to 4 practice sessions per week. He ticks choice '4' in the question regarding the duration of the training, which when recoded equals to 90 minutes of exercise in every training session (or 51.4 minutes of training per day or 0.85 hours per day), that is [[(4 times X 90 minutes X 4 METs)/60 minutes]/7 days or 0.85 X 4 = 3,42 kcal.kg^{-1}. day^{-1}. The subject also accumulates from his participation in training 51.4 minutes of moderate PA per day).

Note: For subjects who will claim that they participate as athletes in sports clubs, we assume that the METs of the sport they practice are those cited in the tables by Ainsworth et al (2000).

PA from *participation in private gyms, fitness centers etc outside of school*

22. If you are NOT a member of any private gym then go to question 26. If you are an active member how many times did you train or race during the last seven days (weekends included)?

(exercise frequency/week)

0= I AM NOT A MEMBER OF A PRIVATE GYM
1= Never 2= Once 3-= Twice 4= Trice 5= 4 times
6= 5 times 7= 6 times

Recode: 0=0 1=0 2=1 3=2 4=3 5=4 6=5 7=6

23. How long does your training session in the gym in which you are a member usually last?

(exercise frequency/week)

0= I AM NOT A MEMBER OF A PRIVATE GYM
1= Approximately 30 minutes 2= Between 30-60 minutes
3= Between 60-90 minutes 4= More than 90 minutes

Recode: 0=0 1=30 min 2=45 min 3= 75 min 4= 90 min

24. Which of the following sports activities do you practise I the gym?

0= I AM NOT A MEMBER OF A PRIVATE GYM
1= Martial Arts = 10 METs
2= Aerobics = 6 METs
3= Bodybuilding = 6 METs
4= Dance = 6 METs
5= Gymnastics = 4 METs
6= Tennis, swimming = 8 METs
7= Something else = See compendium of PA

Calculation f:
[[(frequency) X (duration in minutes) X METs of activity]/60 min]/7 days = the energy expenditure from the participation I private gyms and fitness centers out of school in kcal.kg^{-1}. day^{-1}

Example: The subject in the example claimed that he is a member of a private martial arts gym (10 METs) and that he competes in tournaments. He ticks choice '3' in the question of the training frequency which when recoded equals to 2 training session per week. He ticks choice '4' in the question regarding the duration of the training, which when recoded equals to 90 minutes of training in each session (or 25,7 minutes ;of training per day or 0.43 hours per day), that is in [(2 times X 90 minutes X 10 METs)/60 minutes]/7 days or 0.43 X 10 = 4.3 kcal.kg^{-1}. day^{-1}. The subject also accumulates from his participation in training 25.7 minutes of vigorous PA per day.

Note: For the subjects who will claim that they are members of private gyms (or fitness centers) to evaluate the intensity of the activities in question we examine the answer to the question "...during your training sessions how many times did you train with such intensity that were "huff and puff" for at least 20 minutes?" (question 25). We differentiate the following cases: a) If the participant notes one of the choices 4 or 5 of the question or if he/she claims that he/she participated in competitions of the particular sport then we tally the exact number of the activity's METs (for example 10 METs for martial arts) because the aim of the activity is competitive. b) In cases where the participant trains without competing or if he/she claims that he/she is not training intensively enough to get "huff and puff" for at least 20 minutes, then in order to be more objective in our measurement we must reduce the activity's number of METs at least 20% (e.g. in this example we would equal the martial arts not to 10 but to 8 METs).

PA during *free time*

26. Have you participated in any of the activities below for fun or play in your free time in the last 7 days (last weekend included) for more than 20-40 minutes? If so how many times did you participate?

Frequency of participation in the following PA		Never	1/w	2-3/w	4-5/w	Almost every day
Jump rope	(10 METs)	1	2	3	4	5
Rowing	(5 METs)	1	2	3	4	5
Roller and/or Skate	(7 METs)	1	2	3	4	5
Walking for exercise	(4 METs)	1	2	3	4	5
Cycling for exercise	(4 METs)	1	2	3	4	5
Jogging	(7 METs)	1	2	3	4	5
Aerobics	(6 METs)	1	2	3	4	5

Swimming	(8 METs)	1	2	3	4	5
Dance (traditional or modern)	(5.5 METs)	1	2	3	4	5
Football	(7 METs)	1	2	3	4	5
Volleyball	(3 METs)	1	2	3	4	5
Basketball	(6 METs)	1	2	3	4	5
Handball	(12 METs)1	2	3	4	5	
Tennis	(7 METs)	1	2	3	4	5
Badminton	(6 METs)	1	2	3	4	5
Sailing	(5 METs)	1	2	3	4	5
Wrestling or boxing	(10 METs)1	2	3	4	5	
Other	------→	See compendium of PA (Ainsworth et all. 2000)				

Recode:

Missing values	= 0 time
1 —> 0	= 0 min
2 —> 1	= 30 min
3 —> 2,5	= 75 min
4 —> 4,5	= 135 min
5 —> 6	= 180 min

Calculation g (carried out for every activity individually):
[[(frequency)x (30min per time) X METs of activity]/60 min]/7 days = the energy expenditure of PA during free time in kcal.kg^{-1}. day^{-1}

Example: The subject in the example claimed that during free time he played football (7 METs) for at least 20-40 minutes, 2-3 times for last 7 days (when recoded it equals to 75 minutes of play per week, or 10.7 minutes of play per day or 0.18 hour of play per day), that is (10.7 minutes X 7METs)/60 minutes = 1.25 **kcal.kg^{-1}. day^{-1}**. The subject also accumulates in his/her free time an average of approximately 10.7 minutes of vigorous PA per day. The subject also claimed that he exercised intensively every time he played football (question 27, choice 5).

Note: For the subjects who claim to participate in recreation PA and sports in their free time, in order to evaluate the intensity of their activities we examine the answer to the question "... participating for recreation in some of the activities of the previous question in the last 7 days, how many times did you exercise with such intensity that you "huff and puff" for at least 30 minutes?" (Question 27). We differentiate the following cases: a) If the subject notes one of the choices 4 or 5 in this question this equals to the activity's exact number of METs (e.g. 7 METs for football) because the subject exercised intensively, b) In case the subject claims choices 2 or 3 of the same question then in order to be more objective in the accuracy of the measurement we must reduce the activity's number of METs at 20% (e.g. in this example football would equal not to 7 but to 5 METs).

Energy expenditure calculation

Step 1: Calculation of the total average time of participation in PA and sports per day *(total time).*

It is the total of the time involved in PA such as: transport, school breaks, school physical education, participation in school sports teams, participation in out of school sports clubs, participation in out of school private gyms and participation in physical activities during free time (in minutes or hours per day).

Step 2: Calculation of the energy expenditure during sleep (1MET) *(Sleep)*

The average time of sleep for ALL participants is considered to be eight (8) hours per day (that is 480 minutes), an energy expenditure/ cost that equals to 8 METs (1 MET X 8 hours of sleep).

Step 3: Calculation of the energy expenditure/ cost from the participation in every category of activity *(totalmet).*

The total energy expenditure from the participation in PA and sports in the total of the calculation a+b+c+d+e+f+g in $kcal.kg^{-1}. day^{-1}$. The energy expenditure, which comes as a result of involvement in light PA and sleep, is not included.

Step 4: Calculation of the energy expenditure in light PA (1-2.9 METs) *(Rest).*

The total energy expenditure for the hours the subject does not sleep and does not participate in some moderate or vigorous PA is calculated as:

Rest = [24 hours – (8 hours of sleep + total time)] X 1,5 METs

Step 5: Calculation of the subject's individual performance

The subject's final performance is the total of the energy expenditure: a) from sleep, b) from the participation in PA and sports, and c) from the participation in light intensity PA, that is:

Individual score of the subject = Rest + Sleep + Totalmet

Based upon the value of the average energy expenditure the subjects are placed in four categories of physical activity, which is *very inactive, inactive, moderate active* and *active*. The respective values of energy expenditure for each category are the same with the classification made by Cale (1994) based upon the prices of Blair (1983) in the '7 Day Recall'.

Table 1: Classification of the subjects in categories of activity

A score less than 33	= VERY INACTIVE	(Code 1)
A score between 33 and 36.99	= INACTIVE	(Code 2)
A score between 37 and 39.99	= MODERATELY ACTIVE	(Code 3)
A score of 40 or greater	= ACTIVE	(Code 4)

The values in our example:

Physical Activity	**Time of PA (min) per day**	**Energy cost of activity (METs)**	**Kcal . Kg^{-1} . day^{-1}**	**Moderate PA (3-6 METs) per day (min)**	**Vigorous PA (>6 METs) per day (min)**	**PA profile (%)**
Transport	0.61	3.0	1.84	37	--	
PA at school:						
o *School breaks*	1.0	2.0	2.0	--	--	
o *PE lesson*	0.14	6.0	0.84	--	8.5	
o *Sport team*	0.1	8.0	0.85	--	6.4	
Participation in organized sport clubs out of school	0.85	4.0	3.42	51.4	--	
Participation in private fitness clubs/gyms	0.43	10.0	4.3	--	25.7	
PA and sport during free time	0.18	7.0	1.26	--	10.7.	
Light PA	12.69	1.5	19.0	--	--	
Sleep	8.0	1.0	8.0	--	--	
Sum of PA	24 hours		41.51	88.4	51.3	

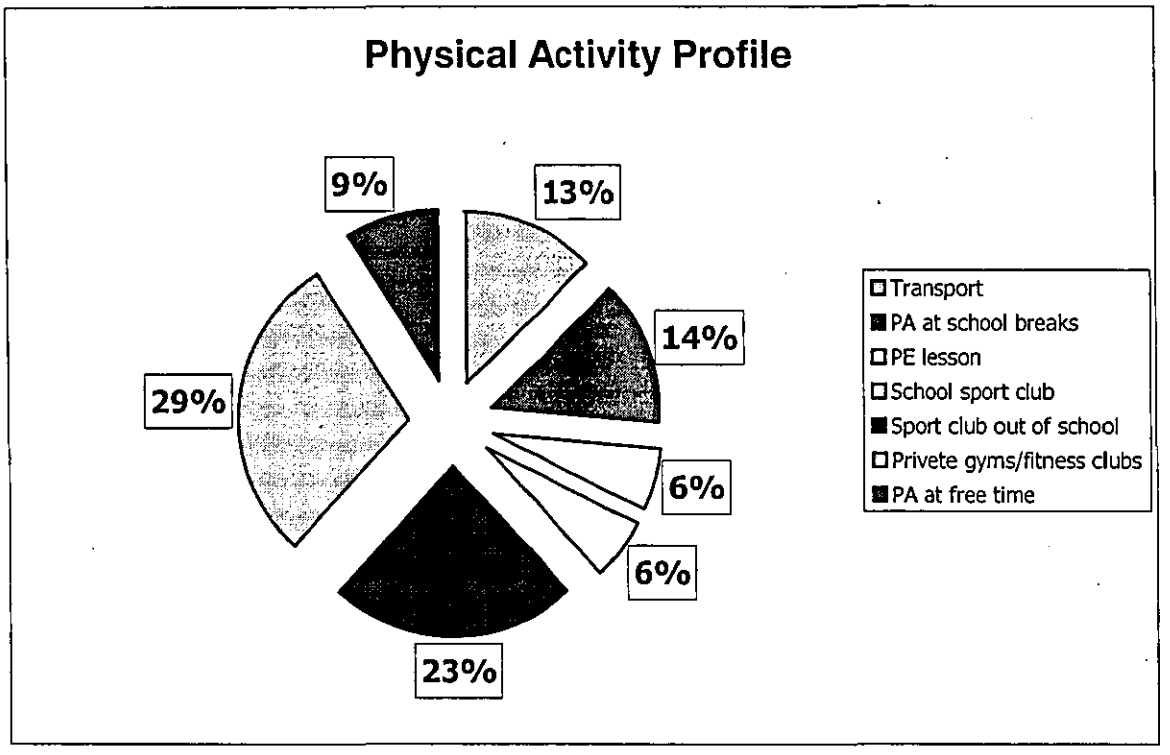
In our example the student is classified as active (because 41.51>40). This is also confirmed by the fact that this particular student accumulated daily an average of 139,7minutes PA out of which 88.4 minutes are of moderate intensity and 51.3 of high intensity. This particular student meets both PA recommendations for health.

We should note that:

Questions 28 and 29 are used to describe the subject's PA during the weekend and to design a picture of his/her physical activity for the last 7 days.

6.4 Outline of the physical activity's profile

The PA profile expresses in percentage (%) the analogy of all the subjects' forms of physical activity carried out in moderate and high intensity, regarding his/her total score in these activities. When designing the profile of PA we do not calculate the energy cost from the subject's involvement in light intensity activities (rest) and sleep.



In this example the particular student 'accumulates' collectively 25.4% of PA in the school environment. We observe that the larger ratio of physical activity comes from his/her participation in organized forms of exercise (sports club and private gym), in contrast to the very small percentage of free time PA.

6.5 Limitations of the questionnaire

The researchers, who will use the PALQ, must bear in mind that questionnaires generally present some limitations related to the accuracy of the information provided by the interviewees, regarding their physical activity. This problem becomes more intense in children than in adolescents and it is attributed to the incomplete cognitive development of young people and in particular of the memory function. Children compared to adults seem to forget more easily, have smaller perception and omit more facts related to PA that would be useful to the researcher. These limitations are more intense when the recall period is long (as for example in PALQ which require recalling information from the

previous week). Often younger children don't manage to estimate the intensity of an activity or to separate activities carried out with different intensity in different times. Children also face added problems when asked to evaluate the duration of an activity. Finally, children's PA levels seem to differentiate from season to season and often from week to week.

Notwithstanding the problems mentioned above which are common to the majority of available questionnaires, PALQ presents some particular limitations which might affect the accuracy of the calculation of the subjects' individual performance.

These limitations are related to:

1. The belief that the subjects on weekends are as active as in weekdays. This view overestimates the true level of the subject's physical activity since the evidence stressed that the subjects are less active in weekends than during weekdays. Young people participate much less in sports on Sunday than during the others days of the week.
2. The belief that the course of physical education in school is an activity of 6METs intensity that lasts an average of 30 minutes. In the validity measurements of the tool in sixth grade students in elementary school - recording with the method of accelerometer 15 different hours of PA lesson minute by minute- it was established that the subjects were involved for the major part of the lesson in moderate intensity activities (6 METs). However, students in PE lesson are involved in numerous other activities less or more intense (for example, dance vs competitions in specific sports).
3. We must also note that there are limitations to the calculation of the precise energy cost of PA such as those presented in Ainsworth's Compendium of Physical Activity (1993; 2000). This occurs simply because: a) the same activity can be carried out with different intensity by different people thus having different energy cost, b) there is a significant differentiation between people taking into consideration the age, the gender and the particular characteristics of their activity, c) the values quoted in METs for the various activities are not the result of a true measurement of the maximum oxygen consumption but were indirectly drawn and calculated for adults and not for children.

The above disadvantages do not contradict the proposed procedure but they should be taken into consideration when the questionnaire is used, especially with elementary school students. In cases where high accuracy is required (for example in intervention programs for the promotion of PA) the use of complex methods is recommended, including objective tools of evaluation (e.g. accelerometer).

APPENDIX 1b

Physical Activity and Lifestyle Questionnaire

Σχολείο: _____ Κωδικός: ☐☐☐☐☐

(ΜΗ γράφεις τίποτα σ' αυτή τη γραμμή)

Αγαπητέ μαθητή/μαθήτρια,

Αυτό το ερωτηματολόγιο σχεδιάστηκε με σκοπό να καταγράψει ορισμένες συνήθειες της καθημερινής ζωής σου και να αξιολογήσει πόσο δραστήριος/α είσαι σε φυσικές και αθλητικές δραστηριότητες.

Βασικές Οδηγίες

- Σκοπός του ερωτηματολογίου είναι να ανακαλύψει πώς οι νέοι της ηλικίας σου αξιοποιούν τον ελεύθερο χρόνο τους. Αυτό το τμήμα του ερωτηματολογίου καταγράφει τη συμμετοχή σου σε φυσικές και αθλητικές δραστηριότητες κατά τη διάρκεια των τελευταίων 7 ημερών, συμπεριλαμβάνοντας και το τελευταίο Σαββατοκύριακο.
- Απάντησε σ' όλες τις ερωτήσεις και δώσε πρόσθετες πληροφορίες, όπου θεωρείς ότι είναι απαραίτητο.
- Για κάποιες δραστηριότητες θα πρέπει ν' αναφέρεις τη χρονική διάρκειά τους. Σε ερωτήσεις που χρειάζεται να υπολογίσεις το χρόνο συμμετοχής σου σ' αυτές, προσπάθησε να είσαι όσο πιο ακριβής μπορείς. Αυτό για μας είναι πολύ σημαντικό!
- Για κάποιες άλλες δραστηριότητες θα πρέπει ν' αναφέρεις αν η ένταση εκτέλεσής τους σ' έκανε να λαχανιάσεις, δηλαδή, η καρδιά σου να χτυπά πιο γρήγορα από το συνηθισμένο και να νιώσεις έντονα ζεστός (-ή) ή ιδρωμένος (-η) (για πράδειγμα όπως όταν παίζεις μπάσκετ, όταν τρέχεις ή ποδηλατείς για αρκετή ώρα).
- Μην ανησυχείς ή αισθάνεσαι ενοχές άν δεν έχεις συμμετάσχει σε κάποιες (ή σ' όλες) από τις δραστηριότητες που υπάρχουν σε κάποια ερώτηση. Απλά, συνέχισε με την επόμενη ερώτηση.

Μην Ξεχνάς!

- Το ερωτηματολόγιο είναι ανώνυμο και απόλυτα εμπιστευτικό! Θα χρησιμοποιηθεί μόνο για τους σκοπούς της έρευνας. Κανείς από το σχολείο ή το οικογενειακό σου περιβάλλον δε θα διαβάσει τις απαντήσεις σου!
- Δεν υπάρχουν σωστές και λαθεμένες απαντήσεις! Το ερωτηματολόγιο δεν είναι σχολική εξέταση!

Ετσι λοιπόν.....

- Απάντησε σ' όλες τις ερωτήσεις με ειλικρίνεια και με όσο το δυνατόν μεγαλύτερη ακρίβεια. Αυτό είναι πολύ σημαντικό!
- Μη γράφεις τ' όνομά σου σε καμιά σελίδα!

Σ' ευχαριστούμε για τη συνεργασία σου!

School : _____ Code : ☐☐☐☐☐☐

(DO NOT write anything in this line)

Dear student,

This questionnaire was created aiming to record certain habits of your daily life and to evaluate how active you are in physical and sports activities.

Basic Instructions

- **The aim of the questionnaire is to discover how young people of your age use their free time. This section of the questionnaire records your participation in physical and sports activities for the duration of the last 7 days, including the last weekend.**
- **Answer all the questions and give additional information, wherever you consider that it is essential.**
- **For certain activities you will have to report their time of duration. In questions that require you to estimate your time of participation try to be as accuarate as possible. This is very important for us!**
- **For certain different activities you will be required to report if their intensity made you "huff and puff", i.e. , your heart beat was faster than usual and you felt hot or sweaty (for example like when you play basketball, when you run or cycle for a while).**
- **Do not worry or feel guilty if you did not participate in some (or in all) of the activities presented in some questions. Simply continue to the next question.**

Do not forget!

- ❖ **The questionnaire is anonymous and absolute confidential! It is used exclusively for the aims of the research. No-one from the school or family environment will read your answers!**
- ❖ **There are no right and wrong answers! The questionnaire is not a school exam!**

Therefore.....

- o **Answer all the questions with as much sincerity and accuracy as possible. This is very important!**
- o **Do not write you name in any page!**

Thank you for your collaboration!

ΤΟ ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ ΧΩΡΙΖΕΤΑΙ ΣΕ 3 ΤΜΗΜΑΤΑ:

- Το Α τμήμα ζητά πληροφορίες για σένα και την οικογένειά σου.
- Το Β τμήμα σε ρωτά για τον τρόπο που διαχειρίζεσαι τον ελεύθερο χρόνο σου.
- Το Γ τμήμα σού ζητά πληροφορίες για τη συμμετοχή σου σε φυσικές δραστηριότητες.

Πληροφορίες για σένα και την οικογένειά σου

1. Πότε ακριβώς γεννήθηκες; _____ / _____ / _____
   ημερομηνία / μήνας / χρόνος

Κύκλωσε ΕΝΑ αριθμό
για κάθε απάντηση

2. Είσαι αγόρι ή κορίτσι;
   1=Αγόρι
   2=Κορίτσι 1 2

3. Ποιες είναι οι γραμματικές γνώσεις του πατέρα σου;

   1=Δεν πήγε καθόλου στο σχολείο ή είναι απόφοιτος δημοτικού σχολείου
   2=Είναι απόφοιτος Γυμνασίου ή τεχνικής σχολής ή Λυκείου
   3=Είναι πτυχιούχος ανώτερης σχολής ή Πανεπιστημίου 1 2 3

4. Ποιες είναι οι γραμματικές γνώσεις της μητέρας σου;

   1=Δεν πήγε καθόλου στο σχολείο ή είναι απόφοιτη δημοτικού σχολείου
   2=Είναι απόφοιτη Γυμνασίου ή τεχνικής σχολής ή Λυκείου
   3=Είναι πτυχιούχος ανώτερης σχολής ή Πανεπιστημίου 1 2 3

5. Ποιο είναι το επάγγελμα του πατέρα σου;.....
   (γράψε το επάγγελμα)

6. Ποιο είναι το επάγγελμα της μητέρας σου;.....
   (γράψε το επάγγελμα)

7. Πόσα αδέλφια έχεις; *Κύκλωσε ένα μόνο αριθμό. Αν δεν έχεις άλλα αδέλφια, κύκλωσε το '0', ενώ αν έχεις πάνω από 4, τότε κύκλωσε το 4.* 0 1 2 3 4

THE QUESTIONNAIRE IS DIVIDED IN 3 SECTIONS:

- **Section A inquires information regarding you and your family.**
- **Section B requires information about the management of your free time.**
- **Section C requires information about your participation in physical activities.**

Information concerning you and your family

1. **When were you born?** _____/_____/_____
   date / month / year

Circle a number for each answer

2. **Are you a boy or a girl?**
   1 = Boy
   2 = Girl **1 2**

3. **What is the educational level of your father?**

   1 = He never went to school or he is an elementary school graduate
   2 = He is secondary school or technical faculty or high school graduate
   3 = He is university or superior faculty graduate **1 2 3**

4. **What is the educational level of your mother?**

   1 = She never went to school or she is an elementary school graduate
   2 = She is secondary school or technical faculty or high school graduate
   3 = She is university or superior faculty graduate **1 2 3**

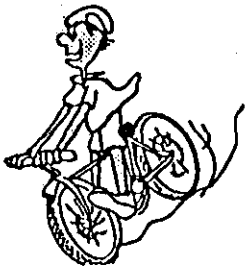
5. **What is your father's profession** ....
   (write the profession)

6. **What is your mother's profession** ....
   (write the profession)

7. **How many brothers or sisters do you have?** *Circle only one number. If you do not have any simblings, circle `0', if you have more than 4, then circle 4.* **0 1 2 3 4**

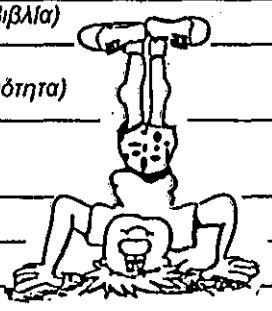
Με τι ασχολείσαι στον ελεύθερο χρόνο σου;

8. Υπάρχουν πολλές δραστηριότητες με τις οποίες μπορείς να ασχοληθείς στον ελεύθερο χρόνο σου. Διάβασε την ακόλουθη λίστα και σημείωσε πόσες ημέρες την εβδομάδα που πέρασε συμμετείχες σε καθεμιά απ' αυτές, κυκλώνοντας τον αντίστοιχο αριθμό.



Κύκλωσε ΕΝΑ αριθμό για κάθε επιλογή

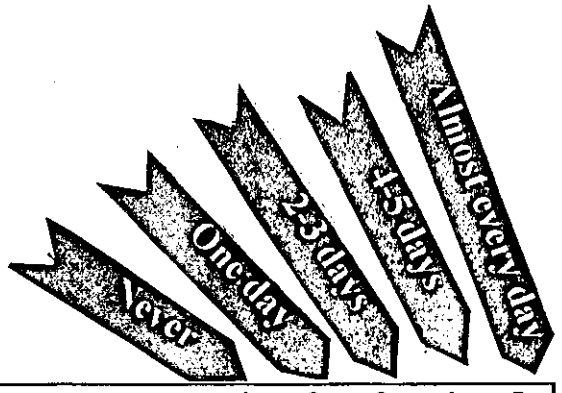
• Να βλέπω τηλεόραση και βίντεο	1	2	3	4	5
• Να παίζω παιχνίδια στο βίντεο, στον υπολογιστή ή επιτραπέζια παιχνίδια (*πχ. σκάκι, τάβλι, τράπουλα, μονόπολι*)	1	2	3	4	5
• Ν' ακούω μουσική *(κασέτες, CD, δίσκους, ράδιο)*	1	2	3	4	5
• Να διαβάζω στο σπίτι <u>άλλα</u> βιβλία που με βοηθούν στο σχολείο	1	2	3	4	5
• Να διαβάζω για ψυχαγωγία *(πχ. εφημερίδες, περιοδικά, βιβλία)*	1	2	3	4	5
• Να βοηθώ στις δουλειές του σπιτιού και στο νοικοκυριό *(πχ. στα ψώνια, στο συμμάζεμα, στο σιδέρωμα, στην καθαριότητα)*	1	2	3	4	5
• Να ασχολούμαι με την τέχνη και τις χειροτεχνίες *(π.χ. ζωγραφική, ράψιμο, κέντημα ή κάτι άλλο)*	1	2	3	4	5
• Να παίζω μουσική ή να τραγουδώ σε χορωδία	1	2	3	4	5
• Να πηγαίνω σε πάρτι, club,pub και καφετέριες	1	2	3	4	5
• Να πηγαίνω κινηματογράφο, θέατρο ή συναυλίες	1	2	3	4	5
• Να πηγαίνω σε κέντρα νέων οργανωμένα από το Δήμο ή τη θρησκεία μου *(πχ. προσκοπισμός, κατηχητικό κά.)*	1	2	3	4	5
• Να προσφέρω εθελοντική εργασία στο σχολείο, το σύλλογο ή την κοινωνία *(πχ. δενδροφύτευση)*	1	2	3	4	5
• Να επισκέπτομαι συγγενείς ή φίλους των γονιών μου	1	2	3	4	5
• Να φροντίζω κατοικίδια ζώα *(πχ. σκύλο, γάτα, πουλιά)*	1	2	3	4	5
• Να περνώ το χρόνο μου με το αγόρι μου / την κοπέλα μου	1	2	3	4	5
• Να κάνω βόλτες και να συζητώ με τους φίλους μου	1	2	3	4	5
• Να περνώ κάποιες ώρες μόνος μου *(πχ. χαλαρώνοντας)*	1	2	3	4	5
• Να παρακολουθώ αθλητικούς αγώνες στα γήπεδα	1	2	3	4	5
• Να μαθαίνω ξένες γλώσσες *(σε φροντιστήριο ή σε ιδιωτικά μαθήματα)*	1	2	3	4	5
• Να πηγαίνω στην αγορά για ψώνια	1	2	3	4	5
• Να πηγαίνω στην εκκλησία	1	2	3	4	5
• Να πηγαίνω στο φροντιστήριο ή σε ιδιωτικά μαθήματα για βοήθεια στο σχολείο μου	1	2	3	4	5
• Να συμμετέχω σε αθλητικές δραστηριότητες αναψυχής μόνος ή μαζί με φίλους *(π.χ. να κάνω βόλτα με το ποδήλατο, να πηγαίνω για περπάτημα, να κάνω πατίνι, σχοινάκι ή να παίζω ομαδικά σπορ κ. ά.)*	1	2	3	4	5
• Να παίρνω μέρος σαν αγωνιζόμενος σε αθλητικούς αγώνες και σπορ *(με το σχολείο μου, το σύλλογο ή το γυμναστήριο στο οποίο είμαι μέλος)*	1	2	3	4	5
• Να πηγαίνω με τους γονείς μου για αναψυχή στη φύση	1	2	3	4	5
• Να κάνω κάτι άλλο που δεν αναφέρεται παραπάνω *(δώσε περισσότερες πληροφορίες)*	1	2	3	4	5



What do you do in your free time?

8. There are a lot of activities that you can be involved in your free time. Read the following list and mark how many days you participated in each one during last week by circling the correspondent number.

Circle a number for each choice



• Watching television and/or videos	1	2	3	4	5
• Playing video, computer games, table games *(for example chess , backgammon , cards , monopoly)*	1	2	3	4	5
• Listening to the music	1	2	3	4	5
• Reading books that help me in school or doing extra homework for school	1	2	3	4	5
• Reding for enjoyment *(for example newspapers , magazines , books)*	1	2	3	4	5
• Helping with the housewoork *(for example the laundry, tiding the house, ironing, cleaning)*	1	2	3	4	5
• Doing arts and crafts *(for example painting , sewing, making things etc)*	1	2	3	4	5
• Playing music or singing in a choir	1	2	3	4	5
• Going to parties, clubs, pubs and cafes	1	2	3	4	5
• Going to cinema , theatre or concerts	1	2	3	4	5
• Going to youth or religious centers	1	2	3	4	5
• Doing volunteer work in school, in organisations or in the society *(for example tree planting)*	1	2	3	4	5
• Visiting relatives or friends of my parents	1	2	3	4	5
• Caring of pet animals	1	2	3	4	5
• Spending time with my boyfriend /girlfriend	1	2	3	4	5
• Hanging around and talking with my friends	1	2	3	4	5
• Spending time alone *(for example relaxing)*	1	2	3	4	5
• Visiting sports events		1	2	3	4 5
• Learning foreign languages *(out of school lessons or private courses)*	1	2	3	4	5
• Shopping	1	2	3	4	5
• Going to the church	1	2	3	4	5
• Going to out of school lessons or private courses to improve my school performance	1	2	3	4	5
• Taking part in recreational sports activities alone or with friends *(for example, I go for a ride with the bicycle , I go for a walk , I skate etc.)*	1	2	3	4	5
• Taking part in organised competitive sports events *(with my school, the sports club or the gym in which I am a member)*	1	2	3	4	5
• Going with my parents for outdoor recreation	1	2	3	4	5
• Other *(Please discribe)*	1	2	3	4	5

Σ'αυτό το μέρος του ερωτηματολογίου θέλουμε να μας πληροφορήσεις για τη συμμετοχή σου σε φυσικές δραστηριότητες και σπορ κατά τη διάρκεια των τελευταίων 7 ημερών. Προσπάθησε να θυμηθείς κάθε δραστηριότητα ώστε να είσαι ακριβής!

Περίγραψε τις καθημερινές σου μετακινήσεις

9. Πως πήγες συνήθως στο σχολείο τις τελευταίες 7 ημέρες;

Κύκλωσε ΕΝΑ ή ΠΕΡΙΣΣΟΤΕΡΟΥΣ αριθμούς

1=Περπατώντας
2=Με λεωφορείο και περπάτημα
3=Με λεωφορείο
4=Με το αυτοκίνητο
5=Με το ποδήλατο
6=Με το μοτοποδήλατο ή τη μοτοσικλέτα
7=Με πατίνια ή σκέιτ
8=Κάτι άλλο *(τι είναι αυτό;)* 1 2 3 4 5 6 7 8

10. Πόσα λεπτά κάθε μέρα περπατάς και/ή ποδηλατείς για τις μετακινήσεις σου πηγαίνοντας στο σχολείο, στο φροντιστήριο, για ψώνια ή για άλλες υποχρεώσεις σου;

Κύκλωσε ΕΝΑ αριθμό

1=Λιγότερο από 15 λεπτά
2=Μεταξύ 15-30 λεπτών
3=Μεταξύ 31-45 λεπτών
4=Μεταξύ 46-60 λεπτών
5=Περισσότερο από 60 λεπτά

1 2 3 4 5

11. Αν έχεις υποχρεώσεις μετά το σχολείο σου (για παράδειγμα ψώνια, δουλειά, φροντιστήριο), με τι μεταφορικό μέσο συνήθως μετακινείσαι;

Κύκλωσε ΕΝΑ αριθμό

1=Περπατώντας
2=Με λεωφορείο και περπάτημα
3=Με λεωφορείο
4=Με το αυτοκίνητο
5=Με το ποδήλατο
6=Με το μοτοποδήλατο ή τη μοτοσικλέτα
7=Με πατίνια ή σκέιτ
8=Κάτι άλλο *(τι είναι αυτό;)* 1 2 3 4 5 6 7 8

Περίγραψε τη συμμετοχή σου σε φυσικές δραστηριότητες και σπορ τις ώρες που βρίσκεσαι στο σχολείο

12. Πόσο δραστήριος ήσουν κατά τη διάρκεια των διαλειμμάτων την περασμένη εβδομάδα στο σχολείο σου;

Κύκλωσε ΕΝΑ αριθμό

Γενικά δεν ήμουν δραστήριος (-α) *(πχ. διάβαζα, συζητούσα ή έκανα σχολικές εργασίες, κα)*
Ήμουν λίγο δραστήριος (-α) *(πχ. στεκόμουν όρθιος (-α) ή περπατούσα στην αυλή του σχολείου)*
Γενικά ήμουν δραστήριος (-α) *(πχ. έπαιζα ή έτρεχα χαλαρά)*
Ήμουν αρκετά δραστήριος (-α) *(πχ. έπαιζα αρκετά έντονα ή ασχολιόμουν με σπορ)*
Ήμουν πολύ δραστήριος (-α) *(πχ. έτρεχα πολύ έντονα ή ασχολιόμουν με σπορ)*

1 2 3 4 5

In this part of questionnaire we want you to give us information about your participation in physical activities and sports during the last 7 days. Try to remember every activity as accurately as possible!

Describe your daily transport

9. How did you usually go to school the last 7 days?

Circle ONE or MORE numbers

1 = Walking
2 = By bus and walking
3 = By bus
4 = By car
5 = By bicycle
6 = By motor cycle or motor bike
7 = Skating
8 = Something different *(what is it)* 1 2 3 4 5 6 7 8

10. How many minutes per day do you walk and /or cycle for transportational reasons going to school, to out of school lessons, shopping or for various other commitments?

Circle One number

1 = At least 15 min
2 = Between 15-30 min
3 = Between 31-45 minutes
4 = Between 46-60 min
5 = More than 60 min
1 2 3 4 5

11. If you have other commitments after school (for example shopping, work, out of school lessons), which form of transportation do you usually use?

Circle ONE number

1 = Walking
2 = By bus and walking
3 = By bus
4 = By car
5 = By bicycle
6 = By motorbike or the motorcicle
7 = Skating
8 = Something different *(what is it)* 1 2 3 4 5 6 7 8

Describe your participation in physical activities and sports at school

12. How active were you during school breaks for the last week?

Circle a number

1 = Generally I was not active *(for example I read, I chated or did school work etc)*
2 = I was a little active *(for example I was standing or walking in the schoolyard)*
3 = Generally I was active *(ex. I played or ran lightly)*
4 = I was quite active *(ex. I played quite intensely or I exercised a sports activity)*
5 = I was very active *(ex. I ran very intensely or I exercised a sport)*
1 2 3 4 5

13. Πόσες φορές συμμετείχες στο μάθημα της Γυμναστικής την περασμένη εβδομάδα στο σχολείο σου;

Κύκλωσε ΕΝΑ αριθμό

1=Ποτέ 2=Μία φορά 3=Δύο φορές 4=Τρεις φορές 1 2 3 4

14. Υπάρχουν στο σχολείο σου αθλητικές ομάδες που συμμετέχουν στο σχολικό πρωτάθλημα;

1=Ναι 2=Οχι 3=Δεν ξέρω 1 2 3

15. Αν απάντησες 'ΝΑΙ', είσαι μέλος σε κάποια απ' αυτές τις σχολικές αθλητικές ομάδες;

1=Οχι
2=Ναι, αλλά δε συμμετέχω συχνά στις προπονήσεις
3=Ναι, συμμετέχω τακτικά στους αγώνες και τις προπονήσεις 1 2 3

16. Αν ΔΕΝ είσαι μέλος σε καμιά σχολική ομάδα, πήγαινε στην ερώτηση 17. Αν είσαι μέλος σε κάποια σχολική ομάδα, πόσες φορές προπονήθηκες ή αγωνίστηκες τις τελευταίες 7 ημέρες;

1=Καθόλου 2=Μία φορά 3=Δύο φορές 4=Τρεις φορές 1 2 3 4

Περίγραψε τη συμμετοχή σου σε οργανωμένες αθλητικές δραστηριότητες τις ώρες που δεν είσαι στο σχολείο

17. Είσαι αθλητής (-τρια) σε κάποιο αθλητικό σύλλογο ή ομάδα εκτός σχολείου;

1=Οχι, ποτέ δεν ήμουν αθλητής (-τρια) σε σύλλογο ή ομάδα
2=Οχι τώρα πλέον, αλλά ήμουν στο παρελθόν
3=Ναι, είμαι αθλητής (-τρια) και συμμετέχω σε αγώνες 1 2 3

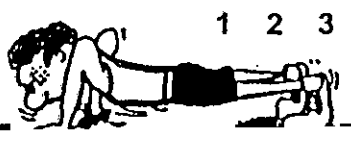
18. Αν ΔΕΝ είσαι αθλητής (-τρια) σε κανένα αθλητικό σύλλογο ή ομάδα εκτός σχολείου, τότε πήγαινε στην ερώτηση 21. Αν είσαι αθλητής -τρια, πόσες φορές προπονήθηκες ή αγωνίστηκες τις τελευταίες 7 ημέρες *(συμπεριλαμβάνοντας και το Σαββατοκύριακο)*;

=Καθόλου 2=Μία φορά 3=2 φορές 4=3 φορές
=4 φορές 6=5 φορές 7=6 φορές 1 2 3 4 5

9. Πόσο χρόνο διαρκεί συνήθως η προπόνησή σου στο σύλλογο που είσαι μέλος;

Κύκλωσε ΕΝΑ Νοριθμό

1=Περίπου 30 λεπτά 2=Μεταξύ 30 λεπτών και μιας ώρας
3=Μεταξύ 60 και 90 λεπτών 4=Περισσότερο από 90 λεπτά 1 2 3 4



13. How many times during the last week did you participate in the physical education lesson?

Circle a number

1 = Never 2 = Once 3 = Twice 4 = Three times 1 2 3 4

14. There are sports teams in your school that participate in the school championships?

Circle a number

1 = Yes 2 = No 3 = I do not know 1 2 3

15. If you answered ` YES', are you member in any school athletic teams?

Circle a number

1 = No

2 = Yes, but I do not participate frequently in training

3 = Yes, I participate regularly in sports games and training 1 2 3

16. If you are not member in any school team, then go to the question 17. If you are member in a school team, how many times did you train or competeted during the last 7 days?

Circle a number

1 = Not once 2 = Once 3 = Twice 4 = Three times 1 2 3 4

Describe your participation in organised sports activities after school hours

17. Are you a member in any sports club or team outside school?

Circle a number

1 = No,I was never an athlete in a sports club or a team

2 = Not currently, but I was in the past

3 = yes, I am an athlete and I participate in sports competitions 1 2 3

18. If you are not an athlete in any sports club or team out of school, then go to the question 21.

If you are an athlete how many times did you train or compete during the last 7 days *(includin the Weekend)*?

Circle a number

1 = No 2 = Once 3 = Twice 4 = 3 times

5 = 4 times 6=5 times 7=6 times 1 2 3 4 5 6 7

19. For how long does your training in the sports club last for usually?

Circle a number

1 = About 30 min 2 = Between 30 min and one hour

3 = Between 60 and 90 min 4 = More than 90 min 1 2 3 4

20. Σε ποιο άθλημα είσαι αθλητής (-τρια); Παρακαλώ, γράψε το άθλημα (ή τα αθλήματα) στα οποία συμμετέχεις εκτός σχολείου καθώς και την ηλικία στην οποία άρχισες την προπόνηση.

1. Αρχισα να αγωνίζομαι στο αγώνισμα _____ σε ηλικία _____ χρονών.
2. Αρχισα να αγωνίζομαι στο αγώνισμα _____ σε ηλικία _____ χρονών.
3. Αρχισα να αγωνίζομαι στο αγώνισμα _____ σε ηλικία _____ χρονών.

Περίγραψε τη συμμετοχή σου σε ιδιωτικά γυμναστήρια, κέντρα Fitness ή σχολές χορού τις ώρες που δεν είσαι στο σχολείο

21. Είσαι μέλος ή αθλητής (-τρια) σε κάποιο ιδιωτικό γυμναστήριο εκτός σχολείου; ***(πχ τάξη αεροβικής γυμναστικής, σωματικής διάπλασης, πολεμικών τεχνών, χορού, ρυθμικής κά.)***

Κύκλωσε ΕΝΑ αριθμό

1=Οχι, ποτέ δεν ήμουν μέλος σε ιδιωτικό γυμναστήριο
2=Οχι τώρα πλέον, αλλά ήμουν στο παρελθόν
3=Ναι, είμαι μέλος ιδιωτικού γυμναστηρίου και προπονούμαι κανονικά
4=Ναι, είμαι μέλος και επίσης συμμετέχω σε διάφορες εκδηλώσεις

1 2 3 4

22. Αν ΔΕΝ είσαι μέλος σε κανένα ιδιωτικό γυμναστήριο, τότε πήγαινε στην ερώτηση 26. Αν είσαι ενεργό μέλος, πόσες φορές προπονήθηκες ή αγωνίστηκες τις τελευταίες 7 ημέρες ***(συμπεριλαμβάνοντας και το Σαββατοκύριακο)*****;**

Κύκλωσε ΕΝΑ αριθμό

1=Καθόλου 2=Μία φορά 3=2 φορές 4=3 φορές
5=4 φορές 6=5 φορές 7=6 φορές

1 2 3 4 5

23. Πόσο χρόνο διαρκεί συνήθως η προπόνησή σου στο γυμναστήριο που είσαι μέλος;

Κύκλωσε ΕΝΑ αριθμό

1=Περίπου 30 λεπτά 2=Μεταξύ 30-60 λεπτών
3=Μεταξύ 60-90 λεπτών 4=Περισσότερο από 90 λεπτά

1 2 3 4

24. Με ποια από τις παρακάτω αθλητικές δραστηριότητες ασχολείσαι στο γυμναστήριο;

1=Πολεμικές Τέχνες 2=Αεροβική Γυμναστική 3=Σωματική διάπλαση
4=Χορός/ρυθμική 5=Ενόργανη Γυμναστική 6=Τένις, κολύμπι
7=Κάτι άλλο *(τι είναι αυτό;)*.....

1 2 3 4 5 6

20. Which sport do you practise? Please, write down the sport in which you participate out of school and also the age in which you started training .

1. I started to compete in _____ in age of _____ years old
2. I started to compete in_____ in age of _____ years old
3. I started to compete in _____ in age of _____ years old

Describe your participation in private gyms, fitness centers or dance schools in out of school hours

21. Are you a <u>member or an athlete</u> in any private gym out of school school? *(for example in aerobic class, body boulding, martial arts, dance, gymnastics etc)*

<u>Circle ONE number</u>

1 = No,I never was a member in a private gym
2 = Not currently, but I was in the past
3 = yes, I am a member of a private gym and I train regularly
4 = Yes, I am member <u>and I also</u> participate in various sports events **1 2 3 4**

22. If you are not member in any private gym, then go to question 26. If you are a regular member, how many times did you train or compete during the last 7 days ***(including the Weekend)*****?**

<u>Circle ONE number</u>

1 = Never 2 = Once 3 = 2 times 4 = 3 times
5 = 4 times 6=5 times 7=6 times **1 2 3 4 5 6 7**

23. How much time does your training in the gym usually last?

<u>Circle ONE number</u>

1 = About 30 min 2 = Between 30-60 min
3 = Between 60-90 min 4 = More than 90 min **1 2 3 4**

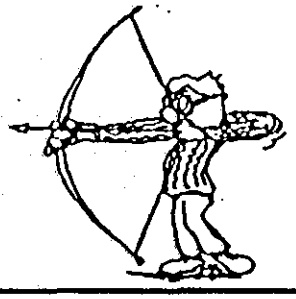
24. Which of the following sport activities do you practise in the gym?

<u>Circle ONE number</u>

1 = Martial Arts 2 = Aerobic Gymnastics 3 = Body building
4 = Dance/rhythmics 5 = Gymnastics 6 = Tennis, swimming
7 = Other *(what is it)*..... **1 2 3 4 5 6 7**

25. Τις τελευταίες 7 ημέρες, κατά τη διάρκεια των προπονήσεών σου στο γυμναστήριο, πόσες φορές ασκήθηκες με τέτοια ένταση ώστε να λαχανιάσεις για τουλάχιστον 20 λεπτά;

Κύκλωσε ΕΝΑ αριθμό

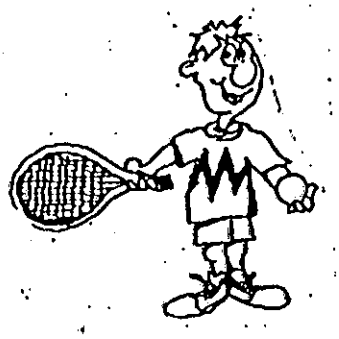


1=Δεν ασκήθηκα την τελευταία εβδομάδα
2=Ποτέ δεν λαχάνιασα τόσο πολύ
3=1-2 φορές
4=3-4 φορές
5=Σχεδόν σε κάθε προπόνηση 1 2 3 4 5

Περίγραψε τη συμμετοχή σου σε φυσικές δραστηριότητες αναψυχής κατά τη διάρκεια του ελεύθερου χρόνου σου!

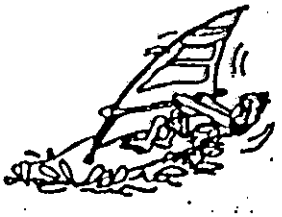
Σ' αυτό το τμήμα του ερωτηματολογίου θέλουμε να μας πληροφορήσεις για τη συμμετοχή σου σε φυσικές δραστηριότητες και σπορ στον ελεύθερο χρόνο σου, χωρίς να υπολογίσεις τη συμμετοχή σου σ' αθλητικούς συλλόγους και ιδιωτικά γυμναστήρια!

26. Εχεις συμμετάσχει σε κάποια από τις παρακάτω δραστηριότητες για παιχνίδι ή διασκέδαση στον ελεύθερο χρόνο σου τις τελευταίες 7 ημέρες ***(συμπεριλαμβάνοντας το τελευταίο Σαββατοκύριακο)*** **που είχαν διάρκεια τουλάχιστον 20 – 40 λεπτά; Αν 'ΝΑΙ', πόσες φορές;** ***(Παρακαλώ κύκλωσε ΕΝΑ αριθμό για ΚΑΘΕ δραστηριότητα)***



Κύκλωσε ΕΝΑ αριθμό
για ΚΑΘΕ δραστηριότητα

	Ποτέ	Μία φορά τη βδομάδα	2-3 φορές τη βδομάδα	4-5 φορές τη βδομάδα	Σχεδόν καθημερινά
Σχοινάκι	1	2	3	4	5
Κωπηλασία	1	2	3	4	5
Πατίνια (Roller) ή σανίδα (Skate)	1	2	3	4	5
Περπάτημα για άσκηση	1	2	3	4	5
Ποδηλασία για άσκηση	1	2	3	4	5
Τρέξιμο ή ανώμαλο δρόμο	1	2	3	4	5
Αεροβική γυμναστική	1	2	3	4	5
Κολύμβηση	1	2	3	4	5
Χορός (παραδοσιακός ή μοντέρνος)	1	2	3	4	5
Ποδόσφαιρο	1	2	3	4	5
Βόλεϊ	1	2	3	4	5
Μπάσκετ	1	2	3	4	5
Χαντ-μπόλ	1	2	3	4	5
Τένις	1	2	3	4	5



25. During your training in the gym in the last seven days, how many times did you practice with such intensity that you were 'huff and puff' or out of breath for at least 20 min?

Circle ONE number

1 = I did not practice last week
2 = I was never out of breath so much
3 = 1-2 times
4 = 3-4 times
5 = Almost every time

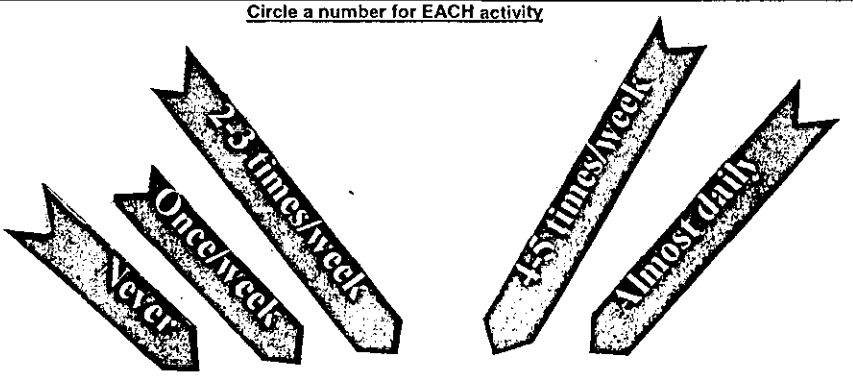
1 2 3 4

Describe your participation in recreational physical activities during your free time!

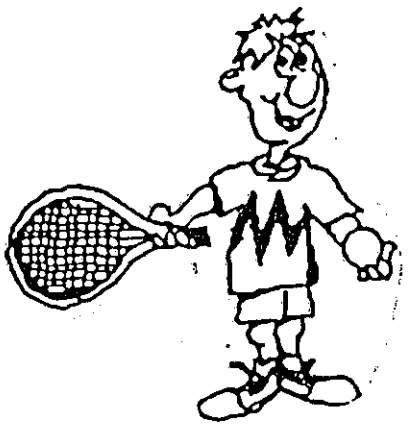
In this section of the questionnaire we want your information regarding your your participation in physical activities and sports during your free time!

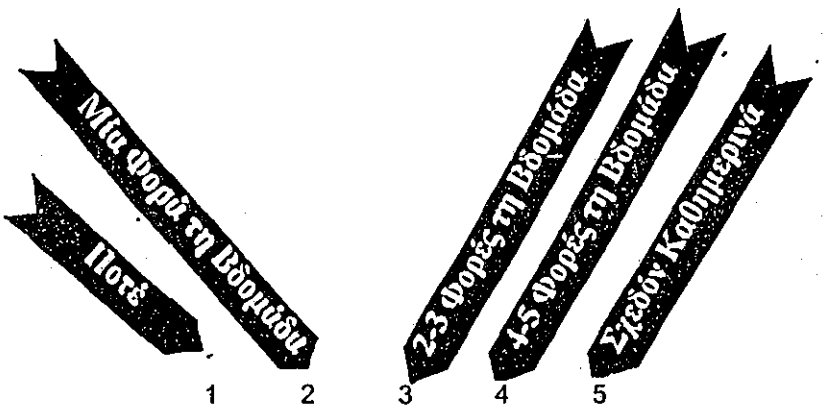
26. Did you participate in some of the following activities for play or recreation in your free time during the last 7 days *(including last Weekend)* **for at least 20-40 minutes? If so, how many times?**
(Circle a number for EACH activity).

Circle a number for EACH activity



Rope jumping	1	2	3	4	5
Rowing	1	2	3	4	5
Roller skating or board skating	1	2	3	4	5
Walking	1	2	3	4	5
Cycling	1	2	3	4	5
Jogging	1	2	3	4	5
Aerobics	1	2	3	4	5
Swimming	1	2	3	4	5
Dance (traditional or modern)	1	2	3	4	5
Football	1	2	3	4	5
Volleyball	1	2	3	4	5
Basketball	1	2	3	4	5
Handball	1	2	3	4	5
Tennis	1	2	3	4	5
Badminton	1	2	3	4	5
Sailing	1	2	3	4	5
Fighting /boxing /martial arts /weights	1	2	3	4	5
Other	1	2	3	4	5





Μπάτμιντον	1	2	3	4	5
Ιστιοπλοΐα	1	2	3	4	5
Πάλη / πυγμαχία / πολεμικές τέχνες / βάρη	1	2	3	4	5
Κάτι άλλο *(αν υπάρχει, γράψε τι είναι αυτό)*	1	2	3	4	5

.....

. Συμμετέχοντας για διασκέδαση σε κάποιες από τις δραστηριότητες της προηγούμενης ερώτησης τις τελευταίες 7 ημέρες, πόσες φορές ασκήθηκες με τέτοια ένταση ώστε να λαχανιάσεις για διάστημα τουλάχιστον 20 λεπτών;

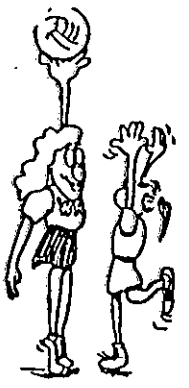
Κύκλωσε ΕΝΑ αριθμό

1=Δε συμμετείχα την τελευταία εβδομάδα σε δραστηριότητες αναψυχής
2=Ποτέ δεν ασκήθηκα αρκετά έντονα την τελευταία εβδομάδα
3=1-2 φορές ήμουν λαχανιασμένος για τουλάχιστον 20 λεπτά
4=3-4 φορές ήμουν λαχανιασμένος για τουλάχιστον 20 λεπτά
5=Σχεδόν κάθε φορά ασκούμαι πολύ έντονα και λαχανιάζω **1 2 3 4 5**

Πόσες φορές κατά τη διάρκεια του τελευταίου Σαββατοκύριακου ασχολήθηκες με φυσικές δραστηριότητες, σπορ, χορό ή με ομαδικά αθλητικά παιχνίδια, σε διαφορετικές ώρες της ημέρας *(πχ. πρωί, μεσημέρι, απόγευμα ή βράδυ)* για τουλάχιστον 20 λεπτά;

Κύκλωσε ΕΝΑ αριθμό

ε συμμετείχα την τελευταία εβδομάδα σε φυσικές δραστηριότητες & σπορ
ιοτέ δεν συμμετείχα σε αθλητικές δραστηριότητες το περασμένο Σαββατοκύριακο
ία φορά για τουλάχιστον 20 λεπτά
ε 2-3 διαφορετικές περιπτώσεις για τουλάχιστον 20 λεπτά
ε 4-5 διαφορετικές περιπτώσεις για τουλάχιστον 20 λεπτά
6=Ασκήθηκα περισσότερες από έξι φορές **1 2 3 4 5 6**



27. Participating for fun in some of the activities of previous question in the last 7 days, how many times did you practice with such intensity that you were 'huff and puff' or out of breath at least for 20 min?

Circle ONE number

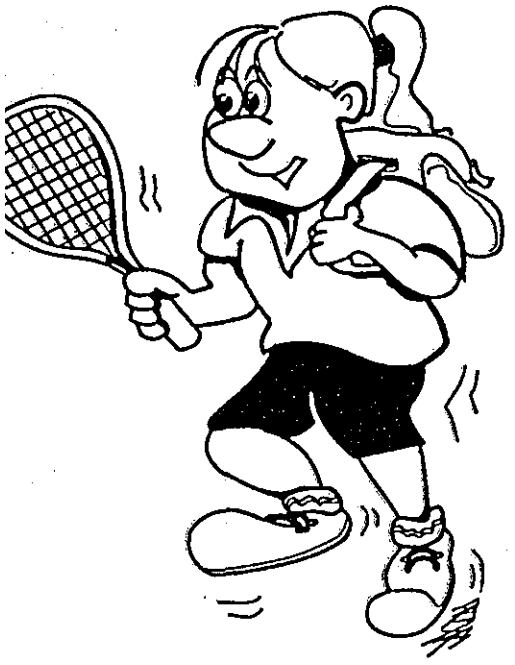
1 = I did not participate in any recreation activities during the last week
2 = I never practiced intensely enough during the last week
3 = 1-2 times I was out of breath for at least 20 thin
4 = 3-4 times I was out of breath for at least 20 thin
5 = Almost every time I practiced very intensely and I was out of breath 1 2 3 4 5

28. How many times during the last weekend did you participate in physical activities, sports, dance or with sport team games, in different occasions *(for example, in the morning, in the middle of the day, in the afternoon or in the evening)* **for at least 20 min ?**

Circle ONE number

1 = Last week I did not participate in any physical activities or sports
2 = I never participated in any sports activities the during the last Weekend
3 = Once for at least 20 thin
4 = In 2-3 different cases for at least 20 thin
5 = In 4-5 different cases for at least 20 thin
6 = I was practised more than six times 1 2 3 4 5 6

29. Σκέψου το ΣΥΝΟΛΟ της φυσικής δραστηριότητας και των σπορ που έκανες τις τελευταίες 7 μέρες *(συμπεριλαμβάνοντας τις μετακινήσεις σου, τη συμμετοχή σου σε αναψυχή, τη σχολική φυσική αγωγή και την πιθανή εξάσκησή σου σε αθλητικούς συλλόγους ή γυμναστήρια).* Τώρα αξιολόγησε ΚΑΘΕΜΙΑ μέρα της εβδομάδας που πέρασε σε σχέση με τη δραστηριότητά σου.



Κύκλωσε ΕΝΑ αριθμό για ΚΑΘΕ μέρα

	Δεν Ασκήθηκα Καθόλου	Ασκήθηκα Λίγο	Ούτε πολύ-Ούτε λίγο	Ασκήθηκα Αρκετά	Ασκήθηκα Πολύ
Δευτέρα	1	2	3	4	5
Τρίτη	1	2	3	4	5
Τετάρτη	1	2	3	4	5
Πέμπτη	1	2	3	4	5
Παρασκευή	1	2	3	4	5
Σάββατο	1	2	3	4	5
Κυριακή	1	2	3	4	5

30. Υπήρξε κάτι που σε εμπόδισε να συμμετάσχεις στις συνηθισμένες σου φυσικές δραστηριότητες και σπορ τις τελευταίες 7 ημέρες *(πχ. αδιαθεσία, αρρώστια, καιρός, σχολικές εξετάσεις)*;

Κύκλωσε ΕΝΑΝ αριθμό

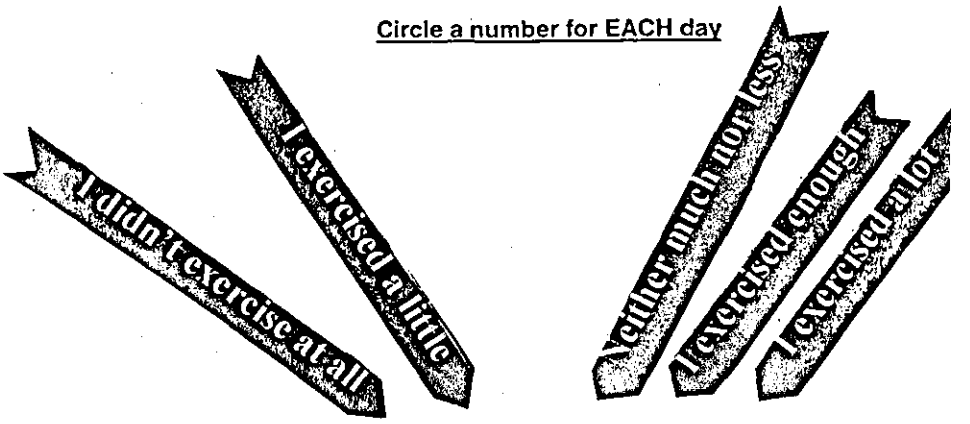
1=ΝΑΙ 2=ΟΧΙ 1 2

Αν απάντησες 'ΝΑΙ', τι σ' εμπόδισε;

Σ' ευχαριστούμε για τη συνεργασία!

29. **Think of all the physical activities and sports during the last 7 days** *(including your transportation, your recreation, school physical education and any training in sports clubs or gyms).* **Now evaluate EACH day of the last week regardinging your activity.**

Circle a number for EACH day



Monday	1	2	3	4	5
Tuesday	1	2	3	4	5
Wednesday	1	2	3	4	5
Thursday	1	2	3	4	5
Friday	1	2	3	4	5
Saturday	1	2	3	4	5
Sunday	1	2	3	4	5

30. **Was there anything that prevented you from participating in your usual physical activities and sports during the last 7 days** ***(for example, illness, uncomfortable weather conditions, school examinations, something else.....)*****?**

Circle a number

1 = YES 2 = NO **1 2**

If you answered ` YES', what prevented you?

_____

_____

_____

We thank you for your collaboration!

APPENDIX 1c

Informed consent

Αθήνα, Φεβρουάριος 1999

Αγαπητέ γονέα/κηδεμόνα,

Όπως πιθανά γνωρίζετε η υγεία των παιδιών εξαρτάται σε μεγάλο βαθμό από την τακτική συμμετοχή σε φυσική δραστηριότητα και σε σπορ. Ο σύγχρονος τρόπος ζωής έχει περιορίσει αισθητά τις ώρες του δραστήριου παιχνιδιού με αποτέλεσμα να αυξάνει συνεχώς ο αριθμός των παιδιών που έχουν υιοθετήσει ένα καθιστικό τρόπο ζωής. Στη χώρα μας πρόσφατες έρευνες έδειξαν ότι το ένα στα τέσσερα παιδιά του δημοτικού σχολείου είναι υπέρβαρο ενώ η πλειοψηφία φαίνεται να έχει μειωμένες κινητικές ικανότητες σε σχέση με την ηλικία τους.

Στα πλαίσια των προσπαθειών που καταβάλλονται διεθνώς για την προώθηση του δραστήριου τρόπου ζωής εντάσσεται μια έρευνα στην οποία θα επιθυμούσαμε να συμμετέχει και το παιδί σας. Σκοπός της έρευνας είναι η αξιολόγηση της δραστηριότητας του παιδιού σας. Αυτό θα γίνει με τη χρήση δύο ερωτηματολογίων και ενός καταγραφέα κίνησης (το επιταχυνσιόμετρο CSA). Το CSA είναι ένα όργανο σε μέγεθος ρολογιού και προσαρμόζεται με ελαστική ζώνη στη μέση του δοκιμαζόμενου αφού τοποθετηθεί σε ειδική θήκη και χρησιμοποιείται διεθνώς σε ανάλογες μελέτες.

Θα σας παρακαλούσαμε λοιπόν να συμβάλλετε σε αυτή μας την προσπάθεια δίνοντας έγγραφα τη συγκατάθεσή σας. Το παιδί σας θα συμμετέχει εθελοντικά. Η συμμετοχή του δεν θα επηρεάσει σε τίποτα την απρόσκοπτη συμμετοχή του στα μαθήματα και την καθημερινή δραστηριότητά του.

Σας ευχαριστούμε εκ των προτέρων για τη συνεργασία.

Συγκατάθεση για συμμετοχή σε έρευνα

Ονοματεπώνυμο γονέα/κηδεμόνα: .....

Διεύθυνση κατοικίας: .....

Τηλέφωνο: .....

Ενημερώθηκα για τους σκοπούς και τη διαδικασία της έρευνας και δέχομαι να συμμετάσχει η/ο κόρη / γιος *(γράψτε το ονοματεπώνυμο)*

.....

Το παιδί μου θα συμμετάσχει μόνο αν το επιθυμεί το ίδιο. Γνωρίζω επίσης ότι μπορεί να αποχωρήσει από την έρευνα οποιαδήποτε στιγμή κρίνω ότι συντρέχουν λόγοι για ανάλογη απόφαση.

Αθήνα, ... 1999

Υπογραφή γονέα ή κηδεμόνα

APPENDIX 1d

Information letter to the schools' masters

ερίστημιούπολη Θέρμης
101, Θεσσαλονίκη
epistimioupoli Thermis
101, Thermi/Thessaloniki
Fax ++30/31/992180

m.....

Tel ++30 31 992180

all: avgerino@phed.auth.gr

Τομέας Φυσικής Δραστηριότητας και Αναψυχής
Division of Physical Activity and Recreation

Θεσσαλονίκη, 11 Δεκεμβρίου 1998

Προς: Διεύθυνση .....Σχολείου
Θέμα: *Αξιολόγηση της φυσικής δραστηριότητας των μαθητών στο σχολείο.*

Κύριε Διευθυντά,

Η υγεία κάθε ατόμου και ειδικά των παιδιών εξαρτάται σε μεγάλο βαθμό από την τακτική εμπλοκή του σε φυσική δραστηριότητα και σπορ. Το σχολείο είναι ο τόπος όπου εδραιώνονται θετικές στάσεις και συμπεριφορές προς ένα τρόπο ζωής που διέπεται από υψηλές αξίες προς την υγεία. Θα επιθυμούσαμε λοιπόν με τη δική σας συνεργασία και τη συνεργασία των γονέων να συλλέξουμε ορισμένα δεδομένα που αφορούν τη φυσική δραστηριότητα επιλεγμένων μαθητών τόσο τις ώρες που βρίσκονται στο σχολείο όσο και τις ώρες εκτός σχολείου. Τα στοιχεία που θα συλλεγούν θα βοηθήσουν στην κατανόηση σημαντικών παραμέτρων της φυσικής δραστηριότητας των μαθητών ενώ παράλληλα θα μπορέσετε να αξιοποιήσετε παραγωγικά αυτές τις πληροφορίες.

Τα δεδομένα που απαιτούνται θα συγκεντρωθούν με τη χρήση ενός καταγραφέα κίνησης (το επιταχυνσιόμετρο CSA) και ενός ερωτηματολογίου. Τα δύο όργανα έχουν εγκριθεί από το Παιδαγωγικό Ινστιτούτο σε προηγούμενες έρευνες και η χρήση τους δεν εγκυμονεί κανένα κίνδυνο για τους μαθητές ούτε πρόκειται να διαταράξει την εύρυθμη λειτουργία του σχολείου. Το όργανο θα φορεθεί για τέσσερις συνεχόμενες ημέρες από 30 συνολικά μαθητές -τριες της Α΄ γυμνασίου που θα επιλεγούν τυχαία και θα εκτελούν τις τυπικές καθημερινές τους δραστηριότητες. Οι μαθητές αυτοί δεν πρόκειται να υποβληθούν ***σε καμία δοκιμασία σωματικής απόδοσης τόσο στο σχολικό περιβάλλον όσο εκτός σχολείου.*** Η συμμετοχή των μαθητών θα γίνει μετά από έγγραφη έγκριση των γονέων τους και την συναίνεση των ιδίων.

Πιστεύουμε ότι αυτή η προσπάθεια θα συνεισφέρει σημαντικά στο να αποκτήσετε εσείς και οι γονείς μια ολοκληρωμένη εικόνα της φυσικής δραστηριότητας των μαθητών που φοιτούν στο σχολείο σας. Έτσι θα μπορέσετε αν το επιθυμείτε να οργανώσετε κάποιο πρόγραμμα παρέμβασης με στόχο την προώθηση του δραστήριου τρόπου ζωής.
Σας ευχαριστώ εκ των προτέρων για τη συνεργασία.

Με ακαδημαϊκούς χαιρετισμούς

Αυγερινός Γ. Ανδρέας
Καθηγητής Φ. Αγωγής

APPENDIX 2a

Questionnaire to Teachers

Code : ☐☐☐☐☐☐

(NOT clerks nothing in the this line)

Dear colleague,

The questionnaire that you are holding is anonymous and absolutely confidential. Its objective is to record your opinions and needs in subjects concerning the implementation of Health Related Education programs in the school. No one from your school or the local board of education will have access to it!

1. **Date of birth:** _____/_____/_____
   date / month / year

2. **Sex:** Male ☐ Female ☐

3. **Family Situation:** Married with _____ children ☐

   Married without children ☐

   Single ☐

4. **Education:** Bachelor of the Dept of PE and Sports Science of the university (please report the university) _____ at the year 19 _____ specialized in _____ (please report your specialization).

5. **Time of service in elementary or secondary education:**

   1-3 yrs ☐ **4-8 yrs** ☐ **9-15 yrs** ☐ **More than 15 yrs** ☐

6. **Other studies/degrees or post graduate degrees:** **Yes** ☐ **No** ☐

   If `Yes', please give more details: **1)** _____ **2)** _____

   3) _____ **4)** _____

7. During the last four years did you attend any scientific *Congress or Symposium* about school physical education or the competitive sports?

Yes ☐ No ☐

If you answered `Yes', in how many did you participate: _____ (number)

8. During the last four years did you attend any seminar(s) *related* to school physical education or competitive sports?

Yes ☐ No ☐

If you answered `Yes', in how many did you participate: _____ (number)

9. Are you currently working or have you ever worked in the past out of school in any job related to your degree (e.g. trainer in a sports club, in private fitness center, fitness instructor, coach, etc)

Yes ☐ No ☐

If you answered `Yes', what was the subject of your work: .....

.....

This work has/had to do with children of school age?

Yes ☐ No ☐

10. Do you know any foreigner language (in such as level that you can adequately understand a book or a scientific article)?

Yes ☐ No ☐

If you answered `Yes', what language(s) do you know .....

[please mention the language(s)]

11. Do you know how to use a computer and utilize the new technologies (e.g. Internet, e-mail)?

NOT AT ALL ☐ A LITTLE ☐ SATISFACTORY ☐ VERY WELL ☐

12. In a scale out of ten degrees my knowledge as how to organize a Health Related Exercise program in my school is *(circle only one number)*:

(No knowledge) **1 2 3 4 5 6 7 8 9 10** (Plenty of knowledge)

(Some knowledge)

13. To implement a new program of physical education in my school is for me.....

(Circle ONE of the 7 choices for EACH one from the 4 following pairs of adjectives):

Difficult:	*very*	*enough*	*little*	*Neither difficult nor easy*	*little*	*enough*	*very*	**:Easy**
Attractive:	*very*	*enough*	*little*	*Neither difficult nor easy*	*little*	*enough*	*very*	**:Repulsive**
Tiresome:	*very*	*enough*	*little*	*Neither difficult nor easy*	*little*	*enough*	*very*	**:Refreshing**
Useful:	*very*	*enough*	*little*	*Neither difficult nor easy*	*little*	*enough*	*very*	**:Useless**

Mark <u>how much you agree or disagree</u> with each of the following statements by circling the point of scale that expresses you more.

14. How sure are you that you can organize a Health Related Exercise program in your school *(circle ONE of the following choices)*?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

15. How sure are you that you can change the bad habits of your students in general?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

16. How sure are you that you can influence your students on giving up smoking?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

17. How sure are you that you can influence the students so that they don't consume alcohol?

Too sure	*Very*	*Enough*	*Neither sure or ensure*	*Little*	*Very little*	*Not at all sure*

18. How sure are you that you can influence your students so that they exercise regularly in their free time?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

19. How sure are you that you can influence your overweight or obese students so that they start a diet?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

20. How sure are you that you can influence the students so that they prefer a healthy diet?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

21. How sure are you that a Health Related Exercise program that you implement in the future will likely have results with your students?

Too sure	*Very*	*Enough*	*Neither certain nor uncertain*	*Little*	*Very little*	*Not at all sure*

22. How interested are you to participate in training seminars relevant to school physical education?

Too much	*Very*	*Enough*	*So and so*	*Little*	*Very little*	*Not at all*

We thank you for your collaboration!

APPENDIX 2b

Check list of the school profile

School _____ **Code:** _____

Teacher: **PE Teacher:**

ax: **E-mail:**

ıber of students:		**Number of staff:**	
ll:		Mean age of staff:	
ents/class:			

ber of PE teachers or other sport staff: ☐

ɔortive sport facilities

; there changig facilities	Yes	☐	No	If 'Yes', how many?	☐
; there showering facilities	Yes	☐	No	If 'Yes', how many?	☐

ther common areas (Computer lab, theather, chemistry lab, school hall, other.....)

'e there indoor sport areas? Yes ☐ No ☐

es' what areas? (e.g. gym, sports hall, fitness room, dance studio, other.....)

'e there outdoor sports areas? Yes ☐ No ☐

es' what areas? (e.g. hard play area, hard play, basketball/handball court, athletics track)

't equipment (e.g. balls, ropes, steps, free weights, medicine balls, other.....)

o	Yes	☐	No	☐
ıputer	Yes	☐	No	☐
	Yes	☐	No	☐

ere school library? _____ Yes ☐ No ☐

here educational video-tapes? Yes ☐ No ☐

ere any other progamme running at school? Yes ☐ No ☐

s', what programme (s)?

of school buildings 1-5 yrs ☐ 6-10 yrs ☐ 11-15 yrs ☐
16-20 yr ☐ More than 20 yrs ☐

lents' performance (mean)

Middle school		Elementary school		
0-Δεκ	%	6	%	**% students who quit the school per year.** ☐
2,1-14	%	7	%	
4,1-16	%	8	%	
6,1-18	%	9	%	
8,1-20	%	10	%	

f participation in seminars - training programmes the previous 12 months.

d teacher: Yes ☐ No ☐ If 'yes', please report:

eacher (s): Yes ☐ No ☐

r staff: Yes ☐ No ☐

t graduate studies or other academic qualifications

eacher (s): Yes ☐ No ☐ If 'yes', please report:

r staff: Yes ☐ No ☐

there any extra curricular activities? Yes ☐ No ☐

es', what activities?

ere any school sport team (s)? Yes ☐ No ☐

s' what team (s)?

s the school participate in the local league? Yes ☐ No ☐

Is there any sport facility near of the school? Yes ☐ No ☐

s' what facility? Please, report:

lents' participation in organized sport activity out of school (%) (e.g. sport clubs, fitness centres, ial arts, other.....)

APPENDIX 3a

IMI Questionnaire

ΦΟΡΜΑ ΑΞΙΟΛΟΓΗΣΗΣ ΠΡΟΓΡΑΜΜΑΤΟΣ ΑΠΟ ΤΟΝ ΜΑΘΗΤΗ

Σχολειο: Κωδικός:

Αγαπητέ μαθητή/ μαθήτρια,

Αυτό το ερωτηματολόγιο σου ζητά να μας πεις τη γνώμη σου για το πρόγραμμα που παρακολούθησες στο μάθημα της γυμναστικής την φετινή χρονιά.

- Απάντησε σε όλες τις ερωτήσεις. Οι απαντήσεις σου θα μας βοηθήσουν στην καλυτέρευση του προγράμματος.
- Το ερωτηματολόγιο είναι **ανώνυμο** και απόλυτα εμπιστευτικό.
- Δεν υπάρχουν σωστές και λαθεμένες απαντήσεις.

Απάντησε βάζοντας ένα (Χ) στην επιλογή που σε εκφράζει περισσότερο	**Συμφωνώ απόλυτα**	**Συμφωνώ**	**Ούτε συμφωνώ ούτε διαφωνώ**	**Διαφωνώ**	**Διαφωνώ Απόλυτα**
1.Το πρόγραμμα στο μάθημα της γυμναστικής μου άρεσε πάρα πολύ					
2. Νομίζω ότι τα κατάφερα καλά στο πρόγραμμα					
3. Κατέβαλλα μεγάλη προσπάθεια κατά την διάρκεια του προγράμματος					
4. Ήταν σημαντικό για εμένα να τα πάω καλά σε αυτό το πρόγραμμα					
5. Αισθάνθηκα άγχος κατά την διάρκεια του προγράμματος					
6. Προσπάθησα πολύ σκληρά στην διάρκεια του προγράμματος					
7.Τα μαθήματα του προγράμματος ήταν ευχάριστα					
8. Θα έλεγα ότι το πρόγραμμα που είχαμε στο μάθημα της γυμναστικής ήταν πολύ ενδιαφέρον					
9. Είμαι ικανοποιημένός με την απόδοσή μου στο πρόγραμμα					
10. Αισθάνθηκα πίεση από τις δραστηριότητες του προγράμματος					
11. Δεν τα κατάφερα πολύ καλά στα μαθήματα του προγράμματος					
12. Δεν προσπάθησα πολύ σκληρά κατά την διάρκεια του προγράμματος					
13. Όταν έκανα το μάθημα σκεφτόμουν πόσο πολύ μου αρέσει					
14. Ήμουν πολύ ήρεμος/η τις ώρες του προγράμματος					
15. Δεν ήμουν συγκεντρωμένος/η όταν εκτελούσα τις διάφορες δραστηριότητες του προγράμματος					
16. Νομίζω ότι τα πήγα καλά στο πρόγραμμα					
17. Τα μαθήματα του προγράμματος ήταν μια ενδιαφέρουσα εμπειρία					
18. Είχα αγωνία καθώς έκανα τις διάφορες δραστηριότητες του προγράμματος					
19. Τις περισσότερες φορές μπορούσα να ανταποκριθώ στις απαιτήσεις τους προγράμματος					
20. Δεν είχα καθόλου άγχος στα μαθήματα του προγράμματος					

Αγόρι ☐ Κορίτσι ☐

Σε ευχαριστούμε πολύ για την συνεργασία!

Appendix 3a: Intrinsic Motivation Inventory

Please read carefully and answer the following questions by checking (X) in the appropriate box	Strongly agree	Agree	Neither agree Nor disagree	Disagree	Strongly disagree
1. I enjoyed the program in P.E. class very mush					
2. I thing I was pretty good at the program.					
3. I put a lot of effort into the program					
4. It was important for me to do well in that program					
5. I was anxious during the program					
6. I tried very hard during the program					
7. The program was fun					
8. I would describe the program in PE class as very interesting					
9. I am satisfied with my performance in the program					
10. I felt tense during the program					
11. I couldn't do very well at the program					
12. I didn't try very hard during the program					
13. While doing different activities of the program, I was thinking how mush I enjoyed them					
14. I was relaxed during the program					
15. I wasn't focused, when I was performing activities of the program.					
16. I am pretty good at the program					
17. I would describe the courses in P.E. class as a very good experience					
18. I felt pressure while performing activities of the program					
19. Most of the times I was able to response to the requirements of the program.					
20. I wasn't nervous during the program					

Male ☐ Female ☐

APPENDIX 3b

Student's evaluation form

Appendix 3b: Students' evaluation form (Original form in Greek)

Αγαπητέ μαθητή/μαθήτρια,

Αυτό το ερωτηματολόγιο σου ζητά να μας πεις τη γνώμη σου για το σημερινό μάθημα φυσικής αγωγής.

- **Απάντησε σ' όλες τις ερωτήσεις!**
- **Το ερωτηματολόγιο είναι ανώνυμο και απόλυτα εμπιστευτικό! Κανένας από το σχολείο σου ή το οικογενειακό σου περιβάλλον δεν θα έχει πρόσβαση σ' αυτό! ΜΗ γράφεις πουθενά το όνομά σου!**
- **Δεν υπάρχουν σωστές και λαθεμένες απαντήσεις!**

Απάντησε σε κάθε μια από τις προτάσεις βάζοντας ένα 'Χ' στην επιλογή που σ' εκφράζει περισσότερο!	*Συμφωνώ Απόλυτα*	*Συμφωνώ*	*Ούτε συμφωνώ ούτε διαφωνώ*	*Διαφωνώ*	*Διαφωνώ Απόλυτα*
Το σημερινό μάθημα μ' άρεσε πολύ					
Στο σημερινό μάθημα προσπάθησα πολύ					
Στο σημερινό μάθημα αισθανόμουν πίεση και άγχος για να τα καταφέρω καλά					
Το σημερινό μάθημα ήταν ευχάριστη εμπειρία για μένα					
Το σημερινό μάθημα ήταν βαρετό και χωρίς ενδιαφέρον					
Το σημερινό μάθημα ήταν πολύ χρήσιμο για μένα					
Στο σημερινό μάθημα έμαθα πολλά καινούργια πράγματα					
Στο σημερινό μάθημα πραγματικά διασκέδασα					
Στο σημερινό μάθημα ο καθηγητής μου με βοήθησε πολύ					
Στο σημερινό μάθημα ο καθηγητής μου έδωσε να καταλάβω τι ακριβώς ζητούσε να κάνω					
Οι ασκήσεις που έκανα ήταν πολύ δύσκολες για μένα					
Το σημερινό μάθημα που κίνησε το ενδιαφέρον και θα ασχοληθώ περισσότερο όταν θα έχω χρόνο					
Στο σημερινό μάθημα συνεργάστηκα πολύ καλά με τους συμμαθητές μου					
Συνολικά, το μάθημα ήταν πολύ καλό					

Συμπλήρωσε τις παρακάτω προτάσεις

Αυτό που ΔΕΝ μ' άρεσε καθόλου στο μάθημα σήμερα ήταν .....

.....

Για το επόμενο μάθημα θα ήθελα να προτείνω στο (στη) καθηγητή (-τριά) μου να .....

.....

Σ' ευχαριστούμε! ☺

Appendix 3b: Students' evaluation form

Dear student,

This questionnaire asks your opinion about today's PE lesson.

- **Please, answer all questions! This is very important!**
- **The questionnaire is anonymous and absolutely confidential! No-one from the school or family environment will read your answers! Therefore, do not write you name in any page!**
- **There are no right or wrong answers!**

Please read carefully and answer the following questions by checking (X) in the appropriate box:	Strongly agree	Agree	Neither agree Nor disagree	Disagree	Strongly disagree
I enjoyed the program of P.E. class very mush					
I put a lot of effort into today's PE lesson					
In today's PE lesson I was anxious to perform well					
Today's PE lesson was a positive experience for me					
Today's PE lesson was boring and without interesting					
Today's PE lesson was very useful for me					
In today's PE lesson I learned many new things					
Today's PE lesson was really fun					
In today's PE lesson my teacher helped me every time I needed leading					
In today's PE lesson my teacher explained to me very well what exactly he expected from me.					
In today's PE lesson I faced a lot of difficulties					
Today's PE lesson stimulated my interest; I work more in my spare time.					
In today's PE lesson I cooperated very well with my classmates.					
Overall, today's PE lesson was very good!					

Please complete the following sentences:

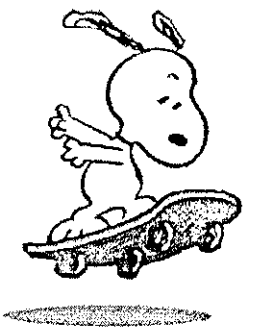
What I didn't' like in today's PE lesson was .....

.....

For the next PE lesson I would like to propose to my teacher .....

.....

Thank you for your collaboration! ☺



APPENDIX 3c

Teacher's evaluation form

Appendix 3c: Teacher's evaluation form (original form)

ΦΟΡΜΑ ΑΞΙΟΛΟΓΗΣΗΣ ΜΑΘΗΜΑΤΟΣ ΑΠΟ ΤΟΝ ΔΙΔΑΣΚΟΝΤΑ

Σχολείο		Εβδομάδα		Ενότητα		Μάθημα	

Βαθμολογώντας με άριστα το 10 αξιολόγησε κάθε μια από παρακάτω τις ερωτήσεις κυκλώνοντας τον αριθμό που σε αντιπροσωπεύει.

Πόσο ευχαριστημένος (-η) είσαι από το σημερινό μάθημα;	1	2	3	4	5	6	7	8	9	10
Πόσο έτοιμος αισθανόσουν να αντιμετωπίσεις τις απαιτήσεις του σημερινού μαθήματος;	1	2	3	4	5	6	7	8	9	10
Σε ποιο βαθμό νομίζεις ότι πέτυχες τους στόχους του μαθήματος;	1	2	3	4	5	6	7	8	9	10

Συμπλήρωσε τις παρακάτω προτάσεις

Τι νομίζεις ότι άρεσε στο σημερινό σου στους μαθητές σου;

.....

.....

Τι νομίζεις ότι ΔΕΝ άρεσε στο σημερινό σου στους μαθητές σου;

.....

.....

- **Για να γίνει πιο αποτελεσματική η σημερινή διδακτική ενότητα προτείνω να:**

α) .....

β) .....

γ) .....

Θεσσαλονίκη, / /1999

Ο ΔΙΔΑΣΚΩΝ

Appendix 3c: Teacher's evaluation form (original form)

EVALUATION FORM

School		Week		Unit		Lesson	

In a scale out of ten degrees, please, mark the following questions by cycling the appropriate number

How pleased are you from today's lesson?	1	2	3	4	5	6	7	8	9	10
How ready did you feel to face the demands of today's lesson?	1	2	3	4	5	6	7	8	9	10
To what extent do you think you won the objectives of the lesson?	1	2	3	4	5	6	7	8	9	10

Please, complete the following sentences:

What do you think your students liked/enjoyed about today's lesson?

.....

.....

What do you think your students did NOT like/enjoy about today's lesson?

.....

.....

- **For making this unit more effective I suggest to:**

a) .....

b) .....

c) .....

Tessaloniki, / /1999

The PE teacher