Greek young peoples’ lifestyles with focus on physical (in)activity and overweight/obesity -
- a review of the research literature

Konstantin Kougioumtzis
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1 Introduction and aims

The four main non-communicable diseases\(^1\) (NCD’s) are connected to the 60% of deaths each year globally (WHO, 2008). A sedentary lifestyle, a poor nutrition and smoking are linked to the leading causes of NCD’s and premature death (Mokdad, Marks, Stroup, & Gerberding, 2004), while lack of physical activity (PA) aggravates the situation (Mihas et al., 2009). The protective effects of PA have been reported in people of all ages (Pedersen & Saltin, 2006). However, physical inactivity remains a major public health concern (Blair, 2009). Moreover, health risks are not affecting all people equally due to socioeconomic and gender inequalities (WHO, 2010).

It can be argued that health behaviour during childhood and adolescence influence adult behaviour and health (Jiménez-Pavón et al., 2011). There is a compelling evidence that PA is associated with health benefits during childhood and adolescence (Ruiz et al., 2011). Nevertheless, “[c]hildhood obesity is an acute health crisis” (IOTF/EASO, 2002, p. 3). The rising prevalence of overweight and obesity among children and adolescents in Europe is highlighted elsewhere (IOTF, 2005; Manios & Costarelli, 2011). Several studies have corroborated connections between body fat, physical fitness and sedentary lifestyle, while the map of the phenomenon is far from replete (Moreno, Pigeot, & Ahrens, 2011; Rey-López, Vicente-Rodríguez, Bueno, & Moreno, 2011).

The present report focuses physical activity (PA) among children and adolescents in Greece. More specifically the aim is twofold:

- To describe PA, sedentary lifestyles as well as overweight and obesity reviewing studies published since 2004.
- To identify physically inactive subgroups considering patterns of PA, sedentary behaviour as well as overweight and obesity.

Firstly, the international context will be presented utilizing reviews and international studies. Secondly, the method of the present report will be outlined. Thirdly, the Greek national context will be focused summarizing national projects and specific studies. Finally a critical overview will be established with the identification of physically inactive groups in mind.

1.1 Physical Activity

Physical activity (PA) is a complex set of behaviours that encompass any bodily movement produced by skeletal muscles and result in elevated energy expenditure (Armstrong & Welsman, 2006; Caspersen, Powell, & Christenson, 1985). More specifically, PA is “any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, school activities, playing with friends, or walking to school. Some examples of PA are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, football and surfing” (Roberts, Tynjälä, & Alexander, 2004, p. 91).

A factor related to PA is physical fitness (PF), while both concepts are closely related to cardio-respiratory fitness (CRF). There is increasing evidence that levels of CRF provide strong and independent prognosis about the overall risk of illness, especially from cardiovascular causes (Castillo-Garzón, Ruiz, Ortega, &

\(^1\) Cardiovascular diseases, cancer, chronic respiratory diseases and diabetes
Gutierrez-Saínz, 2007). PA tracking is connected to the tendency of individuals to maintain their rank or position within a group over time (Telama, 2009).

Evaluation (subjective assessment) and/or measure (objective assessment) can be used to describe patterns of PA (Armstrong & Welsman, 2006). The most common subjective methods are self-reports (retrospective questionnaires, activity diaries, mail surveys), interview-administered recalls and proxy reports by parents or teachers. Activity diaries are less appropriate before the age of 15, while self-administered questionnaires should be avoided under the age of 12. Self-administered questionnaires tend to be less precise than those administered by the interviewer. In general, children tend to overestimate vigorous PA and to underestimate moderate PA. Proxy reports with parents or teachers seem to fruitfully assess PA in children before the age of 10, while biases can occur for activities outside home or school respectively. Regarding objective assessment, the most used measures are direct observation, heart-rate monitoring, accelerometers, CRF tests (shuttle run test - SRT) etc.

Health benefits associated with PA have been widely recognized (Sisson & Katzmarzyk, 2008). During the last decades, numerous PA guidelines and recommendations for youth have been presented (Armstrong & Welsman, 2006). Despite recommendations, a remarkably consistent trend can be seen across European countries as less than 20% of 15-year-old girls are meeting the recommendations (Currie et al., 2004). Furthermore, PA declines with age in several European countries.

1.2 Overweight and obesity

Overweight and obesity constitutes a major health risk worldwide, while prevalence of overweight and obesity has increased dramatically during recent years (Pigeot, Moreno, & Ahrens, 2011). Obesity can be defined as "the disease in which excess body fat has accumulated to such an extent that health may be adversely affected" (WHO, 2000, p. 6). The most common measure to classify overweight and obesity is the Body Mass Index (BMI). A BMI value of 25 or more indicate overweight (WHO, 2000). In other cases descriptions can be based on BMI percentile curves, while tracking of overweight and obesity is defined as the persistence of a relative position in a population over time (Pigeot et al., 2011). Besides BMI, skin-fold thickness is another anthropometry-based body composition index. Additionally body composition can be obtained utilizing non-anthropometric methods such as bio-impedance analysis etc (Rodríguez, Pietrobelli, Wang, & Moreno, 2011). Nowadays, the investigation of obesity in youth is conducted with the best quality standards available (Ahrens, Moreno, & Pigeot, 2011). Notwithstanding, the use of different measures, samples and groupings constitutes an obvious limitation (Ahrens et al., 2011).

Overweight and obesity can be regarded mainly as the result of the imbalance between energy intake and expenditure. Some researchers suggest that energy intake is the primary source, while others propose that the modern inactive lifestyle is at least as important as diet (Rey-López, 2011). According to Rodriguez and Moreno (2006) there is not enough evidence that excessive dietary intake causes childhood and adolescence overweight and obesity. "Perhaps more than the increase in energy intake, a reduction in energy expenditure might be considered as the main determinant of the obesity "epidemic" (Rodriguez & Moreno, 2006, p. 299). Major physical transitions and body composition changes occur during childhood and adolescence, while young people have to adjust developing self-esteem and own body image (Mulvihill, Németh, & Vereecken, 2004).
1.3 Physical inactivity and sedentary behaviour

A sedentary behaviour is a major reducer of total energy expenditure (Todd & Currie, 2004). Mapping sedentary behaviour can also be associated with physical inactivity and is thus a complement to measures of PA (Todd & Currie, 2004). However, the findings are rather contradictory as high-level users of electronic media are more physically active than low-level users (Todd & Currie, 2004). During recent years the interest for the study of sedentary behaviours is increasing especially in individuals not meeting criteria for PA (Rey-López et al., 2011). Sedentary behaviour is commonly addressed as screen-based inactivity in terms of TV watching and computer use (Tokmakidis, Kasambalis, & Christodoulous, 2006). Time on homework is also used (Todd & Currie, 2004).

Sedentary behaviour is nowadays addressed in terms of displacing PA and obesogenic effect. Regarding displacement of PA, Rey-López et al (2011) argue that: “it could happen that even if young people meet the current recommendations of screen time, the diverse sedentary behaviour of young people (studying, talking with friends, passive transportation …) could equally produce a low daily total energy expenditure and weight gain to adulthood” (p. 370). Additionally, sedentary behaviour is correlated to unhealthy food habits and country specific connections between TV watching and consumption of sweets (Vereecken, Todd, Roberts, Mulvihill, & Maes, 2006).

1.4 Inequality factors

Health inequality regards differences in health experience and outcomes between different groups according to socioeconomic status (SES), geographical area, age, disability, gender or ethnic group (Whitehead & Dahlgren, 2006). The traditional pattern with a low SES connected to inadequate energy intake is still evident in many developing countries (UNFAO, 2009). However, in most developed countries obesity in both boys and girls correlates negatively with SES (Johnson, Pratt, & Wardle, 2011). It seems that “higher SES individuals have better knowledge of nutrition, more positive attitudes towards healthy lifestyles and are more likely to live in environments in which healthy choices are easier” (Johnson et al., 2011, p. 385). Regarding assessment of SES, parental education is accepted to be the most consistent association with child overweight and obesity, indicating that economic factors are not the primary causes of the SES-obesity relation (Johnson et al., 2011).

During the past decades several environmental changes have influenced PA and sedentary behaviour on one hand and eating habits, dietary preferences and food supplies on the other (Huybrechts, Bourdeaudhuij, & Henauw, 2011). The most important factors related to children’s and adolescent’s lifestyle are connected to technological advances (e.g. remote controllers), schools (e.g. intellectual education), sedentary pastimes (e.g. video game), safety (e.g. traffic), walkability (e.g. outdoor playing), modern transportation (e.g. less walking) and access to sport activities (Huybrechts et al., 2011). Regarding eating, diet and food the impact of fast food meals, unhealthy school environments (e.g. school lunches), advertisements and supermarkets (e.g. pricing of healthy food) are evident (Huybrechts et al., 2011).

Health inequality by gender can be connected to outcomes and behaviours. A principal outcome is the consistent differences in which boys are more likely to be overweight and obese than girls. However, girls are more likely than boys to report negative body image. Furthermore, boys are more likely to engage in PA and also more likely to exceed guidelines for TV watching (Currie et al., 2008). Inequalities on the basis of age during childhood and adolescence are striking as older youngsters re-
port more frequently overweight and obesity, lower PA and higher sedentary behaviour and unhealthy food consumption (Currie et al., 2008). Regarding SES inequalities, children and adolescents from less affluent families are more likely to be overweight and obese as well as to report lower levels of PA and higher levels of sedentary behaviour. This pattern seem to be stronger in the western and northern European countries (Currie et al., 2008). The relationship between adolescent health and family SES is complex. However, it seems that there is an association between SES and PA (Currie et al., 2008). Geographical inequalities can be outlined as the highest rates of overweight and obesity are reported in North America, while Eastern European girls are less likely to be overweight or obese (Currie et al., 2008).

2 International Context

Within this chapter scientific reviews and major international projects are outlined. Scientific reviews summarize large bodies of data, while international projects facilitate consistent comparisons. Regarding projects, the Health Behaviour in School-aged children survey (HBSC), the Healthy Lifestyles by Nutrition in Adolescents study (HELENA) and the European Youth Heart study (EYHS) will be presented.

2.1 Previous reviews

The section is divided in two parts. Firstly, some reviews summarize international findings connected to PA, physical inactivity, sedentary behaviour and overweight/obesity. Secondly, a couple of other reviews epitomize Greek national data. The presentation follows an alphabetical order, while the number of the summarized studies in each review is indicated if information is provided by the author(s).

2.1.1 International reviews

Armstrong and Welsman (2006) reviewed studies focusing PA in European children and adolescents and concluded that PA levels decline through adolescence and PA patterns are sporadic during childhood and adolescence.

Bolte, Tamburlini and Kohlhuber (2009) selected 21 studies to describe environmental inequalities among children in Europe and concluded that a low SES is associated with an increased exposure in health risks and less PA opportunities.

Daugbjerg et al (2009) abbreviated national policy documents from 52 European countries and Former Soviet Union Republics. According to the results, 15 countries have developed 27 national policy documents on PA and health promotion. 21 and 11 documents targeted children and adolescents respectively. Most of the documents incorporate general goals, an implementation plan, a timeframe and a responsible body for the implementation. However, very few documents targeted the most sedentary subgroups of the population. Regarding Greece, no national policy documents on PA and health promotion were identified.

Fogelholm (2010) concentrated 26 studies focusing interrelations between PA and disease risk factors. According to the results having a high BMI, even with a high PA, the risk of NCD is higher than having a normal BMI and a low PA. On the contrary, good physical fitness even with high BMI is protective against NCD maybe due to the specific metabolic profile of physically fit individuals. It is clear that the ideal is to be normal weight, physically fit and physically active. However, as a weight reduction is rather unachievable for most obese individuals, the risks could decrease by increasing PA and improving fitness.

Hallal, Victora, Azevedo and Wells (2006) considered studies related to short- and long-term health effects of adolescent PA and concluded that: a) adolescent PA is
positively associated with adult PA; b) adolescent PA provides a long term protection on both health and maybe on breast cancer; c) sedentary behaviour and poor PA during adolescence are associated with poor adult health; d) adolescent PA provides short-term benefits (e.g. bone and mental health).

Hanson and Chen (2007) summarized studies to establish associations between SES and health behaviour in adolescence. According to the review, lifestyle behaviours like diet and PA are significantly associated with SES as low SES adolescents report poorer nutritional habits and less exercise than high SES adolescents. Regarding PA, low SES teens spend more time indoors as a result of unsafe neighbourhood or lack of green spaces to exercise. Low SES adolescents may also have to work after school to earn spending money or to contribute to the family.

Labree, van de Mheen, Rutten and Foets (2011) abbreviated European studies to describe differences in overweight/obesity and ethnicity among children from native (European) and migrant (usually non-European) origin. In conclusion, the risk of obesity and overweight is higher in immigrant than in native children. More specifically, the prevalence of overweight and obesity in migrant children ranges from 8.9% to 37.5% and from 1.2 to 15.4% respectively, while the prevalence of obesity and overweight in native children ranges from 8.8% to 27.3% and from 0.6% to 11.6% respectively. The comparison of data from migrants’ country of origin with data from migrants themselves indicates that overweight/obesity is more prevalent among the later. PA and dietary patterns are the leading causes of overweight and obesity as well as migration entails a more sedentary lifestyle and nutritional modifications.

Midei and Mathews (2011) epitomized studies focusing interpersonal violence in childhood as a risk factor for obesity. In conclusion, there is a mixed support for the association between neighbourhood safety and obesity. Additionally, childhood interpersonal violence from caregivers and peers can be connected to obesity and central adiposity. However, some bidirectional relationships might be the case as the stigma of being obese may contribute to being bullied.

Moreno et al (2007) compressed studies connected to European adolescents nutritional status, eating habits and PA. According to the results, relationships between PA, physical fitness and a number of cardiovascular risk factor are well documented. PA and fitness during adolescence can have both long- and short terms health benefits. Furthermore, a positive association can be established between obesity in adolescence and cardiovascular diseases in adulthood. Additionally, approximately half of the obese adolescents with a BMI above the 95th percentile become obese adults. In Europe a dramatic increase of obesity is evident among adolescents, with variation on the basis of gender and SES.

Papas et al (2007) scrutinized studies focusing associations between built environment and obesity. According to the results, there is a significant association between some aspects of the built environment and BMI in adolescents, while the built environment as a whole correlated significantly with BMI only in three out of 17 studies. The significant aspects of the built environment regard access to recreational activities, neighbourhood landscape, urban sprawl etc. However, data connected with proximity to public play-space, city parks, sport facilities were contradictory.

Pedersen and Saltin (2006) summed up studies to establish evidence for prescribing exercise in chronic disease. Regarding obesity the results are basically the same as for adults. Training has little effect on weight loss assessed as body weight, while it has a good effect on fat mass and weight maintenance after weight loss. “PA increases energy consumption and induces lipolysis, thereby reducing the fat mass provided that the energy consumption is not compensated for by increased calorie
intake” (Pedersen & Saltin, 2006, p. 15). Furthermore, physical training enhances endothelial function. PA prescription should be individualized while a general recommendation regards 30 min moderate daily exercise. To affect weight markedly, the aim should be one hour of exercise daily (walking, running etc).

Rodriguez and Moreno (2006) evaluated studies to associate dietary intake and body fatness in children and adolescents. In conclusion, “[p]erhaps more than an increase on energy intake, a reduction in energy expenditure might be considered as the main determinant of the obesity epidemic” (Rodríguez & Moreno, 2006, p. 299)

Rokholm, Baker and Sørensen (2010) accessed studies to describe the obesity epidemic levelling off. In conclusion, stability or levelling of is now evident among children and adolescents in several parts of the world. However, heterogeneity with respect to SES and ethnicity is obvious within the studied populations. Regarding European children a levelling off or a decrease in the prevalence of obesity was observed in several countries. Regarding adolescents, a levelling of was observed in Sweden, Netherlands and France, while a decrease was found in England.

Salmon, Booth, Phongsavan, Murphy and Timperio (2007) examined interventions promoting PA among children and adolescents. In conclusion, these interventions seem to be very case-sensitive and transfers of eventual positive results to other settings might be very preliminary. It seem though that “interventions delivered in the school setting that included some focus on physical education, that involved activity breaks, or that included family strategies appeared to be the most effective among children. Among adolescents, interventions in primary care settings and tailored advice/brief counselling appeared to be most effective” (Salmon et al., 2007, p. 154).

Sisson and Katzmarzyk (2008) investigated studies to describe the prevalence of PA in youth and adults. On the basis of the results, the highest prevalence of PA in adolescents can be described in Australia, China, and Ireland while Belgium, France and Tonga showed the lowest prevalence. Additionally the range of adolescents meeting recommendations varies significantly between countries.

Telama (2009) reviewed studies to describe tracking from childhood to adulthood making some major conclusions. In males, PA has low or moderate stability during life transitions. In females, the tracking is lower and in several studies non significant. In both males and females, stability is lower in early childhood than in adolescence as well as lower in transitional phases from childhood to adolescence and from adolescence to adulthood.

Van der Horst, Paw, Twisk and Van Mechelen (2007) summarized studies focusing correlates of PA and sedentary behaviour in youth. According to the results, the most significant determinants during childhood are gender, self efficacy and parental support. In adolescence critical determinants are gender, parental education, attitude, self efficacy, goal orientation/motivation, physical education/school sports participation, family influences, friend support and availability of facilities. Regarding ethnicity, no association could be supported in childhood, while in adolescence the information were insufficient. Furthermore, gender, BMI, ethnicity, SES as well as parental education were associated with sedentary behaviour in adolescence. Notwithstanding, the authors stressed the importance to differentiate between insufficient PA and sedentary behaviours as the later is not the opposite of the former. Sedentary behaviours are multifaceted with specific determinants.

2.1.2 Greek reviews

Tzormpatzakis and Sleap (2007) summed up accounts related to PA and exercise in the general population in Greece. In conclusion, participation in Greece is generally
low, both in absolute (e.g. recommended levels) and comparable (e.g. other countries) terms. More specifically, the majority of Greeks (50%-82%) participate little or not at all. The minority (24%-44%), seemed to exercise little at home. Furthermore, the prevalence of sedentary behaviours varies between 50% and 69% in Athens as well as between 39% and 81% in national level. However, there are some indices that physical inactivity shrank from 24%-61% in 2002 to 3%-28% in 2005. The lowest sedentary behaviours were evident in army recruits and personnel. On the contrary, almost half of the university students adopted a sedentary lifestyle.

According to Tzormpatzakis and Slep the main reasons for PA were health, weight control, fitness and stress management, while lack of time was considered as the main perceived barrier. In general, Greek women are more sedentary than men, while Greek female students exercise less in quantity and frequency than male students. Furthermore, people living in rural areas were more likely to be physically active than those in urban areas. Significant associations between PA and educational level, annual income or SES were not found in the area of Athens. However, age, gender, type of work, marital status, residence and educational background are considered as critical factors. It should be pointed out that Greece had a high proportion of manual workers and farmers in the beginning of the millennium. At the same time Greece had the lowest PA during 1990s and in early 2000s. However, middle 2000s data was promising and could be connected to 2006 Athens Olympics interventions.

Papadimitriou, Douros, Fretzayas and Nicolaidou (2007) revised accounts to establish the trends of body weight in schoolchildren in the 20th century. In conclusion, the gradual increase of weight in both sexes started in the years before the Second World War, decreased during the war and continued to increase during the post war period. However, adolescent girls showed a levelling off between 1981 and 1995.

Roditis, Parlapani, Tzotzas, Hassapidou and Krassas (2009) examined studies connected to predisposing factors of overweight and obesity in Greece from the Second World war until today. In conclusion, both childhood and adult obesity can be considered as an epidemic nowadays in Greece. Adopting a longitudinal perspective a clear tendency of weight increase is evident especially in male adolescents and adults. The delayed but sharp economic growth at that time in combination with the abandoning of the traditional Mediterranean diet might be a possible explanation. It seems that parental obesity, frequent TV watching, low rates of breastfeeding and in adolescents girls smoking and alcohol consumption are the main childhood and adolescence obesity predisposing factors. Regarding associations between obesity and PA the data are contradictory as the phenomenon is complicated and the relevant studies few. Notwithstanding, it can be argued that a sedentary lifestyle probably contributes to excess body weight more than the lack of PA do. Furthermore, both men and women with a lower SES are more likely to be overweight and obese. In children there is a negative correlation between parental education and obesity, while the effect of parental occupation is not significant. Additionally, PA levels are lower in urban areas. Regarding ethnicity, data indicated that abdominal obesity affected Greek males more than immigrant males. Although the energy intake was higher in migrants than in Greeks, the former exercised more than the later. A possible explanation might be the fact that first generation immigrants are less affected by the so called Western-type lifestyle and the associated dietary patterns.

2.2 The HBSC survey

The Health-Behaviour in School-Aged Children (HBSC) survey is a cross-national project aiming to gain insights into health behaviour and lifestyles in European children and adolescents. One of the earliest reports was published 1996
with data from the 1993-1994 survey (King, Wold, Tudor-Smith, & Harel, 1996), while another report was announced year 2000 including information from the 1997/1998 survey (Currie, Hurrelmann, Setertobulte, Smith, & Todd, 2000). Since then, two more reports have been issued with data from the 2001/2002 and 2005/2006 surveys (Currie et al., 2008; Currie et al., 2004). Additionally several articles have been published. Within this report only data from the latest study are summarised. The 2005/2006 HBSC survey highlights health inequalities on the basis of gender, age, geographic and socioeconomic level. Additionally, an increased effort has been given to conceptual development and theory advancement. More specifically, the Family Affluence Scale (FAS) intakes a central position as a composite measure on parents’ occupational status, family affluence (material conditions) and poverty. The sampling strategy as well as the sample size within each country follows the logic of previous HBSC surveys. The total number of respondents in Greece was 3690 individuals that is 1746 boys and 1944 girls or 1087 11-years-old, 1187 13-years-old and 1416 15-years-old (Currie et al., 2008).

Table 1 highlights FAS scores related to the “Active Lifestyles project” countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>FAS 1 (low)</th>
<th>FAS 2 (medium)</th>
<th>FAS 3 (high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>8</td>
<td>31</td>
<td>60</td>
</tr>
<tr>
<td>Sweden</td>
<td>7</td>
<td>38</td>
<td>56</td>
</tr>
<tr>
<td>Belgium (Flemish)</td>
<td>10</td>
<td>42</td>
<td>47</td>
</tr>
<tr>
<td>Germany</td>
<td>13</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>Italy</td>
<td>21</td>
<td>45</td>
<td>33</td>
</tr>
<tr>
<td>Greece</td>
<td>25</td>
<td>47</td>
<td>28</td>
</tr>
</tbody>
</table>

According to table 1, England and Sweden have the highest FAS3 scores, while Italy and Greece have the lowest.

Within the 2005/2006 survey, PA has been obtained through the number of days per week with at least 60 minutes of moderate to vigorous physical activity (MVPA). Regarding sedentary behaviours, weekday television watching is highlighted. Overweight and obesity is emphasized utilizing the BMI index.

The answers of Greek young people’s are summarized in table 2.

Table 2. Greek young people’s health behaviours and health outcomes

<table>
<thead>
<tr>
<th>Activity</th>
<th>Measure</th>
<th>11-years-old</th>
<th>13-years-old</th>
<th>15-years-old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Physical Activity</td>
<td>Meeting MVPA recommendations (%)</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16*</td>
<td>25*</td>
<td>12*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(22)</td>
<td>(30)</td>
<td>(15)</td>
</tr>
<tr>
<td>Weekday TV watching</td>
<td>Two hours or more (%)</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70</td>
<td>68</td>
<td>82*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(60)</td>
<td>(63)</td>
<td>(69)</td>
</tr>
<tr>
<td>Overweight or obesity</td>
<td>Reported weight/height and BMI calculation (%)</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16*</td>
<td>21*</td>
<td>13*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12)</td>
<td>(16)</td>
<td>(10)</td>
</tr>
</tbody>
</table>

Note: HBSC average in parenthesis, * indicates significant gender differences

As it can be seen in table 2, the percentage of Greek young people meeting the MVPA recommendations is lower that the HBSC average per age and gender in all
age and gender groups. Furthermore, Greek girls meet the recommendations to a lesser extent than boys do. Furthermore, a significant association between daily MVPA and FAS is evident only in the case of girls. In aspect of TV watching, more boys than girls are watching TV for two hours or more daily. However, no significant association between TV watching and FAS could be established. Overweight and obesity rates per age and gender group in Greece are higher than the HBSC average with the exception of girls at the age of 15 with a difference of 1% only. Within the country, gender differences are significant for all age groups. However, none significant association was found between family affluence and overweight/obesity.

Karademas, Peppa, Fotiou and Kokkevi (2008) published the preliminary findings of the Greek part of the HBSC 2005/2006 survey targeting the role of family and school in young people's subjective health. According to the results, a small but stable decrease in self-reported health and satisfaction with life is indicated as well as an increase in health complaints with age. Furthermore, the hypothesis that family (communication with parents, parental support) and school factors (satisfaction, pressure) interplay with perceived health and well being is rather validated.

2.3 The HELENA study

The Healthy Lifestyles in Europe by Nutrition in Adolescents Cross-Sectional Study (HELENA-CSS) is a European project focusing nutritional habits, body composition and levels of PA and fitness in 12.5 to 17.5 years old adolescents. Furthermore, the Family Affluence Scale (FAS) have been employed to explore family circumstances such as material conditions (own bedroom, number of cars, PC's, internet access etc.). Ten European cities (ten centres) of more than 100 000 inhabitants in nine countries participated in the project (Athens & Heraclion, Greece; Dortmund, Germany; Ghent, Belgium; Lille, France; Pécs, Hungary; Rome, Italy; Stockholm, Sweden; Vienna, Austria; Zaragoza, Spain). Project results have been published in several articles, while the most relevant for the present review are presented in the following section.

Jimenez-Pavon et al (2010) studied associations between physical fitness and SES in a sample of 3529 adolescents aged 12.5 to 17.5 years from all ten centres. accordance with the results, there is a strong positive association between SES and physical fitness in European adolescents independently of BMI (see also Ortega et al., 2010).

Ruiz et al (2011) studied CRF, PA and sedentary time in a sample of 2200 adolescents aged 12.5 to 17.49 years old from all ten centres. PA has been measured with accelerometer showing the average of total PA as well as the amount of time engaged in MVPA. The SES factor was connected to maternal education, while differences between Southern (Greece, Italy, Spain) and Central-Northern (Austria, Belgium, France, Hungary, Sweden) European countries were evident.

Overall, boys were more active and less sedentary than girls. The median (range) of MVPA was 64 (48-81) and 49 (37-62) minutes per day for boys and girls respectively, while the median (range) of sedentary activity was 9.0 (8.0-9.8) and 9.1 (8.4-9.8) hours per for boys and girls respectively. 56.8% of boys and 27.5% of girls met the recommended activity level of 60 or more minutes of MVPA daily. All gender differences were statistically significant. Furthermore, the average PA of boys was negatively associated to age, while such a trend is neither linear nor significant in girls (Table 3). Daily MVPA decreases linear in boys and non-linear in girls.
Table 3. PA per age group and pubertal stage. Mean (95% CI)

<table>
<thead>
<tr>
<th>Boys</th>
<th>Average Activity (counts/minute)</th>
<th>MVPA (minutes/day)</th>
<th>Average Activity (counts/minute)</th>
<th>MVPA (minutes/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group, years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5-13.49</td>
<td>504 (478-531)</td>
<td>68 (64-72)</td>
<td>396 (378-413)</td>
<td>51 (48-53)</td>
</tr>
<tr>
<td>13.5-14.49</td>
<td>501 (477-526)</td>
<td>68 (64-71)</td>
<td>379 (364-393)</td>
<td>49 (47-51)</td>
</tr>
<tr>
<td>14.5-15.49</td>
<td>481 (460-502)</td>
<td>66 (63-69)</td>
<td>384 (369-398)</td>
<td>51 (49-53)</td>
</tr>
<tr>
<td>15.5-16.49</td>
<td>466 (439-493)</td>
<td>65 (61-69)</td>
<td>390 (374-407)</td>
<td>53 (50-55)</td>
</tr>
<tr>
<td>16.5-17.49</td>
<td>456 (411-501)</td>
<td>61 (54-67)</td>
<td>364 (321-408)</td>
<td>50 (44-57)</td>
</tr>
<tr>
<td>Pubertal stage or stage of sexual maturation (see Tanner and Whitehouse, 1976)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>509 (468-551)</td>
<td>69 (63-75)</td>
<td>390 (328-452)</td>
<td>50 (41-60)</td>
</tr>
<tr>
<td>III</td>
<td>506 (482-530)</td>
<td>69 (65-72)</td>
<td>381 (362-400)</td>
<td>49 (46-52)</td>
</tr>
<tr>
<td>IV</td>
<td>485 (467-502)</td>
<td>66 (64-69)</td>
<td>403 (389-416)</td>
<td>54 (52-56)</td>
</tr>
<tr>
<td>V</td>
<td>502 (473-531)</td>
<td>69 (65-74)</td>
<td>379 (363-395)</td>
<td>50 (48-53)</td>
</tr>
</tbody>
</table>
| Note: CI: confidence interval; the statistical significance of the age trends were a) Average Activity per age group: p = .006 for boys and p = .7 for girls; b) Average Activity per pubertal stage: p = .155 for boys and p = .3 for girls; c) MVPA per age group p = .059 for boys and p = .057 for girls; d) MVPA per pubertal stage: p = .44 for boys and p = .8 for girls.

According to the results, average PA and MVPA was similar across BMI categories, while no significant differences were observed in relation to maternal education. Furthermore, the comparisons between regions revealed a higher average PA level in Central-Northern Europe than in the Southern region, while this difference was more profound in girls than in boys. Additionally, the proportion of boys meeting MVPA recommendations were similar in the two regions, while less girls met the recommendation in Southern region in comparison to the Central-Northern region.

Table 4 shows sedentary time in relation to age group and pubertal stage.

Table 4. Sedentary activities. Mean (range)

<table>
<thead>
<tr>
<th>Boys</th>
<th>Mean time (hours/day)</th>
<th>95% confidence interval</th>
<th>Girls</th>
<th>Mean time (hours/day)</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group, years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5-13.49</td>
<td>8.6</td>
<td>8.4-8.7</td>
<td>8.9</td>
<td>8.8-9.0</td>
<td></td>
</tr>
<tr>
<td>13.5-14.49</td>
<td>8.7</td>
<td>8.6-8.8</td>
<td>9.1</td>
<td>9.0-9.2</td>
<td></td>
</tr>
<tr>
<td>16.5-17.49</td>
<td>9.2</td>
<td>9.0-9.4</td>
<td>9.4</td>
<td>9.2-9.6</td>
<td></td>
</tr>
<tr>
<td>Pubertal stage or stage of sexual maturation (see Tanner and Whitehouse, 1976)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>8.5</td>
<td>8.2-8.7</td>
<td>9.0</td>
<td>8.6-9.3</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>8.7</td>
<td>8.6-8.9</td>
<td>9.1</td>
<td>9.0-9.2</td>
<td></td>
</tr>
</tbody>
</table>
| Notes: the statistical significance of the age trends were a) Sedentary activity per age group: p ≤ .001 for both boys and girls; b) Sedentary activity per pubertal stage: p ≤ .001 for boys and p ≤ .005 for girls.
According to table 4, there is a positive association between sedentary time and age in boys and girls expressed either as age group or as pubertal stage. Sedentary time was not associated with BMI in boys. However, sedentary time was lower in girls with greater BMI. Furthermore, sedentary time did not correlate with maternal education. Additionally, sedentary time was lower in Central-Northern than in Southern region.

2.4 The EYHS study

The European Youth Heart study (EYHS) is an international school-based project addressing the prevalence and causes of CVD risk factors including PA in children aged 9 and 15 years (Riddoch et al., 2004). The aim was to establish relationships between personal, environmental and lifestyle influences (Riddoch et al., 2005). A sample of at least 1000 boys and girls from each one of the four participating countries was collected. According to Armstrong and Welsman (Armstrong & Welsman, 2006) EYHS is one of the most substantial studies using accelerometer. Data from the project has been published widely with national and international focus. Within section representative articles are presented.

Andersen et al (2006) used data from 1732 9 and 15 years old school children from Denmark, Estonia, and Portugal to describe PA and physical fitness. According to the results, PA activity in girls is consistently lower than in boys at both ages and in all three countries. However, significant differences existed between countries as Danish both boys and girls showed lower levels of PA.

Nilsson et al (2009) used data from 1327 9 and 15 years old children and adolescents from Estonia, Norway and Portugal to compare self reported MVPA and objectively measured MVPA. According to the results, the two methods differ significantly regarding after school outdoor play, sports participation and MVPA time. Furthermore, self reported sedentary behaviour correlates are likely to disagree with self reported PA correlates. Furthermore, gender differences are significant as girls spend less time in MVPA and more time in sedentary behaviours than boys do at both 9 and 15 years of age. The gender specific as well as the total MVPA is decreasing, while time in sedentary behaviour is increasing with the age.

Riddoch et al (2004) published data related to 2185 9 and 15 years old children and adolescents from Denmark, Estonia, Norway and Portugal. According to the results, boys were generally more physically active than girls. The same pattern was evident even in terms of the time engaged in moderate activity in both 9 and 15 years of age. Additionally, more boys and girls met the health-related recommended level of PA at the age of 9 than the age of 15. More specifically, the average daily MVPA in 9 years old boys and girls was 192 (66) and 160 (54) minutes/day respectively, while the corresponding data in 15 years old children was 99 (45) and 74(32). At the age of 9, 97.4% of boys and 97.6% of girls met the recommendations, while at the age of 15 the only 81% of boys and 62% of girls did the same.

Vimaleswaran et al (2010) publish data related to 2062 children and adolescents from Denmark, Estonia, Norway and Portugal. According to the results, PA in 9 and 15 years old boys was 745 (11.6) and 550(17.9) counts/minute respectively, while the corresponding data for 9 and 15 years old girls was 617(8,9) and 452.7(101) indicating gender differences and a PA reduction over the years.

2 Originally four countries participated (Denmark, Estonia, Norway and Portugal). Later on some other countries entered e.g. Spain, Iceland and Sweden
3 Method

A systematic literature review approach consists of four areas: a) problem definition, b) search strategy, c) study evaluation and d) data extraction (Badger, Nursten, Williams, & Woodward, 2000). Regarding problem formulation, PA activity is the main concept that has been established and defined earlier in this report. Furthermore, it can be argued that physical or cardio respiratory fitness, sedentary behaviours and physically inactivity have an affinity with PA. Additionally, it seems that studies focusing overweight/obesity contain usually descriptions of PA patterns. Thus the overall problem of this review is connected primarily to PA and complementary to physical fitness, CRF, sedentary behaviours, physical inactivity and overweight/obesity. Three inclusion criteria were established. The first regarded studies published since year 2004 while the second was associated to young peoples at the age of primary and secondary schooling. The third inclusion focused peer-reviewed articles.

Searching for a combination of “physical activity”, “adolesc* OR child*” and “Greece OR Greek” in the main body of articles resulted in 45 to 74 hits in SPORTDiscus, Academic Search Elite or ERIC. In MEDLINE and ISI Web of Knowledge the hits were between 100 and 217 (see table 5). Refining the search in SPORTDiscus, Academic Search Elite and ERIC using “physical activity” as a keyword, resulted in fewer hits. In MEDLINE via Ebsco, MEDLINE via PubMed and ISI Web of Knowledge the refinement concerned “physical activity” as words in the title because keyword-search were not supported. Further refinement by selecting only peer reviewed accounts resulted in fewer hits in the first three databases, while the later three databases do not include this use. Additionally, the hits connected to a full text service were more limited. However, hits with no full text support could be accessed via the journal site or in print form. In conclusion, articles referring to “physical activity” in the text are much more than those connected to “physical activity” as part of a more indicative index such as keyword or word in the title. It is obvious that articles targeting primarily overweight and obesity are many considering some aspects of physical activity as well. On the contrary, articles focusing first and foremost PA are not so many.

<table>
<thead>
<tr>
<th>Table 5. Children and Adolescents Physical Activity related publications in Greece between 2004 and 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>SPORTDiscus</td>
</tr>
<tr>
<td>Academic Search Elite</td>
</tr>
<tr>
<td>ERIC</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
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<tr>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>MEDLINE via Ebsco</td>
</tr>
<tr>
<td>MEDLINE via PubMed</td>
</tr>
<tr>
<td>ISI Web of Knowledge</td>
</tr>
</tbody>
</table>

3 Star (*) to capture all suffixes e.g. adolesc-en, adolesc-e
As it can be seen in Table 5, the sample of the relevant articles is between 45 and 125 articles, while the 217 hits in MEDLINE via PubMed seem to indicate even books etc. The evaluation of the abstracts of the 125 articles resulted in 40 articles which are included in the present report. 9 articles are connected to 3 major national projects, while 26 articles regard individual studies. Additionally 3 articles from the National Epidemiological Survey as well as 2 relevant epidemiological studies have been included (Appendix).

4 Physical activity patterns in Greek children and adolescents

Within this section, PA patterns in Greek children and adolescents will be summarized utilizing national projects and original articles. These patterns are connected primarily to PA. Data related to physical inactivity, sedentary behaviour and overweight/obesity are used as complementary to map the phenomenon more adequately. Almost all of the studies are cross-sectional, while eventual longitudinal studies are indicated if applicable. Furthermore, studies with samples from urban areas in general and Athens in specific dominate to a great degree. Methodological data (sample, sampling method, generalisation etc.) can be seen in Appendix.

Contemporary research on PA, physical inactivity and overweight/obesity is characterised by a methodological variation restricting data juxtaposition. This is the case in Greece also. The following presentation is meant to facilitate a systematic description with the uncovering of the most inactive groups in mind. Due to the page limitation a discussion on contradictory data and inconsistent cut off points will be rather omitted.

4.1 Projects

In this section three major Greek projects are presented with data related to PA, physical inactivity, sedentary behaviours and/or overweight/obesity. These projects are the Physical Activity, Nutrition and Allergies in Children Examined in Athens project (PANACEA), the VYRONAS study and the Leontio Lyceum ALmubirunia study (3L study)

The PANACEA project surveyed 10 to 12 years old children in the greater Athens area (Antonogeorgos, Papadimitriou, Panagiotakos, Priftis, & Nicolaïdou, 2011; Antonogeorgos, Papadimitriou, Panagiotakos, Priftis, & Nicolaïdou, 2010; Priftis, Panagiotakos, Anthracopoulos, Papadimitriou, & Nicolaïdou, 2007; Priftis, Panagiotakos, Antonogeorgos et al., 2007). PA was evaluated through an interview administered retrospective questionnaire and a parent proxy report. According to the results, 55% of the boys and 46.4% of the girls achieved the daily recommended MVPA levels. More specifically, 48.9% of the boys and 31.8% of the girls were involved in extra curricular sports activities in more than three hours a week, while 99.7% of boys and 98% of girls attended school physical education for more than one hour per week. 15.9 % of the boys and 16.8% of the girls reported very low PA. Furthermore, the overweight and obesity rates for boys were 33.9% and 9.4% respectively as well as 22.1% and 8.6% for the girls. The average TV watching or videogame playing were 2.3 (1.3) hours for boys and 2.1 (1.3) hours for girls. PANACEA study PA and overweight/obesity related findings are rather overestimated in relation to the 2005/2006 HBSC survey Greek part (Currie et al., 2008). However, all gender differences were statistically significant which is in line with the HBSC studies. Summarizing the findings, most of 10-12 years old Greek children are physical active, while approximately every third boy and every fifth girls reported overweight. It seems that a rather big group of children is physically inactive, that boys are more overweight or obese than girls, and that sedentary behaviour is similar in both sexes.
In the VYRONAS study participated 12 to 17 years old children and adolescents from 12 schools in Vyronas, a suburb of Athens (Kosti et al., 2008; Kourlaba et al., 2008; Mihas et al., 2009). 4.4% of males and 1.7 of females reported obesity, while 19.2 of males and 13.2 of females stated overweight. Regarding PA, 35.4% of males and 21.3% of females were involved in sport activity for more than five hours during a normal week. The average hours per week for males and females were 3.7 and 2.2 for sport activities, 3.1 and 2.2 for playtime or walks, 2.7 and 2.1 for screen-based inactivity plus 2.7 and 3.7 for homework respectively. The finding of the VYRONAS study regarding PA and overweight/obesity are rather underestimated in relation to 2005/2006 study (Currie et al., 2008). However, the patterns of gender differences are almost identical, indicating a lower PA in girls than in boys. Considering sedentary behaviours, it is obvious that Greek boys portrayed higher levels of screen-based inactivity than girls do. Notwithstanding, the overall physical inactivity of Greek girls seem to be higher than boys as girls spend considerable more time doing homework. Within this study, a positive relation was established between overweight/obesity and PA while parents’ lifestyle was also critical. In conclusion: “The typical boy … spent less time studying and more time watching television or playing video games using a personal computer than the typical girl. On the other hand, the typical boy devoted more time to sports activities and playtime, a trend which increased with age” (Mihas et al., 2009, p. 497).

The 3L study focused 12 to 18 years old children and adolescents in a school in Athens utilizing a self reported questionnaire (Tsioufis et al., 2010; Tsioufis et al., 2009). According to the results, the average hours per week ranged between 5.3 and 8 for sports activities, between 3 and 6 for PA excluding sports and between 2 to 2.1 for screen-based inactivity. Overall, boys were more physically active than girls, spending more time in vigorous PA and less time in sedentary activities.

Juxtaposing the data from PANACEA, VYRONAS and 3L studies, a majority of Greek children and adolescents are physical active of at least five hours per week. However, the recommended daily PA levels are not discussed raising questions and jeopardizing the comparison of the results. Furthermore, it seems that girls are a more vulnerable group than boys with PA in mind, while sedentary behaviours incorporate gendered patterns. Additionally, the lifestyles of the offspring are related to parents’ lifestyle which is SES constructed.

4.2 Studies

The 26 studies presented in this section are connected to PA, physical inactivity as well as overweight and obesity among children and adolescents. A presentation in distinct sections focusing the aforementioned concept was difficult due to a significant overlap in almost all articles. Therefore the section is divided on the basis of the sample type.

First, eight studies with national samples (5 articles) and broader regional samples (3 articles) are outlined. The next nine studies focus local urban samples predominantly from Athens and in some cases from Thessaloniki. Additionally six studies are connected to local samples from other major Greek cities with semi-urban environment. Finally, three studies including data even from rural areas are conveyed. Notwithstanding, the underrepresentation of studies with rural samples is remarkable.

4.2.1 National or broader regional samples

Digelidis, Kamtsios and Theodorakis (2007) surveyed 11-12 years old pupils within a broader regional sample. The pupils answered the retrospective questionnaire in three BMI related groups (normal, overweight and obese). According to the results,
53% of normal weight pupils participated in sport clubs while the corresponding data for overweight and obese pupils were 37.7% and 23.1% respectively. The rates of pupils active for at least one hour every training was 30.2%, 17.5% and 11.5% for normal weight, overweight and obese pupils respectively. Furthermore, 84.2% of overweight and 92.3% of the obese pupils participated in neither sports club nor leisure PA. Additionally, normal weight pupils portrayed greater satisfaction from school physical education than overweight and obese pupils did. Finally, overweight and obesity rates were 23.6% and 3.4% respectively. 6.2% of normal weight, 20.2% of overweight and 53.8% of obese pupils watched TV for more than five hours per day. Moreover, 40.1% of normal weight, 51.4% of overweight and 69.2% of obese pupils used a computer from one to three hours per day.

Kokkevi, Fotiou, Chileva, Nociar and Miller (2008) investigated 16 year old Greek students utilizing a retrospective questionnaire. The survey was part of a comparative study targeting anabolic steroid use in adolescents in Greece, Bulgaria, Cyprus, the UK, Slovenia and Croatia. As part of the questionnaire focused PA some data could be extracted. According to PA related results, 35.3% of boys and 14.2% of girls exercised almost daily (gender difference sig. at .001 level).

Lagiou and Parava (2008) examined 10-12 years old pupils in a broader regional sample using a retrospective questionnaire. Pupils were divided according to BMI in two groups, normal (<85th percentile) and overweight (≥85 percentile). 15.2% of boys and 6% of girls reported a PA of more than four hours per day, while 8.9% of boys and 6% of girls reported TV watching of more than five hours per day. However, reported PA was unrelated to overweight, but screen-based inactivity was a highly significant predictor of overweight. Furthermore, children born abroad were less exposed to unhealthy lifestyles than children born in Greece. Additionally, pupils born in urban milieu were more exposed to overweight than pupils born in semi-urban context, who in turn were more exposed than immigrant pupils. Finally, a positive association between paternal education and overweight could be established.

Papadimitriou, Kounadi, Konstantinidou, Xepapadaki and Nicolaidou (2006) studied 6-11 years old pupils in a broader regional sample employing anthropometric measures. According to the results, there were statistically significant differences between the mean BMI of Greek and immigrant boys (18.9 and 17.3 respectively, p ≤ .001) as well as between the mean BMI of Greek and immigrant girls (18.7 and 17.1 respectively, p ≤ .001). Overall overweight and obesity prevalence was significantly higher in Greek than in immigrant children. Additionally, the authors claimed a rather big increase of overweight and obesity in both boys and girls in Greece.

Papaioannou, Karastogiannidou and Theodorakis (2004) surveyed pupils in a broader regional sample operating a retrospective questionnaire. The pupils were divided in age groups (11-12, 13-14 and 16-17 years old). The results can be seen in the next table.

<table>
<thead>
<tr>
<th>Table 6. PA per age group (%)</th>
<th>11-12 years</th>
<th>13-14 years</th>
<th>16-17 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Monthly exercise ≥10times</td>
<td>56.6</td>
<td>30.5</td>
<td>69.3</td>
</tr>
<tr>
<td>Exercise in fitness class</td>
<td>18.5</td>
<td>22.5</td>
<td>20.5</td>
</tr>
<tr>
<td>Exercise alone or with peers</td>
<td>61.2</td>
<td>57.0</td>
<td>67.1</td>
</tr>
<tr>
<td>No exercise at all</td>
<td>10.7</td>
<td>17.1</td>
<td>9.3</td>
</tr>
</tbody>
</table>
As it can be seen in table 6, monthly exercise increase from age group 11-12 to group 13-14 and decrease from group 13-14 to group 16-17, while a dramatic decrease is evident in females. Approximately the same pattern regards exercise in fitness classes and exercise alone or with peers. Furthermore, almost every third girl and every fifth 16-17 aged boy do not exercise at all. On the basis of the analysis of the results, the authors argue that broader attitudes such as being an athlete can be regarded as key determinants of physical activity patterns, while unhealthy lifestyles and identities (e.g. "smoker") should by campaigned against.

Petraki, Derri, Gaintatzis and Aggeloussis (2006) focused 10-12 years old pupils in a broader regional sampling putting to use a retrospective questionnaire to evaluate children’s and parents’ PA transformed in kcal per week. The PA of boys and girls was estimated to 5616 and 5044 kcal/week respectively. Furthermore, the PA of younger and older pupils was 4941.5 and 5582.2 kcal/week respectively. Additionally, pupils’ PA was positively associated with mothers’ PA (r= .28, p ≤ .05).

Psarraf, Nassis and Sidossis (2006) conducted a longitudinal study with 6-12 years old pupils in a broader regional sample. According to the baseline data (first occasion) 6.3%, 17.2% and 5% of pupils were underweight, overweight and obese respectively. In the two year follow up measure, the corresponding data were 1.8%, 27.7% and 7.5%. CRF was measured only during the follow up, indicating an average of 4.3 completed SRT stages. Furthermore, connections between maternal and offspring BMI were indicated.

Smokos, Linardakis, Papadaki and Kafatos (2011) went into 6-7 years old children in a broader regional sample employing a retrospective questionnaire. 33.7% of boys and 34.6% of girls was overweight or obese (sig. gender diff p≤.001). No association between PA and BMI could be established. However, BMI correlated with hours of TV watching. Some of the children represented a cohort of grade 1 pupils in 2006/2007. As the authors had similar data from a previous cohort of 1st grades (1992/1993) some comparisons were possible. The overweight and obese boys and girls were 19.4% and 24.4% respectively in the 1992/1993 study showing a dramatic increase of overweight and obesity in both genders.

### 4.2.2 Urban samples

Arvanitidou et al (2008) surveyed 14-15 and 17-18 years old adolescents applying a self administered retrospective questionnaire focusing primarily smoking habits. Questions on PA were included either as habitual gymnastics (aerobic, endurance training) or as habitual sports (soccer, basketball). According to the results, 38.1% of pupils were classified as smokers. The percentages for males and females were 34.3% and 40.9% respectively, while 36.4% of the younger pupils and 39.4% of the older students were smoking. 69.5% and 67.7% of the non smoking pupils participated regularly in sports activities and gymnastics respectively, while only 30.5% and 32% of non smokers did the same. The differences were statistically significant. Smoking correlated negatively with mothers and fathers educational level.

Bertaki, Michalopoulou, Argyropoulou and Bitzidou (2007) studied 15-18 years old children and adolescents in the 10th, 11th and 12th grade of three schools making use of a self administered PA questionnaire. 56% of pupils reported a high PA that is vigorous activity for at least three days per week. Furthermore, males were significantly more physically active than females. 11th grade boys reported higher physical activity than 10th graders and 12th grades did. 10th grade girls reported the highest PA among girls, while girls PA decreased dramatically from 11th grade to 12th grade. It seems that the 12th grade which includes the preparation for university admission has
a significant impact on pupils’ PA. Gender differences were statistically significant, while the age factor played a significant role in both sexes.

Bouziotas et al (2004) investigated 11-14 years old pupils from 7 schools with a retrospective self reported questionnaire to evaluate organized PA (school, sport clubs) and leisure time PA (walking, cycling etc.). In addition, fitness and fatness were measured with SRT and BMI respectively. According to the results, the average daily PA was estimated to 45 kcal per kg, the mean fitness corresponded to 33 ml O₂/min/kg, while the BMI was 20.0 in average. Furthermore, PA correlated positively with fitness (r=.58, p≤.01) and negatively with fatness (r=-.69, p≤.01). Fitness correlated also negatively with fatness (r=-.63, p≤.01).

Hassapidou, Papadopoulou, Frossinis, Kaklamanos and Tzotzas (2009) examined 10-12 years old pupils using a retrospective questionnaire. 36 pupils (13%) were immigrants from Balkan or ex-Soviet Union countries. According to the results, pupils had a high prevalence of overweight (26.1% of boys, 22.4% of girls) and obesity (11.6 of boys, 10.9% of girls). Furthermore, overweight/obesity rates in Greek children (25.8/12.7) were significantly higher than in immigrant children (10.0/3.3). Greek and immigrant pupils exercised in average 4.14 and 6.38 hour per week respectively. Additionally, the average screen-based inactivity was 1.54 and 1.76 hours per days for Greek and immigrant pupils respectively. Regarding energy intake, immigrant children got more calories per day (1611) than Greek children did (1363). Obese pupils’ grandmothers used to prepare the family meals to a higher degree than in the other two groups, while young mothers usually complained because grandmothers overfed children.

Hassapidou, Fotiadou, Maglara and Papadopoulou (2006) inspected 11-14 years old pupils utilizing anthropometry and a retrospective questionnaire. 3.2% of boys and 4.8% of girls had overweight (obesity included). The mean daily energy intake of overweight and normal weight boys was 2290 and 2465 kcal respectively, while the corresponding data for energy expenditure was 3312 and 2540. The mean daily energy intake for overweight and normal weight girls was 1720 and 2062 respectively, while the corresponding data for energy expenditure was 2385 and 2078. Overweight boys and girls reported a lower energy intake than normal weight individuals did, while calculated energy expenditure was significantly higher in overweight than in normal weight pupils. However, no significant differences between overweight and normal pupils could be established in relation to PA. The authors argued that this maybe was due to an overestimation of PA from the part of the overweight pupils.

Lioumpi, Georgiadis and Mountakis (2010) went into 11-12 years old pupils employing a PE teacher administered retrospective questionnaire. According to pupils' answers, exercise is always or nearly always part of their everyday life for 74.4% of boys and 72.1% of girls. Additionally, 50.5% of boys and 63.7% of girls reported that they always or almost always had 15-30 minutes MVPA for at least three times a week, while 67.9% of boys and 83.3% of girls reported that they took part in at least one leisure activity per week (e.g. cycling, skiing or bowling) with peers or family. Furthermore, 71.1% of boys and 65.4% of girls reported that they avoid always or nearly always a sedentary life. However, 12.2% of boys and 8.8% of girls stated that exercise in never or almost never part of their everyday life, while 12.6% of boys and 11.5% of girls answered that they never or almost never avoid a sedentary life. Gender differences in all aforementioned aspects were not statistically significant.

Lykesas, Koutsoubia and Tyrovola (2009) examined 13-14 years old pupils comparing traditional and nuanced dance methods within PE lessons. According to the results, only 50% of the pupils participated in the traditional lesson, while the participa-
tion during the nuanced method was almost 100%. In conclusion, adopting creative instead of teacher-centred methods seems to increase pupils’ participation in PE lessons.

Nassis, Psarra and Didossis (2005) investigated 6 to 13 years old pupils conducting objective measures of BMI and CRF. The overall overweight and obesity rate was 34.8%. Furthermore, 66.2% of the normal weight and 23.1% of the overweight/obese pupils were classified as fit with an average of 5.9 and 5.4 completed SRT stages respectively. Moreover, 33.8% of the normal weight and 76.9% of the overweight/obese pupils were classified as non-fit with a mean of 2.8 and 2.6 completed SRT stages respectively.

Tsiotra et al (2006) compared Greek and Canadian 11-12 year old pupils with anthropometry as well as with motor and fitness measures. The mean BMI of boys was 22.6 and 21.4 in Greece and Canada respectively, while the corresponding data for girls was 23.3 and 21.9. Furthermore, the mean maximum oxygen uptake of boys was 37.6 ml/kg/min and 38.9 ml/kg/min in Greece and Canada respectively, while the corresponding data for girls was 33.5 and 35.3. Additionally, the mean score of boys in a motor performance test was 51.9 and 58.2 in Greece and Canada respectively, while the corresponding data for girls was 46.9 and 52.3. All differences (gender, country) were statistically significant (p ≤ .05). The same pattern was evident even in aspects of body fat as Canadian pupils had a higher BMI than Greek pupils in the entire sample and in gender comparisons. Within each country, girls’ BMI was higher than boys.

4.2.3 Semi-urban samples

Christodoulos, Douda, Bouziotas and Tokmakidis (2004) studied 8 years old pupils from schools using a retrospective questionnaire. According to the results, 51% of pupils participated not only in school physical education but in extra curricular sport activities in clubs as well (active students). 49% of pupils reported involvement only in physical education classes (non active students).

Christodoulos, Douda, Polykratis and Tokmakidis (2006) evaluated a year long health education intervention. Within this evaluation, the total MVPA (TMVPA) and the organized MVPA (OMVPA) were assessed utilizing a retrospective questionnaire. The control and the intervention group consisted of 6th grade pupils. According to the results, the average OMVPA and TMVPA was 2.54 and 6.26 hours per week respectively. The intervention group increased the OMVPA and TMVPA to 3.54 (.32) and 7.50 (.51) respectively. Before the intervention, 32.3% of the pupils in the intervention group and 26.5% of pupils in the control group fulfilled the physical activity recommendations of TMVPA of at least 60 minutes per day.

Damianidis, Kouthouris and Alexandris (2007) surveyed 12-18 years old pupils. The retrospective questionnaire of the study focused extracurricular sports activities and pupils’ perceived constraints. 32.5% of the pupils participated in extra curricular sport activities, which the authors found lower than in big cities and higher than in rural areas. Furthermore, the most critical constraint for participation was available services and facilities, followed by lack of free time, economical reasons, lack of interest and lack of peers for common PA. It seems that younger pupils and boys face constraints to a smaller degree than older pupils and girls respectively.

Kamtsios and Digelidis (2007) went into 10-12 years old pupils with BMI and EU-ROFIT measures as well as a retrospective questionnaire. 71% of pupils had normal weight, while 17% was overweight and 11.3% obese. The maximum oxygen intake for the three groups was 27.13, 24.5 and 22.96 ml/kg/min for normal, overweight and
obese respectively. Furthermore, 12.9% of normal, 20.8% of overweight and 43.8% of obese pupils watched TV between 3 and 5 hours daily. Additionally, a negative correlation could be established between BMI and PA in sports clubs as well as between BMI and participation in school sport games.

Manios et al (2004) examined 11-12 years old pupils employing objective methods as well as an interview administered retrospective questionnaire. 30.3% of pupils had overweight (35.6% of boys, 25.7% of girls), while 6.7% of pupils were obese (6.7% of boys, 6.7% of girls). However, the gender differences regarding BMI were not statistically significant. The average TMVPA in minutes per week was 485 for boys and 369 for girls (sig. gender diff., p≤.003), while the OMVPA in minutes per week was 298 for boys and 327 for girls (ns gender diff.). Furthermore, the CRF as well as weekly TV watching of boys was significantly higher than girls (p≤.001). Finally, the TMVPA was not significantly related to BMI, while a positive correlation between BMI and TV watching could be established.

Nevill, Tsiotra, Tsimeas and Koutedakis (2009) investigated 11-13 years old pupils taking advantage of anthropometry and physical performance assessments. They concluded that there weren’t any gender differences connected to BMI (20.9 for boys, 20.8 for girls) and aerobic endurance (11.9 km/h for boys, 11.4 km/h for girls).

4.2.4 Rural related samples

Tokmakidis et al (2006) surveyed 7-10 years old pupils in semi-urban and rural context utilizing anthropometric and CRF measures. 26.5% and 13.4% of girls was overweight and obese respectively, while the corresponding data for boys were 25.2% and 16%. There were significant differences between normal weight and obese pupils regarding stages completed in the SRT. More specifically, normal weight boys accomplished in average 2.7 and 3.8 more stages than overweight and obese respectively, while the corresponding data for girls were 2.7 and 7.8.

Tsimeas, Tsiokanos, Koutedakis, Tsigilis and Kellis (2005) studied 12 year old pupils in urban and rural setting in order to compare pupils physical fitness on the basis of the area of residence. Physical fitness was obtained utilizing anthropometry as well as fitness and motor tests. According to the measures, no significant differences could be established in aspects of BMI, body fat, oxygen uptake and residence. Urban pupils had significantly better results than rural pupils only in basketball throw and handgrip. The authors suggested that it is tempting to suggest that “the place or residence has no clear impact on physical fitness”(Tsimeas et al., 2005, p. 673).

Tzetzis, Goudas and Kyratsou (2005) investigated 10-12 years old pupils in rural milieu measuring PA during physical education classes with accelerometer. The PA of boys and girls during an average physical education lesson was measured to 2195.5 and 1716.5 counts respectively (sig. gender diff. p≤.001. The average time on vigorous PA was 2.76 and 2.02 minutes for boys and girls respectively. The average time on moderate PA was 15.52 minutes in boys and 11.67 minutes in girls, while the average time on low level PA was 24.15 minutes in boys and 29.02 minutes in girls.

4.3 Epidemiological Projects and Studies

The National Epidemiological Survey is a nationwide, cross-sectional study to estimate obesity prevalence in Greece and to identify related factors utilizing a retrospective questionnaire with anthropometric parameters as well as dietary and PA patterns (Kapantais et al., 2006; Tzotzas et al., 2008; Tzotzas et al., 2011). The sample of adults consisted of 17341 individuals, while the sample of adolescents comprised 14.456 adolescents (6677 boys, 7779 girls) aged 13-19 years. Additionally, the younger siblings (6-12 years old) of the adolescents in the sample was identi-
fied and participated in the survey (3,140 siblings: 1589 boys, 1551 girls). The methodology of the survey facilitated various groupings such as residence (urban more than 20,000 inhabitants, semi-urban more than 5000 and less than 20,000 inhabitants, rural less than 5000 inhabitants), ethnicity (Greek or foreign born), and age. Unfortunately, data on SES and physical activity status have not been released up to now.

According to the results, the mean BMI for all children and adolescents was 18.8 kg/sq m and 18.4 kg/sq m for boys and girls respectively. Furthermore, 31.1% of boys and 26.5% of girls were overweight and obese, while 9.4% of boys and 6.4% of girls were obese. The prevalence of overweight and obesity in adolescence can be seen in the next table.

<table>
<thead>
<tr>
<th>Table 7. Adolescents overweight and obesity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>Overweight</td>
</tr>
<tr>
<td>Obesity</td>
</tr>
</tbody>
</table>

Note: significant gender differences, \( p \leq .0001 \)

According to table 7, overweight and obesity rates are significantly higher in boys than girls. Regarding living in urban, semi-urban or rural context no significant differences could be established with overweight and obesity in mind. On the contrary, differences could be established between Greek and foreign born males, as the former reported an increased overweight and obesity in relation to the later.

Beside the National Epidemiological Survey, two other epidemiological studies have been extracted within this report.

Georgiadis and Nassis (2007) investigated 6-17 years old pupils assessing BMI through anthropometric measures with the help of trained PE teachers. According to the results, the overall prevalence of overweight was 17.3% (boys: 16.9% for boys, girls: 17.6%), and the obesity rates were 3.6% (boys: 3.8%, girls: 3.3%). In 6 to 9 years old children the overweight and obesity rates were 23.2% and 6.7% respectively, while in 10 to 17 children and adolescents the corresponding rates were 14.8% and 1.6%. Female’s overweight and obesity decreases systematically from 6 to 17 years of age, while such a pattern could not be established in males. Additionally, no significant differences could be established regarding overweight and obesity on the basis of residence (urban, semi-urban, and rural).

Tokmakidis, Christodoulos and Mantzouranis (2007) examined 10-12 years old pupils in semi-urban context utilizing not only self-reported information but objective measures as well. Self-reported overweight and obesity rates in the younger (10-11 years) and older (11-12) pupils were 24.6% and 3.7% respectively, while the corresponding data obtained through objective measures were 28.3% and 9.5%. Furthermore, self-reported overweight and obesity in the older pupils were 21.2% and 5% respectively, while the corresponding data obtained through measurements were 29.5% and 9.4%. The data revealed significant differences between self reported and objective measured BMI in both genders and age groups.
5 PA opportunities for Greek children and adolescents

Within this section, obtained information will be analysed with sites of PA in mind. More specifically, data connected to schools and physical education (PE); sport clubs; family and community; informal sports, peers and build environment as well as policy related programs and strategies will be discussed on the basis of the reviewed studies.

It can be argued that school and PE classes are connected to possibilities for PA for all children. PE in Greece concern two 45 min lessons weekly from year one to year 12 with the exception of year 7 and 8 with three 45 min lessons per week. It seems that participation in PE during primary schooling is rather high as 99.7% of boys and 98.9% of girls are engaging for more than 1 hour per week (Antonogeorgos et al., 2011). Despite the fact that the allocated PE time is the same all over the country, some participation issues can be raised. More specifically, normal weight primary school pupils reported greater satisfaction from PE than overweight and obese pupils did (Digelidis et al., 2007). Furthermore, the average time on vigorous PA during PE is higher in boys than girls in primary schools (Tzetzis et al., 2005). However, MVPA could be increased using cooperative and not competitive exercise and games (Christodoulos et al., 2006). This trend is evident in lower secondary schools as well as only 50% of the pupils participated in traditional teacher centred lessons, while the participation during more child-centred method was almost 100% (Lykesas et al., 2009). As a negative correlation can be established between BMI and PA in school sport games at least in primary schools (Kamtsios & Digelidis, 2007) it becomes obvious that PE participation issues should be confronted with health promotion and an upgraded physically active lifestyle in mind. However, most of the relevant studies in Greece are connected to children in primary school, while data with adolescents are rather rare.

Regarding sport clubs, the mass sport movement in Greece is rather underdeveloped even if a reverse trend occurs during recent years. It seem though that only half of primary school pupils participate regularly in sport clubs (Christodoulos et al., 2004; Digelidis et al., 2007). Furthermore, only half of boys and one third of girls are involved in out of school sport activities (Antonogeorgos et al., 2011). These numbers decrease further in adolescence as one third are taking part in extra curricular sport activities (Damianidis et al., 2007). The participation of overweight and obese children is even lower as nine out of ten overweight and obese children are not connected to sports clubs (Digelidis et al., 2007). As in the case with school PE, a negative correlation between BMI and participation in sports clubs is supported (Kamtsios & Digelidis, 2007). However, information connected to the effects of the area of residence is lacking making it more difficult to outline the relative importance of cultural and structural constraints in order to reverse the trend more rapidly.

Concerning community in urban areas, only one third of children commute regularly by walking or cycling (Antonogeorgos et al., 2011), while adolescents reported playtime or walk for approximately two and a half hours per week (Mihas et al., 2009). Additionally, three quarters of the children reported at least one weekly leisure activity with family (Lioumpi et al., 2010). However, it is difficult to draw conclusions as data from rural communities are sparse. Cultural attributes interplay with health risks as grandmothers play an important role in the traditional big Greek family overfeeding in some cases their grandchildren (Hassapidou et al., 2009)

The importance of peers for common extra curricular sport activities is highlighted in adolescence (Damianidis et al., 2007) and in childhood (Lioumpi et al., 2010). How-
ever, most of overweight and obese children in both rural and semi-urban areas, do not participate in informal sport or leisure physical activity with peers (Digelidis et al., 2007). In adolescence, problematic access to facilities constrains participation severely participation in extra curricular sport activities (Damianidis et al., 2007). Regarding the build environment, it seems that living in urban or rural landscape do no have a clear impact on physical fitness and activity (Tsimas et al., 2005).

Unfortunately no national policy documents on PA and health promotion can be identified (Daugbjerg et al., 2009). It seems that PA in Greece depends solely on school PE and research initiated interventions. PE targets sport specific competencies to promote familiarity with certain events. This acquaintance is expected to develop sustainable physically active lifestyles. The whole idea could have been fruitful if mass sport movement was developed to a higher degree. However, more clearly connections between school PE and health promotion should be stated. Furthermore, PA and health promotion national policies and strategies are needed urgently.

6 Physically inactive subgroups in childhood and adolescence.

Within this section the less inactive subgroups among children and adolescence will be discuss with gender, SES, age, ethnicity and the area of residence as starting points. Determinants of physical inactivity will be also discussed as well as overweight and obesity in children and adolescents in Greece.

In Greece, numerous studies support that gender is a significant determinant for PA as males are more physically active than females in both childhood and adolescence in rural, semi-urban and urban milieux (Antonogeorgos et al., 2011; Arvanitidou et al., 2008; Bertaki et al., 2007; Damianidis et al., 2007; Kokkevi et al., 2008; Lagiou & Parava, 2008; Manios et al., 2004; Mihas et al., 2009; Papaoannou et al., 2004; Petraki et al., 2006; Tsioufis et al., 2010). Furthermore boys seem to have higher CRF than girls (Manios et al., 2004; Tzotzas et al., 2006) and boys are more physically active than girls during PE lessons (Tzetis et al., 2005). However, non significant gender differences in CRF can be also found (Nevill et al., 2009). Moreover, screen-based inactivity is higher in boys than girls in childhood (Lagiou & Parava, 2008; Manios et al., 2004).

Findings on gender differences connected to overweight and obesity are contradictory. Some studies suggest that overweight and obesity rates during childhood and adolescence are significantly higher in boys than girls (Tzotzas et al., 2011). The opposite can also be supported (Hassapidou et al., 2006; Smkokos et al., 2011; Tsiotra et al., 2006). Other studies found no significant differences (Georgiadis & Nassis, 2007; Manios et al., 2004; Nevill et al., 2009; Tokmakidis et al., 2007). Descriptions become more obscure as obesity increases in females during adolescence (Tzotzas et al., 2008), while other studies propose the opposite (Georgiadis & Nassis, 2007). Confusing descriptions might be due to methodological and cut-off point variation. Notwithstanding, girls and boys seem not to be homogeneous subgroups as overweight and obese individuals transcend gender categories. Maybe, overweight girls are more alike overweight boys than other normal weight girls and perhaps, overweight boys are more alike overweight girls than other normal weight boys.

The impact of SES on PA and other health related behaviours is rather difficult to establish on the basis of the reviewed national data. In adolescence, parents’ age and mothers smoking correlates negatively with offspring healthy lifestyle (Mihas et al., 2009); parents’ educational level correlates negatively with smoking, while smoking correlates negatively with physical activity (Arvanitidou et al., 2008); economical constraints jeopardize participation in extra curricular sport
activities (Damianidis et al., 2007). In childhood, a positive association between paternal education and overweight could be established (Lagiou & Parava, 2008); children PA was positively associated with mothers’ PA (Petraki et al., 2006).

It seems that age is a significant determinant connected to PA and other health behaviours. More specifically, during adolescence, age correlates negatively with extra curricular sport activities (Damianidis et al., 2007) and positively with smoking (Arvanitidou et al., 2008). In childhood, age correlates positively with PA (Petraki et al., 2006). Significant age differences are connected to overweight and obesity rates (Tokmakidis et al., 2007), while the direction of the association is rather obscure. Overweight and obesity rates seem to be lower in adolescence than in childhood (Georgiadis & Nassis, 2007). The opposite direction can also be supported (Psarra et al., 2006). However, the negative association between age and overweight/obesity is stronger in females than in males (Georgiadis & Nassis, 2007).

Regarding ethnicity, a remarkable trend seems to be evident in Greece as native children are more overweight and obese than immigrant children (Hassapidou et al., 2009; Lagiou & Parava, 2008; Papadimitriou et al., 2006; Tzotzas et al., 2008; Tzotzas et al., 2011). Furthermore, native children exercise less than immigrant children (Hassapidou et al., 2006). However, immigrant children intake more calories and show higher screen-based inactivity than native children (Hassapidou et al., 2009). Overall, immigrant children are less exposed to unhealthy lifestyles and than native children do (Lagiou & Parava, 2008).

The area of residence in Greece has no clear impact on children and adolescents physical fitness (Tsimeas et al., 2005), overweight/obesity (Georgiadis & Nassis, 2007; Tsimeas et al., 2005; Tzotzas et al., 2008). However, the hypothesis that children in urban milieus are more exposed to overweight than children in semi-urban context can also be supported (Lagiou & Parava, 2008).

Regarding association between overweight/obesity and PA, no significant differences could be established in children (Hassapidou et al., 2006; Lagiou & Parava, 2008; Manios et al., 2004; Smpokos et al., 2011). However it is clear that normal weight children have higher CRF than overweight/obese children (Kamtsios & Digelidis, 2007; Nassis et al., 2005). Furthermore, overweight and obese children report a higher screen-based inactivity than normal weight children do (Lagiou & Parava, 2008; Manios et al., 2004; Smpokos et al., 2011)

7 Conclusion

“Contemporary Greek children and adolescents demonstrate diminished physical activity patterns, increased screen-based inactivity, but similar energy intake, compared with age-related peers from other countries “ (Tokmakidis et al., 2006, p. 872).

Despite methodological scientific research pluralism in the descriptions of PA patterns in children and adolescents in Greece, it becomes evident that systemic correlates are not addressed adequately. Indeed, this statement is reinforced by the total absence of national policies and strategies within the problem area. Notwithstanding, individual or group attributes should also be addressed more systematically with the exception of the rather well articulated gender related health related patterns. From a macro-level point of view, it is evident that both genders face health related risks during childhood and adolescence in different ways. However, more holistic, detailed and in-depth information is needed from both boys and girls to grasp attitudes towards physically active lifestyles. The
map of SES related correlates is rather obscure. Nevertheless, youth from disadvantaged urban neighbourhoods might face more challenges despite that the Greek society seems to be more socioeconomically and culturally homogeneous than other European countries. Even if research suggests that native youth have to cope with more health risks than immigrants do, some issues should be raised. The large proportion of illegal immigrants whose children are going to school normally might have shown mistrust in research and refused their children’s participation in surveys. In relation to area of residence it is obvious that rural areas deserve more scientific interest.

Analysing the obtained information, using my personal experience and taking into account that Greeks are socializing informally to a higher degree than people in the other more developed European countries, a hypothesis could be formulated that the social identity and in some cases the social stigma is crucial for the development of a physically active lifestyle. In accordance with this I recommend that the schedule of the in-depth interviews in Greece should be as follows:

Six group-interviews

1. Native adolescents (mix-gendered) from disadvantaged urban neighbourhood.
2. Native children (mix-gendered) from disadvantaged urban neighbourhood.
3. Immigrant adolescents (mix-gendered) from disadvantaged urban neighbourhood.
4. Immigrant children (mix-gendered) from disadvantaged urban neighbourhood.
5. Native adolescents (mix-gendered) from rural area.
6. Native children (mix-gendered) from rural area.

Ten individual interviews

1. Normal weight 12 years old male.
2. Normal weight 12 years old female.
3. Normal weight 18 years old male.
4. Normal weight 18 years old female.
5. Overweight/obese 12 years old male.
6. Overweight/obese 12 years old female.
7. Overweight/obese 18 years old male.
8. Overweight/obese 18 years old female.
9. 15 years old male from socially stigmatized family (unemployed, alcoholic or drug misusing parent).
10. 15 years old male from socially stigmatized family (unemployed, alcoholic or drug misusing parent).

The aforementioned combination of group- and individual interviews is expected to provide multifaceted and detailed information on the construction of physically active and inactive lifestyles. Furthermore, groups and individuals can be approached without any complicated selection strategy or social stigma awakening procedure among children and adolescents in the site of conduct.
# Appendix

<table>
<thead>
<tr>
<th>Project or Sample</th>
<th>Author (s)</th>
<th>Sample Size (or Rate of participation)</th>
<th>Method</th>
<th>Determinant</th>
<th>PA site</th>
<th>Div.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PANACEA: National, broader regional</td>
<td>(Antonogeorgos et al., 2011)</td>
<td>700 (323)</td>
<td>10-12</td>
<td>UR</td>
<td>RE</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Antonogeorgos et al., 2010)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Priftis, Panagiotakos, Antonogeorgos et al., 2007)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Priftis, Panagiotakos, Anthracopoulos et al., 2007)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>3L, Urban</td>
<td>(Kosti et al., 2008)</td>
<td>2008 (1021)</td>
<td>12-17</td>
<td>LO</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Kourtaba et al., 2008)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Mihas et al., 2009)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Tsouefs et al., 2009)</td>
<td>498 (304)</td>
<td>12-18</td>
<td>LO</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(Tsouefs et al., 2010)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>National: Rural, all</td>
<td>(Digelidis et al., 2007)</td>
<td>775 (362)</td>
<td>10-12</td>
<td>AL</td>
<td>NC</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Kokkavi et al., 2008)</td>
<td>2259</td>
<td>16</td>
<td>AL</td>
<td>NC</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Lagiou &amp; Parava, 2008)</td>
<td>633 (326)</td>
<td>10-12</td>
<td>UR, SU</td>
<td>LO</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Papadimitriou et al., 2006)</td>
<td>4131 (2054)</td>
<td>6-11</td>
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<tr>
<td></td>
<td>(Papagiannou et al., 2004)</td>
<td>5991 (2346)</td>
<td>11-17</td>
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<td>(Petragi et al., 2006)</td>
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<tr>
<td></td>
<td>(Psar et al., 2006)</td>
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<td>RE</td>
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</tr>
<tr>
<td></td>
<td>(Smokos et al., 2011)</td>
<td>361 (199)</td>
<td>6-7</td>
<td>ALL</td>
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</tr>
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<td>Urban</td>
<td>(Arvanitidou et al., 2008)</td>
<td>1221 (527)</td>
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<tr>
<td></td>
<td>(Bertaki et al., 2007)</td>
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<td>15-18</td>
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<tr>
<td></td>
<td>(Bouziotas et al., 2004)</td>
<td>210 (117)</td>
<td>12.3 (6)</td>
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<tr>
<td></td>
<td>(Hassapidou et al., 2009)</td>
<td>276 (132)</td>
<td>8-12</td>
<td>RE</td>
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</tr>
<tr>
<td></td>
<td>(Hassapidou et al., 2008)</td>
<td>502 (228)</td>
<td>11-14</td>
<td>RE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Lioupi et al., 2010)</td>
<td>163 (83)</td>
<td>11-12</td>
<td>LO</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Lykes et al., 2009)</td>
<td>200 (82)</td>
<td>13-14</td>
<td>LO</td>
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<td></td>
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</tr>
<tr>
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<td>(Tsotra et al., 2006)</td>
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<td>11-12</td>
<td>LO</td>
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<td>Y</td>
</tr>
<tr>
<td>Semi-urban</td>
<td>(Christodoulos et al., 2006)</td>
<td>78 (42)</td>
<td>10-12.5</td>
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<td>8.1 (1.3)</td>
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<tr>
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<td>(Damiantis et al., 2007)</td>
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<td>12-18</td>
<td>RE</td>
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<td>Y</td>
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<td>(Kamtsios &amp; Digelidis, 2007)</td>
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<td>11.2</td>
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</tr>
<tr>
<td></td>
<td>(Manios et al., 2004)</td>
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<td>11.5 (4)</td>
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<tr>
<td></td>
<td>(Nevill et al., 2009)</td>
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<td>11-13</td>
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</tr>
<tr>
<td>Rural</td>
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<td>7-10</td>
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<td>RE</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Tsmeas et al., 2005)</td>
<td>617 (360)</td>
<td>12</td>
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<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Tzetzis et al., 2005)</td>
<td>58 (29)</td>
<td>10-12</td>
<td>RU</td>
<td>LO</td>
<td>Y</td>
</tr>
<tr>
<td>NES</td>
<td>(Kapantais et al., 2006)</td>
<td></td>
<td></td>
<td>Y</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Tzozitas et al., 2008)</td>
<td>14456 (6677)</td>
<td>15.4 (1.8)</td>
<td>NR</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Tzozitas et al., 2011)</td>
<td>3140 (1589)</td>
<td>6-12</td>
<td>NR</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>(Georgiadis &amp; Nass, 2007)</td>
<td>6448 (50.4%)</td>
<td>6-17</td>
<td>AL</td>
<td>NR</td>
<td>Y</td>
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<tr>
<td></td>
<td>(Tokmakidis et al., 2007)</td>
<td>676 (327)</td>
<td>10-12</td>
<td>SU</td>
<td>RE</td>
<td></td>
</tr>
</tbody>
</table>

References


Moreno, L., González-Gross, M., Kersting, M., Molnar, D., De Henauw, S., Beghin, L., et al. (2007). Assessing, understanding and modifying nutritional status, eating habits and


Idrottsvetenskapliga rapporter –
Institutionen för kost- och idrottsvetenskap
Göteborgs universitet
Adress: Box 100
405 30 Göteborg
Redaktör: Owe Stråhlman


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2012:
