ICSSPE
International Council of Sport Science and Physical Education
Conseil International pour l'Education Physique et la Science du Sport
Weltrat für Sportwissenschaft und Leibes-/Körpererziehung
Consejo Internacional para la Ciencia del Deporte y la Educación Física

NARRATIVE REVIEW – THE STATE OF PHYSICAL ACTIVITY IN EUROPE

ICSSPE, Berlin

Richard Bailey, PhD FRSA
Martin Holzweg, MA
Katrin Koenen, MA
Iva Glibo, Mag. cin
Gabriela Olosová, PhD
Jordy De Roos, BSc (Hons)

1. PREAMBLE

The relationship between physical activity and physical health is now established beyond doubt, and the awareness of the health costs of sedentary behaviours is so advanced among both scientists and policymakers that inactivity is now recognised as a major public health concern (Kohl, Craig, Lambert, et al., 2012; Physical Activity Guidelines Advisory Committee, 2008; World Health Organization, 2010). WHO estimated that physical inactivity is the fourth leading risk factor for global mortality, responsible for 6% of deaths globally – around 3.2 million deaths per year, including 2.6 million in low- and middle-income countries (2010). An analysis published in *The Lancet* in 2012 suggested that the impact of physical inactivity on mortality could be even greater – up to about 5.3 million deaths a year – rivalling tobacco use as a cause of death (Lee, Shiroma, Lobelo, *et al*, 2012).

This document aims to provide an accessible summary of the relevant evidence related to the state and status of physical activity in Europe. It is presented as a 'narrative review', which means that it summarises different studies, and the findings and conclusions from these studies are drawn into a holistic interpretation. While the earlier systematic review had a narrow focus and strict protocols, this review adopts a more flexible approach to include different types of evidence related to a much wider rename of subjects. It begins by discussing the costs and benefits of physical in/activity, before going on to summarise some of the evidence of levels of activity and inactivity around the world, and especially in Europe. It then briefly summarises what is known about the factors that influence physical in/activity, focusing on five contexts that seem particular useful settings for promoting activity.

The review is intended to be a reference document. For this reason, academic sources are included, which means the interested reader can follow-up specific questions or concerns. Also, a Glossary is provided, since it is inevitable that some technical terms have had to be used.

OUTLINE

2. GLOSSARY

Due to its subject matter, this document occasionally makes reference to technical, medical or scientific terms. These are explained in the following table.

Table 1 – Technical terms used in this report

Aerobic Activity	**Aerobic activity, also called endurance activity, improves cardiorespiratory fitness. Examples of aerobic activity include: brisk walking, running, bicycling, jumping rope, and swimming. (WHO, 2010)**
Biopsychosocial	**The biopsychosocial approach systematically considers biological, psychological, and social factors and their complex interactions in understanding health, illness, and health care delivery. (Engel, 1978)**
Body Mass Index	**Body Mass Index (kg / m$^{2)}$ = weight (kg) / height^2 (m^2). (Ekström, Kull,**

(BMI)	**Nilsson, *et al*., 2015)**
Dose-response	**The dose in this term refers to the amount of physical activity and/or exercise, whereas the response references the resultant health outcome. (ACSM, 2013)**
Duration	**The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes. (WHO, 2010)**
Exercise	**Physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective. (Caspersen, Powell and Christenson, 1985)**
Frequency	**The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week. (WHO, 2010)**
Health Enhancing Physical Activity (HEPA)	**Health enhancing physical activity is a multidisciplinary research field that has developed in order to provide a knowledge base for understanding of the significance and role of sport, exercise and physical activity for the health, function and well-being of all people. (Oja, 2008)**
Intensity	**Intensity refers to the rate at which the activity is being performed or the magnitude of the effort required to perform an activity or exercise. (WHO, 2010)**
Moderate to Vigorous Physical Activity (MVPA)	**On an absolute scale, moderate intensity refers to activity that is performed at 3.0–5.9 times the intensity of rest. On a scale relative to an individual's personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10.** **On an absolute scale, vigorous intensity refers to activity that is performed at 6.0 or more times the intensity of rest for adults and typically 7.0 or more times for children and youth. On a scale relative to an individual's personal capacity, vigorous-intensity physical activity is usually a 7 or 8 on a scale of 0–10. (WHO, 2010)**

Non-communicable diseases (NCDs)	**Commonly known as chronic or lifestyle-related diseases, the main non-communicable diseases are cardiovascular diseases, diabetes, cancers and chronic respiratory diseases. (UN, 2011)**
Physical Activity	**Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. (WHO, 2015)**
Physical Education (PE)	**The area of the school curriculum concerned with developing students' physical competence and confidence, and their ability to use these to perform in a range of activities. (DFEE, 2000)**
Type of Physical Activity	**The mode of participation in physical activity. The type of physical activity can take many forms: aerobic, strength, flexibility, balance. (WHO, 2010)**
Socio-economic status (SES)	**Often measured as a combination of education, income and occupation. It is commonly conceptualized as the social standing or class of an individual or group. When viewed through a social class lens, privilege, power, and control are emphasized. (APA, 2015)**
Sport	**A range of activities, processes, social relationships, and presumed physical, psychological, and sociological outcomes. (Council of Europe, 2001)**
STEPwise	**A simple, standardized method for collecting, analysing and disseminating data in WHO member countries. The approach encourages the collection of small amounts of useful data information on a regular and continuing basis. It focuses on a minimum number of risk factors that predict the major non-communicable diseases. (WHO, 2015)**
Volume	**Aerobic exercise exposures can be characterized by an interaction between bout intensity, frequency, duration, and longevity of the programme. The product of these characteristics can be thought of as volume. (WHO, 2010)**

3 Context - where are we now?

3.1 - Introduction

The importance of regular physical activity is now well-established, as are the harmful consequences of sedentary lifestyles. The compounded effects of the industrial, automotive and information technology revelations, as well as other social-cultural changes around the world, have resulted in radical changes to the ways in which people carry out their daily tasks. The effects of some of these developments, such as cars and trains, have directly impacted on habitual levels of physical activity, whilst others, such as televisions, computers and electronic entertainment are indirect and more complex. The emergence and ready availability of new technologies has exaggerated these changes on physical labour and human energy expenditure (Hallal, Andersen, Bull, *et al*., 2012). Children are probably most susceptible to these changes due to their susceptibility to a technologically changing environment and issues concerning their perceived safety (Hills, King, & Armstrong, 2007).

3.2 - Are we active enough?

Through the lenses of the lifetimes of most readers of this report, modern lives are normal; viewed from the perspective of human history, the lives of those of us in Western, Educated, Industrialised, Rich and Democratic societies are WEIRD (Henrich *et al*., 2010). Moreover, such is the pace and scope of change, that its effects can now be seen increasingly in the developed world, and the consequences of this have be both positive, in terms of greater technological and economic opportunities, and negative, in terms of reduced physical activity levels and increased incidence of non-communicable diseases. With regard to the latter set of changes, the changes have been devastating. For the first time on record, more people in the developing world now die from strokes and heart attacks than infectious diseases. Combined, non-

communicable diseases cause almost nearly 60% of all deaths in the developing world, about 20 million people each year (Institute for Health Metrics and Evaluation, 2015). Physical inactivity is the fourth leading risk factor for these diseases (WHO, 2009).

It is becoming increasingly clear from research studies that a number of social and economic factors mediate physical activity, and marginalised groups are among those at least likely to be active. For example, in the United States, Black females are least likely to participate in moderate to strenuous exercise, followed by White females and Black males. The highest prevalence is among White males (Hersch, 1996). Similar findings have been reported in a range of age groups (e.g., He & Baker, 2005). Reviews of approximately 300 studies on the correlates of adult PA were performed by Bauman Sallis, Dzewaltowski, *et al*., (2002) and Sherwood and Jeffery (2000) found that males and Whites tend to be more physically active, and that income, education, and socioeconomic status are generally positively associated with physical activity. Differences by ethnicity and income also affect physical activity patterns among children and adolescents (Powell, Slater, and Chaloupka, 2004).

In should be acknowledged, however, that accurate measures of the amount of daily physical activity in European children and adolescents is somewhat unknown, since the available information is rarely based on objective methods. The most common research tools are still questionnaires which, whilst useful to a degree, provide only a partial picture of overall levels of active behaviour in a typical day (Rey-López, Vicente-Rodriguez, Ortega, *et al*, 2010). This also means that comparison between countries often needs to be treated cautiously, as cultural factors can significantly influence the types of responses given (Dismore, Bailey and Izaki, 2006).

The World Health Organisation recommendations for physical activity for health are summarised in Table 2, below.

Table 2 - *WHO recommendations for physical activity for health, based on WHO, 2010*

Age range	**Children and Youth aged 5-17**	**Adults aged 18–64**	**Older adults aged 65 and above**
Types of activities	Play, games, sports, transportation, recreation, physical education, or planned exercise, in the context of family, school and community activities.	Leisure time physical activity, transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities.	Leisure time physical activity, transportation (e.g. walking or cycling), occupational (if the individual is still engaged in work), household chores, play, games, sports or planned exercise, in the context of daily, family and community activities.
Recommendations	1. Children and youth should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily. 2. Amounts of physical activity greater than 60 minutes provide additional health benefits. 3. Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week.	1. Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. 2. Aerobic activity should be performed in bouts of at least 10 minutes duration. 3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150	1. Adults aged 65 years and above should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous- intensity activity. 2. Aerobic activity should be performed in bouts of at least 10 minutes duration. 3. For additional health benefits, adults aged 65 years and above should increase their moderate-

		minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity. 4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.	intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous-intensity activity. 4. Adults of this age group, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week. 5. Muscle-strengthening activities should be done involving major muscle groups, on 2 or more days a week. 6. When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

Individual states produce their own physical activity recommendations, but they tend to be versions of the WHO guidelines. Their rationale is that reaching such standards substantially reduces an individual's risk of developing one or more of non-communicable disease. The daily and weekly levels represent certain levels of energy

expenditure. However, lower levels have been shown to cause improved health outcomes, and more vigorous intensities of exercise, with their increased the rates of energy expenditure, can result in significant benefits with relatively shorter periods of activity (ICSA / CEBR, 2015). So, all recommendations like this should be understood as general guidance. Nevertheless, the recommendations offer a useful, objective goal for active lifestyles, allow the possibility of relatively accurate comparisons over time and between countries, and help policymakers implement effective non-communicable disease prevention programmes. This final point is worth stress, as there is now a consensus among researchers in the field that regular, valid and reliable evidence based on objective measures of activity is vitally important in driving national and global action in the promotion of physical activity.

Based on this increasingly robust evidence, it is becoming clear that there is a trend for sedentary lifestyles across most of developed countries, and, as has been seen, across developing countries, too. However, until relatively recently, comparisons of patterns of participation in physical activity between countries and regions were unachievable, as standardised instruments suitable for international use were not available (Bull, Armstrong, Dixon, *et al*., 2004). So, before the last decade, knowledge of the health risks of inactivity significantly exceeded awareness of international levels of activity. This means that historical measures of physical activity need to be taken with a degree of caution, as they have tended to rely on indirect measures. Now, with the development of validated instruments, like the International Physical Activity Questionnaire (IPAQ; see Appendix) and relatively affordable tools that measure objective activity, such as accelerometers, awareness of the state of activity levels around the world is now immeasurable better.

As will be argued below, childhood and adolescence, and especially the first 10 or so years of life, represent a vitally important period in the development of physical activity behaviours, and much of the recent concern from politicians, policymakers, advocacy groups and other stakeholders has targetted this phase of development as particularly deserving attention.

Table 3 summarises some of the recent empirical studies of physical activity during childhood and adolescence.

Table 3 – Research studies of physical activity among European children and young people

Authors	**Countries researched**	**Methods used**	**Main relevant findings**
Spittaels, H., Van Cauwenberghe, E., Verbestel, *et al*. (2012)	Belgium	Aggregation of accelerometer data from 7 cross-sectional studies (N=2083) in four age groups (preschoolers, primary schoolchildren, secondary schoolchildren and adults)	For the total sample, 55% of the waking time was spent in sedentary behaviour (SB), 39% in light intensity physical activity (LIPA), and 6% in moderate-to-vigorous intensity physical activity (MVPA). Positive LIPA-SB balance was assessed in 18% of the total sample and only 10% combined this positive balance with recommended amount of MVPA. Secondary schoolgirls were most at risk, with only 1% of the sample combining a positive LIPA-SB balance with sufficient MVPA. Another risk group was the large proportion (43%) of adult men who combined sufficient MVPA with a negative LIPA-SB balance.
Baptista, Santos, Silva, *et al*. (2012)	Portugal	Accelerometers were worn for four consecutive days, and a valid record was defined as at least 3 d with 10 h	36% of 10–11 year olds (boys = 51.6%, girls = 22.5%), and 4% of 16–17 year olds (boys = 7.9%, girls = 1.2%) reached the recommended daily levels of activity.

		of wear time	
Eiðsdóttir, Kristjánsson, Sigfúsdóttir, *et al*. (2008)	Iceland	Repeated questionnaires to four cross-sectional, nationally representative population-based cohorts of 14- and 15-year old students (N=7000+)	There was a 6% increase in the rate of vigorous physical activity and a 15% increase in active sports club participation among 14- and 15-year old Icelandic adolescents from 1992 to 2006. The trends were consistent across genders; however, only 53% of boys actually achieved the recommended levels for vigorous physical activity, with the percentage of girls averaging 16% lower than that for boys. There was also an overall increase in the proportion of inactive adolescents, with girls consistently reporting higher levels of inactivity than boys even though the net increase in inactivity was higher for boys.
Konstabel, Veidebaum, Verbestel, *et al*. (2014)	Sweden, Germany, Hungary, Italy, Cyprus, Spain, Belgium and Estonia	Accelerometry based on at least 3 days' worth of valid data, with at least 8 h of valid recording time each day with children aged 2.0–10.9 years	The figures show similar trends in boys and girls. The percentage of children complying with recommendations regarding moderate-to-vigorous physical activity (MVPA) is also presented and varied considerably between sexes and country. For example, the percentage of study participants who were physically active (as assessed by MVPA) for 60 or more minutes per day ranged from 2.0% (Cyprus) to 14.7% (Sweden) in girls and from 9.5% (Italy) to 34.1% (Belgium) in boys.
Verloigne, Van Lippevelde, Maes, *et al*,	Belgium, Greece, Hungary, the	Accelerometry based on at least 2 weekdays with	Girls spent significantly more time sedentary) than boys, and significantly less time in light and moderate-to-

(2012)	Netherlands and Switzerland	minimum 10 h-wearing time and 1 weekend day with minimum 8 h-wearing time	vigorous PA than boys. 4.6% of the girls and 16.8% of the boys met moderate-to vigorous PA recommendations of at least 60 minutes/day. Greek boys were more sedentary than other boys. Dutch girls were less sedentary than other girls. Swiss girls displayed more moderate-to-vigorous PA than other girls.
Ruiz, Ortega, Martínez-Gómez, *et al*. (2011)	Greece, Germany, Belgium, Hungary, Italy, Sweden, Austria and Spain	Accelerometry expressed as average intensity (counts/minute) and amount of time (minutes/day) spent engaging in moderate- to vigorous-intensity physical activity (MVPA). Time spent in sedentary behaviours was also objectively measured.	A higher proportion of boys (56.8% of boys vs. 27.5% of girls) met the physical activity recommendations. Adolescents spent most time in sedentary behaviours. Both average intensity and MVPA were higher in adolescents with high cardiorespiratory fitness, and sedentary time was lower in the high fitness group.

Gender is a particular cause for concern, as relatively low levels of physical activity among women and girls seem resistant to change. A review by Bailey, Wellard and Dismore (2004) for the WHO revealed consistently low levels of physical activity among women and girls, both relative to men and boys, and to physical activity recommendations. Since that report numerous studies have corroborated that report's conclusion that girls tend to be more sedentary than boys and less active across all intensities. For example, a nationally representative prospective cohort study of British

7-8 year olds (Griffiths, Cortina-Borja, Sera, *et al*, 2013).51% 7-year-olds achieved current recommendations for daily physical activity, with results significantly lower in girls (38%) than in boys (63%). Such a stark difference n activity levels between boys and girls has been reported in numerous international studies. For example, the Portuguese study outlined in Table 3 used objective measure of activity to compare activity patterns within a large cohort, and found just 36% of participants age 10–11 year olds were active enough, according to WHO guidelines, with just 22.5% if girls within the sample reaching the threshold (Baptista, Santos, Silva, *et al*, 2012). Even more alarmingly, 4% of the 16-17 year olds in the sample were considered sufficiently active (with just 1.2% of girls reaching the necessary level). Similar findings were report by a study of Swedish children and adolescents (Ortega, Ruiz, J. R & Sjöström, 2007): in all variables studied, boys were more active than girls, with the differences between boys and girls being greater in adolescents than in children. These and other studies report a clear trend of decreasing levels of activity as girls get older, and a widening disparity between girls' and boys' physical activity behaviours.

3.3 - 'The Lancet' Review

One of the most authoritative recent global reviews of physical activity levels was the 'surveillance' exercise carried out by the Lancet Physical Activity Series Working Group (Hallal, Andersen, Bull, *et al*., 2012). It was published, along with a set of papers examining related aspects of what the Working Group called 'the pandemic of physical inactivity' (Kohl, Craig, Lambert, *et al*., 2012).

The review was based on adult and adolescent data from 122 countries and adolescent data from 105 countries. Its aim was to describe differences in activity between regions and populations, and patterns of walking and vigorous-intensity activity. In light of the identified links between health, physical activity and the environment, the review also included information about active transportation (i.e., walking and cycling). In addition to analysing the available data, the group drew attention to the gaps that remain in physical activity surveillance, revealing

considerable (and concerning) limitations in information from many countries and the the absence of information from many low and middle income countries. The main findings from the Lancet review are presented in Table 4, below.

Table 4 – How Active are People, summary of findings*, based on WHO, 2010*

- A third of adults and four-fifths of adolescents do not reach public health guidelines for recommended levels of physical activity.
- Notable disparities exist in the prevalence of physical inactivity; in most countries inactivity is higher in women than in men, and older adults are less active than are younger adults. These consistent patterns should be used to help policy makers to implement effective programmes for the prevention and treatment of non-communicable diseases.
- Trend data from high-income countries suggest that occupational physical activity is decreasing but leisure-time physical activity has increased in adults.
- Gaps in surveillance of physical activity remain. No data are available from about a third of countries, mostly those of low and middle income in Africa and central Asia. Data for trends in physical activity are scarce.
- WHO's STEPwise approach to chronic disease risk factor surveillance provides a good framework and practical ways to initiate physical activity surveillance, particularly in countries of low and middle income.
- Advances in new technologies and measurement methods, especially accelerometry, show promise for future surveillance of physical

activity. These devices have potential widespread practical application if equipment costs continue to fall and sufficient efforts are directed towards increasing technical skills and workforce capacity in countries of low and middle income.

According to the Lancet analysis, the overall prevalence of physical inactivity worldwide for adults was 31.1%. There were, of course, considerable variations in the prevalence of inactivity across the WHO regions:

- Africa - 27.5%
- Americas - 43.3%
- Eastern Mediterranean - 43.2%
- Europe - 34.8%
- South-East Asia - 17.0%
- Western Pacific - 33.7%

Certain patterns were also identified. Notably, women were more inactive (33.9%) than men (27.9%), although there were wide differences across countries. Inactivity increased with age (this pattern has been shown to have a strong biological basis; Ingram, 2000), although there was variation here, too, with older adults (60+ years) from South-East Asia much more active than older adults from all other regions, and more active than young adults (15-29 years) from the Americas, the Eastern Mediterranean, European and Western Pacific regions. Finally, activity was higher in wealthier countries, although this is complex due to the different types of activity that tend to be practiced by different social groups, with the rich engaging in more leisure-time physical activity, and the poor engaging in less occupational physical activity (Knuth & Hallal, 2009).

Participation in vigorous physical activity is an important indicator of physical activity levels, and there are well-established health benefits from undertaking activity at

vigorous intensity (Lee & Paffenbarger, 2000). Once again, there was considerable variation: globally, 31.4% of adults reported three or more days per week of vigorous-intensity physical activity; in the Americas, the figure was 24.6%; in Europe, 25.4%; in Western Pacific, 35.3%; in Africa, 38.0%; in Eastern Mediterranean, 43.2%; and in South-East Asia, 43.2%.

For each age category, men were more likely to participate in vigorous physical activity than women, and for both men and women, participation in vigorous physical activity declined with age.

Walking and cycling are common, accessible, inexpensive form of physical activity and have been shown to be important elements of total physical activity. They can also provide health benefits valuable health benefits (Andersen, Schnohr, Schroll, *et al*., 2000). Walking, in particular, is a useful public health measure for increasing activity, as it is free. The Lancet review estimated that 64.1% of adults globally walked for at least 10 consecutive minutes on five or more days per week. In this case, the variation across regions was modest, ranging from 57.0% in Africa to 67.2% in South-East Asia. Also, there was almost no difference in patterns of walking between men and women and across age groups.

There was considerable variation, however, between countries within regions. Table 5 shows the proportion of adults reporting walking or cycling to work in Europe (where evidence was available). The difference in so-called 'active transportation' between Denmark and Netherlands, on the one hand, and Switzerland and Ireland, on the other, is stark.

Table 5 - *Proportion of adults reporting walking to work, cycling to work, or using any type of active transportation (walking or cycling), by country. Source: data extracted from Hallal, Andersen, Bull,* et al*. (2012)*

	Walk to work	**Cycle to work**	**Walk or cycle to work**
Austria	5.0-6.6%	--	--
Denmark	--	25%	--
Finland	--	--	19.5%
France	--	--	34.9%
Germany	23.0%	9.0%	32.0%
Ireland	10.9%	1.9%	12.8%
Switzerland	2.2%	0.3%	2.5%
Sweden	23.5%	9.5%	22.2-33%
Netherlands	12.1%	21.0-25.8%	37.9%
UK	12.5%	0.5%-3.4%	14.5%

The review also used existing data to estimate the activity levels of young people (aged 13 years and above). The short- and long-term health benefits from regular physical activity for benefits of activity for youth, both at that age and later in life, are substantial, as has been outlined above. However, there remain substantial gaps in reliable information about young people's activity, and the available evidence rarely

includes repeated measures over time. So changes and the effectiveness of interventions are difficult to judge. According to this analysis 80.3% of 13-15 year olds do not reach the WHO recommended levels of physical activity.

3.4 - The Eurobarometer

'Eurobarometers' are standardised population-level public opinion surveys in Europe, which are conducted on behalf of the European Commission and provide regular monitoring of social and political attitudes in the European public. The Eurobarometer on Sport and Physical Activity (EU, 2014) offers cross-country comparisons of physical activity prevalence in Europe. Such comparisons provide the opportunity for detailed modelling of the prevalence of activity and inactivity, and will gradually show trends that are taking place in population levels of physical activity across Europe. As such, it is an extremely useful source of information for the PASS project, and its findings will be considered in some detail.

First question relates to the frequency and levels of engagement in sport and other physical activity. Figure 1 shows the responses.

Figure 1 - 'How often do you exercise and play sports?'

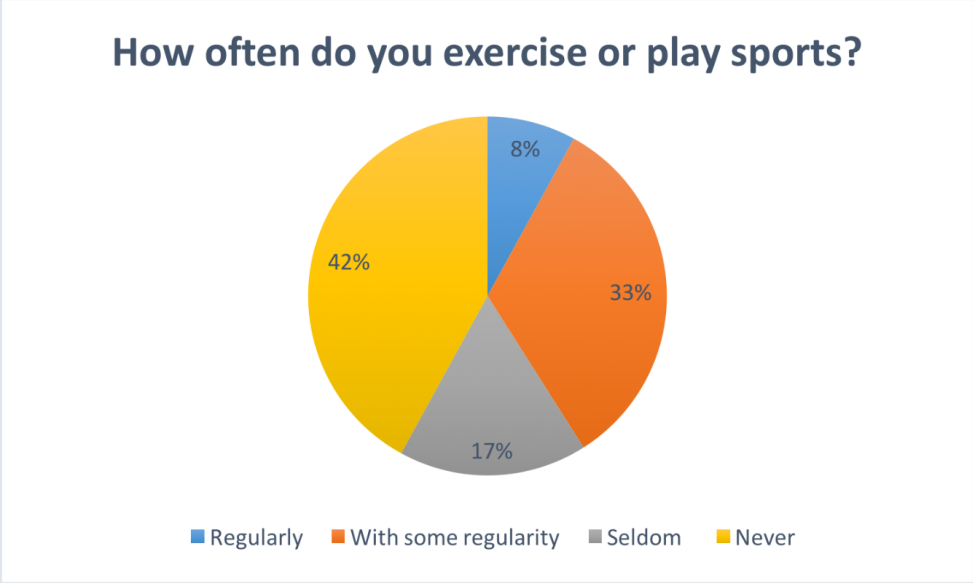
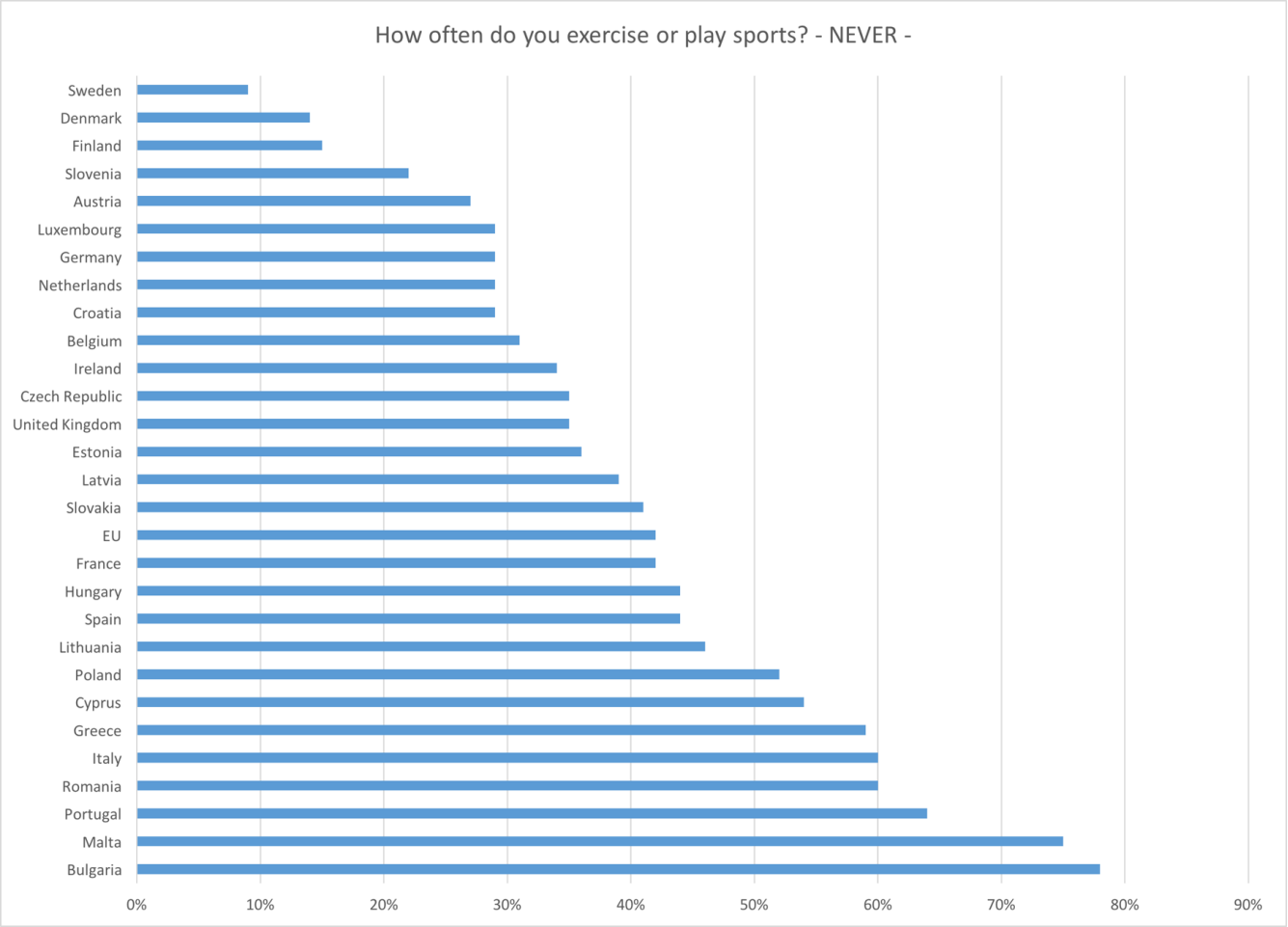


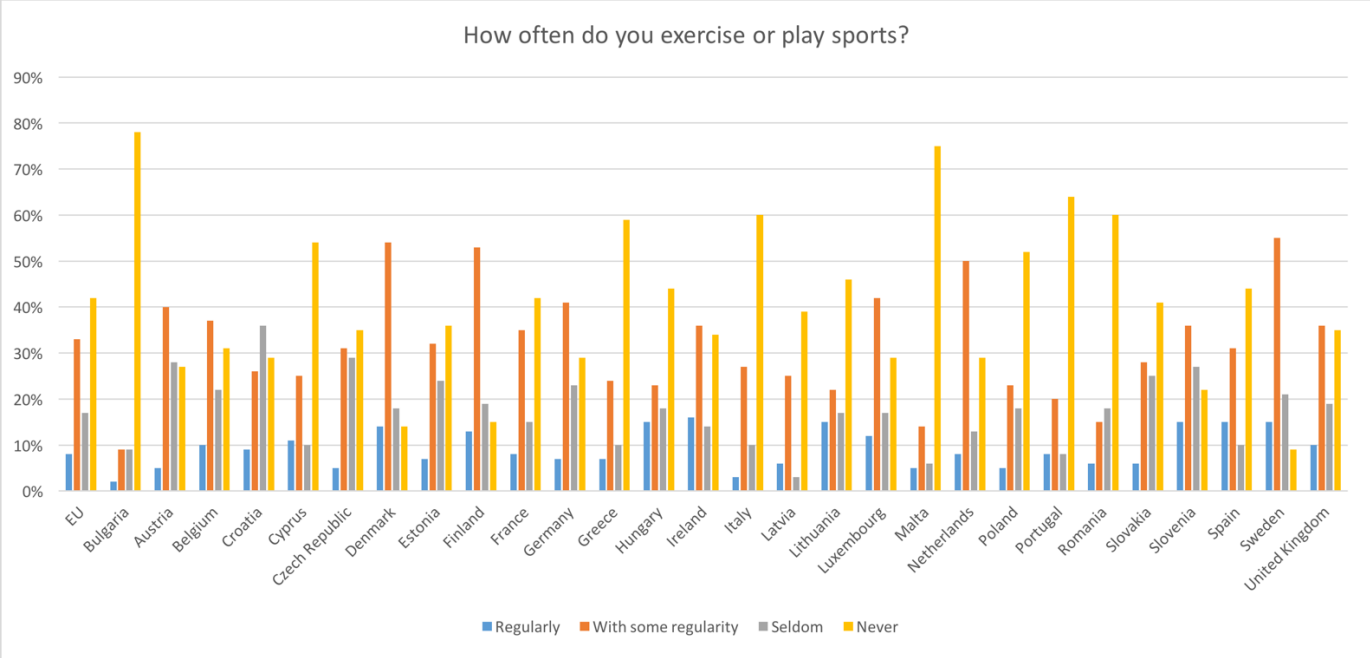
Figure 2 - 'How often do you exercise and play sports?' – NEVER



People from Nordic countries, with Sweden on the top of the list with only 9% of respondents who never exercise or play sports, were most likely to exercise or play sports. Denmark and Finland follow with 14% and 15%, respectively. At the other end of the table, Romania and Portugal both have 60% or more of their populations who never exercise, whilst Malta and Bulgaria report 75% and 78%, respectively, of their populations who do not exercise or play sports at least once a week. Overall, in 8 European countries less than half the population exercise or play sports once a week.

It is also useful to compare countries by the frequency of their engagement in exercise or sports. As can be seen in Figure 3, below, there is considerable variation in the responses.

Figure 3 - 'How often do you exercise and play sports?' - by country

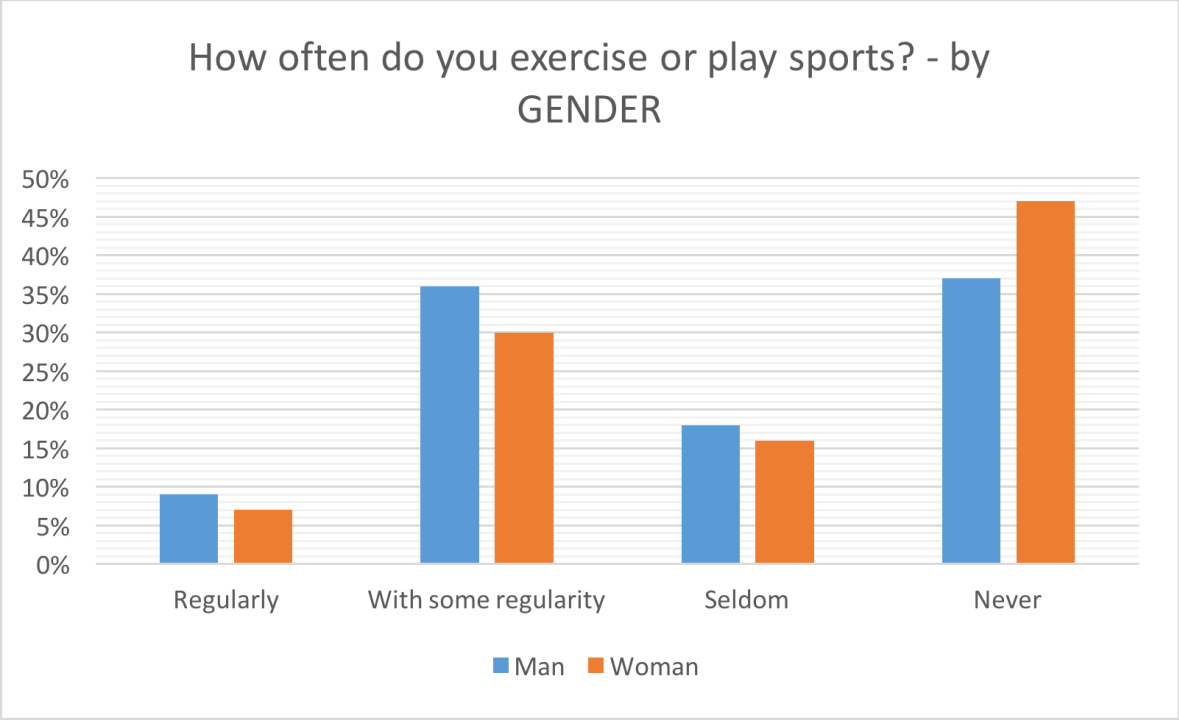


8% of Europeans exercise or play sports at least 5 times a week and 33% are active 1

to 4 times a week. 17% of EU citizens say that they are rarely active being 3 or less times per month active. 42% of Europeans are never active. Bulgaria is at the bottom of the list of regularly active respondents with only 2% of people who are regularly active. Italy, Austria, Poland, Malta and Czech Republic all have less than 5% of regularly active population. Bulgaria is at the bottom of the list again with only 9% of people who exercise or do sports 1 to 4 times per week. The country with the highest percentage of regularly active citizens is Ireland with 16%, followed by Slovenia, Hungary, Lithuania, Sweden and Spain.

Gender is a recurring theme within the physical activity literature, and the Eurobarometer reported findings that is consistent with previous research. Figure 4 compares men's and women's responses to the question 'How often do you exercise and play sports?'.

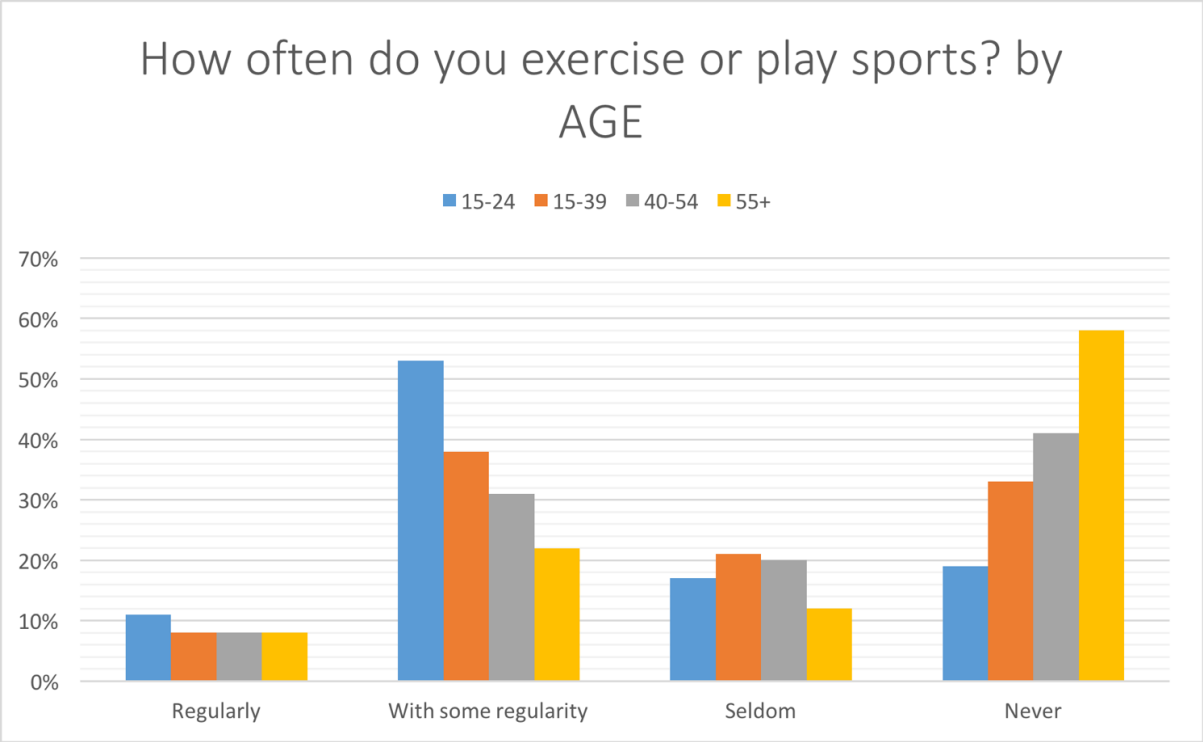
Figure 4 - 'How often do you exercise and play sports?' - by gender



Analysis of the responses reveals that men are more likely than women to engage in physical activity. 45% of men exercise at least once a week, compared with 37% of women. At the same time 37% of men and 47% of women state that they never exercise or play sports.

Another significant variable for physical activity is age. Once again, the evidence from Europe is consistent with the previous studies, as can be seen in Figure 5.

Figure 5 - 'How often do you exercise and play sports?' - by age



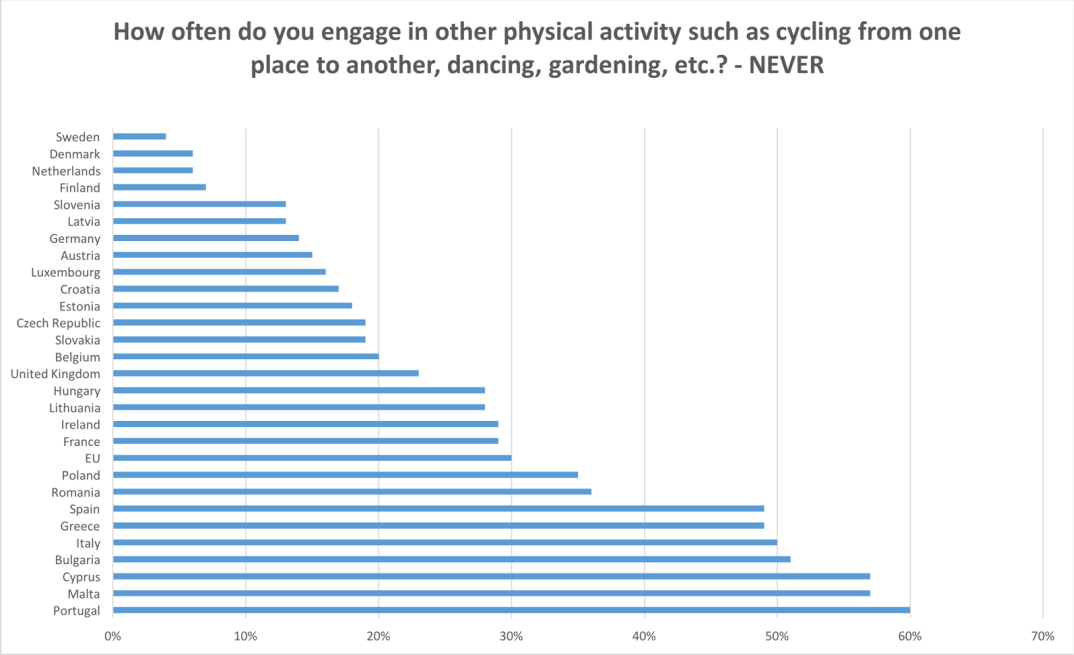
When it comes to the difference according to the age of respondents, younger people are more likely to be physically active. 11% of 15 – 24 year olds exercise 5 or more times per week and 53% of them report that they exercise with some regularity. The numbers decrease as age increases, so 8% of 15 – 39 year olds exercise regularly and

38% exercise with some regularity. 8% respondents aged 40 + engage in physical activity regularly. Level of physical activity decreases with age so 31% of 40 – 54 year olds exercise with some regularity as opposed to 22% of 55 + year olds. 58% of the oldest group do not exercise or play sports at all.

Exercise and sports are, of course, not the only forms of physical activity. As has been discussed earlier, research is suggesting that different social groups participate in different forms of physical activity. So it is important to measure non-organised activity, too. The Eurobarometer asked respondents indicate the levels of engagement with the other forms of physical activity, including incidental activities, like cycling and garden.

Figure 6 compares countries, showing the percentage of responses indicating that they never participate in these other forms of physical activity.

Figure 6 - 'How often do you engage in other physical activity such as cycling from one place to another, dancing, gardening, etc.?' – NEVER



30% of Europeans never engage in such activities. Nordic countries Sweden, Denmark and Finland as well as the Netherlands, count up to 7% of respondents who never cycle, dance or garden, etc. Above the European average are: Slovenia, Latvia, Germany, Austria, Luxembourg, Croatia, Estonia, Czech Republic, Slovakia, Belgium, UK, Hungary, Lithuania, Ireland and France. At the bottom of the table are Mediterranean countries that skew the results: Spain, Greece, Italy, Cyprus and Malta, as well as Bulgaria. Portugal is at the bottom of the list as it counts 60% of respondents who never engage in other forms of physical activities.

Overall, 15% of EU citizens say they do these kinds of activity regularly (five times or more per week), while 33% do so with some regularity (once to four times a week). However, 30% of those surveyed say they never do this kind of activity at all.

Again, patterns of physical activity were strongly influenced by age. 14% - 17% of all age groups engaged in other physical activity on a regular basis. 38% of the youngest group of respondents reported engagement with some regularity in such activities. The level decreased with age: 35% of 15 – 39 year olds, 3% of 40 – 54 year olds and 29% of 55+ year olds are physically active. 40% of the oldest age group (55+) reported that they never engage in other forms of physical activity.

3.5 - The Report Card on Physical Activity

The final set of evidence to be presented here is the Report Card on Physical Activity for Children and Youth (Colley, Brownrigg, & Tremblay, 2012). Originally developed in Canada, Report Cards have only been completed in four European countries to date. They are included in this document because they provide useful evidence on the physical activity patterns of children and young people, and they suggest an alternative approach to gathering and comparing national levels.

The Report Card is an annual update or “state of the nation” that assesses how a country is doing as a nation at promoting and facilitating physical activity opportunities

for children and youth. An update on overall physical activity levels as well as its sub-components (e.g., active play, organized sport, active transportation, screen time) is completed. Furthermore, a thorough and critical evaluation is conducted for all sectors and settings that have a known impact on physical activity participation, including school, community, home, and policy. Quality evidence is gathered from a range of sources, analysed by a group of experts, and assigned grades for each indicator:

A = succeeding with a large majority of children and youth (≥80%);

B = succeeding with well over half of children and youth (60% to 79%);

C = succeeding with about half of children and youth (40% to 59%);

D = succeeding with less than half of children and youth (20% to 39%);

F = succeeding with very few children and youth (<20%);

Inc = Inconclusive - Not enough data exists on this indicator.

Key considerations for these grades include the quality of the compiled evidence, trends over time, international comparisons, and the presence of disparities (e.g., gender differences, children with disabilities, geographic differences, socioeconomic differences, etc.). Table 6 summarises the findings of the most recent Report Card exercises in the participating European countries. As can be seen, there is some differences in the categories used by the different countries since, in the present formulation, they are all designed to emphasise comparisons over time, rather than between countries.

Table 6 - *Report Cards for Physical Activity - summary of European responses. Sources: Reilly, Dick, McNeill,* et al*., 2014; Harrington, Belton, Coppinger,* et al*., 2014; Liukkonen, Jaakkola, Kokko,* et al*., 2014; Standage, Wilkie, Jago,* et al*., 2014*

Indicator	Indicative Benchmark	Scotland	Ireland	Finland	England
Overall physical activity	% of children meeting physical activity guidelines of 60 minutes of moderate to vigorous physical activity (MVPA) every day	F	D-	D	C//D
Organized sport participation	% of children participating in sport twice/week	INC	C-	C	C-
Physical Education	% of children receiving the recommended time for PE each week in school	--	D	—	—
Active play	Unclear	INC	INC	D	INC
Active transportation	% of children reporting walking or cycling to or from school each day	C	D	B	C
Sedentary behaviours	% of children watching < 2 hours of TV/day	F	C-	D	INC
Family and peers	Unclear	D-	INC	C	INC
School	% of children participating in 2+ hours/week in extra-curricular sport and school based recreation	--	C-	B	A-
Community and the built	% of parents perceiving their local area as safe and % of adolescents	B	B	B	B

environment	perceiving their local facilities as good quality				
Diet	Unclear	D-	--	--	--
Obesity	Unclear	F-	--	--	—
Government	Unclear	B	INC	B	INC

4.6 - Conclusion

Physical activity is important for people of all ages. So, it is concerning that available evidence suggests activity levels, in Europe and elsewhere, are often low and declining. The limited surveillance information on children suggests a similar pattern, and this is even more alarming as childhood represents a foundation for later health and activity behaviours. Consider obesity, which is a major adverse health consequence of physical inactivity, although not the only one. In the USA, half of obese children aged 3 to 6 will become obese adults, and obese three-year-olds generally became obese during infancy (Lake, 2012). Habits track from childhood to adulthood, so active children are less likely to suffer the adverse health consequences of physical inactivity in adulthood (Telama, 2009).

4 BENEFITS AND COSTS - WHY DOES PHYSICAL ACTIVITY MATTERS?

4.1 - Introduction

The relationship between physical activity and physical health is strong, as it is

between inactivity and ill-health. There has been a tendency for researchers to focus on the risks and costs of inactivity, rather than the benefits of activity (Bailey, Hillman, Arent, *et al*., 2013). Important studies from the 1950s (e.g., Morris, *et al*., 1953) and 1970s (e.g., Paffenbarger & Hale, 1975) laid a foundation for numerous long-term prospective follow-up studies that have assessed the relative risk of death from any cause and from specific diseases associated with physical inactivity (Berlin & Colditz, 1990; Wannamethee, Shaper & Walker, 1998; Lee & Paffenbarger, 2000).

4.2 - Physical Activity and Morbidity

Increasing physical activity and physical fitness has been shown to be associated with reductions in relative risk of death, and while decreasing them increases the risk (Blair, Kohl, Barlow, *et al*., 1995). Even relatively small improvements in activity are associated with significant reduction in risk. For example, a Taiwanese study found that the benefits of exercise appear to be significant, even without reaching the recommended 150 minutes per week (Wen, Wai, Tsai, *et al*., 2011). In fact, the authors discovered that an individual's risk of mortality from any cause tended to decreased with additional exercise time up to 100 minutes a day over the course of the study. Those exercising for 30 minutes daily added about four years to life expectancy. These benefits were found to apply in all age groups, both sexes and those with cardiovascular disease risk.

A dose-response appears to exist, so the more active an individual is, the greater the health rewards (Erikssen, Liestøl, Bjørnholt, *et al*., 1998). Paffenbarger and Hale (1975) found that regular physical activity (equating to an average of 2,000 kcal per week) was associated with an increased life expectancy of between 1 and 2 years by 80 years old, and that the benefits of activity were linear, with improvements evident even with lower levels of energy expenditure. Later studies have supported these findings, suggesting that activity costing just 1,000 kcals per week is associated with a 20-30% reduction in

all-cause mortality (Lee & Skerrett, 1993; Paffenbarger, Hyde, Wing, *et al*., 1993). Inactive or elderly people can accrue health gains from just 500 kcal of exercise or activity per week (Leon, Connett, Jacobs, *et al*., 1987). Generally, fit and active people have been found to have more than 50% risk reduction than their sedentary peers, and increasing energy expenditure from physical activity by 1000 kcal (the equivalent of 2 hours of recreational football) per week has been associated with a 20% reduction in risks of death (Myers, Kaykha, George, *et al*., 2004). Sedentary middle-aged women have a 52% increased risk of mortality, including a doubling of cardiovascular disease, and a 29% increase in cancer-related mortality (Hu, Willett, Li, *et al*., 2004). This pattern of risk is comparable to high blood pressure, high levels of cholesterol, obesity and smoking (Warburton, Nicol & Bredin, 2006).

4.3 - Physical Activity and Specific Health Conditions

So, the link between physical activity and physical health has now reached the point of consensus. Moreover, physical activity is an important feature of healthy human development, and inactivity is a risk factor for a range of serious conditions, many of which develop during childhood or adolescence. Five physical outcomes have drawn the most attention from researchers:

- Cardio metabolic health
- Bone Health
- Cardiorespiratory fitness
- Motor skills/development
- Body composition

The relationship between physical activity and these outcomes is summarised in Table 7, below.

Table 7 - *The relationship between physical activity and five serious health conditions*

	Definition	Association with Physical Activity	Sources
Cardio-metabolic health	A measure of the risk of diabetes and heart disease	There is strong evidence for a positive association between physical activity and cardio-metabolic health among children; children with good cardio-metabolic health have lower-risk of developing a range of risk factors for cardiovascular disease, including type 2 diabetes, hypertension and obesity. Studies show the relationship between physical activity and cardio metabolic health is particularly evident among those with an elevated risk status at baseline. There is a dose-response, with higher doses of physical activity associated with higher levels of cardiovascular and metabolic health.	Brage, Wedderkopp, Ekelund, *et al*., 2004; Chalkley, Milton, Foster, 2015; Khan, Thompson, Blair, *et al*., 2012; Janseen, I. & LeBlanc, A. (2010)
Bone Health	Maintenance of bone mineral density	Regular physical activity has a beneficial effect on bone mineral content and density. This is apparent in studies of youth, including regular sports players and non-players, and retrospective studies of childhood and adolescent sport activity relative to adult bone mineral content.	Chalkley, Milton, Foster, 2015; DeBar, Ritenbaugh, Aickin, *et al*., 2006; Strong, Malina, Blimkie, *et al*., 2005.

Cardio-respiratory fitness	Ability to perform sustained bouts of physical activity	Physical activity is associated with cardiorespiratory fitness among children. Participation in activities requiring sustained activity, such as brisk walking, running, cycling, stair climbing and sports, leads to improved fitness in both boys and girls. Low fitness is an important precursor of mortality, and even moderate fitness protects against the influence of cigarette smoking, elevated cholesterol levels, elevated blood pressure, and other predictors on mortality.	Chalkley, Milton, Foster, 2015; Kodama, Saito, Tanaka, *et al*., 2009; Veijalainen, Tompuri, Haapala, *et al*., 2015.
Motor skills/development	Ability of the body to perform tasks, such as walking, balancing, catching and throwing	There is some evidence of a relationship between physical activity and motor skill acquisition in children, especially if planned sessions are delivered by subject specialists to ensure they are developmentally appropriate. Sustained participation in programmes is most likely to facilitate development. The relationship between physical activity and motor skill development appears to be reciprocal: participation in physical activities improves motor skills and development; and children with higher motor proficiently are likely to be more physically active.	Chalkley, Milton, Foster, 2015; Stodden, Goodway, Langendorfer, *et al*., 2008; Laukkanen, Pesola, Havu, *et al*., 2015; Wrotniak, Epstein, Dorn, *et al*., 2006.

Body composition	Percentages of fat, bone, muscle and water in the body.	While programmes aimed at increasing physical activity among normal weight children typically have little effect on adiposity, physical activity is associated with reductions in overall adiposity and visceral adiposity among children who are overweight or obese. Generally, research evidence supports the ideas that physical activity is a key component of energy balance, and that keeping active is an essential part of preventing people from becoming overweight and accumulating body fat. Active children and adolescents tend to have less body fat, and physical activities have been shown to be effective in programmes for overweight and obese young people. The beneficial effects of physical activity on obesity in young people are lost when interventions stop, which suggests a need for lifestyle change.	Barbeau, Johnson, Howe, *et al.*, 2007; Basterfield, Adamson, Frary, *et al.*, 2011; Chalkley, Milton, Foster, 2015; Janseen, & LeBlanc, 2010; Tremblay, Colley, Saunders, *et al.*, 2010

4.4 – The Special Case of Childhood and Youth Physical Activity

It is worthwhile saying a little more about movement (or motor) skill development, as it is generally overlooked in reviews. Childhood (especially up to the period of puberty) represents a particularly important period in the development of movement skills, since these skills represent the fundamental resources upon which engagement with all later physical activity relies (Lubans, Morgan, Cliff, *et al*., 2010). This is a time when the learning of certain basic movement skills is relatively easy, and during which development is accelerated. Some go further, arguing that the period of childhood is so critical for movement skill learning that if children do not develop a broad foundation of skills during this period, they will never acquire fluency and confidence in movement (Balyi, 2001). The evidence base for claims of a critical period like this is weak (Bailey, Collins, Ford, *et al*., 2010). However, it does seem to be the case that failure to master movement skills at one stage of development will hinder the development of skills at the next, because each stage of skill development is built upon the preceding phase, and this will restrict participation in sport and other forms of physical activity (Bailey, 2000).

From the perspective of public health, childhood is a uniquely important time, as physical activity and other health-enhancing behaviours, contribute not just to the health of the individual child, but also the adolescent and adult that child will become. The whole period of childhood, from infancy to puberty, offers a window of opportunity in the development of predispositions to act or behave in certain ways. This has enormous implications for sports and physical activities as it is worthwhile to lay the foundations of participation during the first decade of life. The propensity to be physically active and to engage in sports is set during childhood (Wheeler, 2012). Of course, human behaviour is too complex to be ‘determined’ from an early age, in a restricted sense. Different social factors leave their marks throughout the life course. However, it seems reasonable to suggest that those wishing to promote an active lifestyle among children and young people will need to recognize the effect of social

influences, If the earliest experiences of sports and/or activity are uninspiring, boys and girls will not want to continue, and evidence suggests that inactive children are likely to become inactive adolescents, and inactive adults (Craigie, Lake, Kelly, Adamson & Mathers, 2011; Janz, Burns & Levy, 2005).

The case for a childhood focus for heath-orientated physical activity policies and programmes has been enhanced by the growing body of evidence associated with the “early obesity intervention hypothesis’, which theorises that intervening before adulthood is necessary to mitigate the development of poor body composition status later in life (Dietz, 1994; Lawlor & Chaturvedi, 2006). An assumption inherent in the early obesity intervention hypothesis is that, prior to adulthood, windows of opportunity exist within which interventions may offset the risk of obesity prior to adulthood. This is an emerging body of research, but it is consistent with a great deal of existing evidence on this subject (Street, Wells & Hills, 2015).

Overweight young people tend to be more poorly coordinated than their peers, and this relationship seems to extend back to infancy (Jaffe & Kosakov, 1982). This pattern might explain why there is an association between movement competence and physical activity. One important factor seems to be physical self-perception, or the individual’s perceptions, evaluations and descriptions of their physical self (Jennett, 2008). In particular, movement skills have been found to relate to self-efficacy or perceived competence in physical activities (Barnett, Morgan, van Beurden, *et al*., 2008). Studies have also found an association between perceived competence and physical activity behaviour (Crocker, Eklund & Kowalski, 2000) and with actual competence or motor skill proficiency (Raudsepp & Liblik, 2002; Jones, Okely, Caputi, *et al*., 2010). These findings are extremely important, since motor skill proficiency is a correlate of both physical activity participation and fitness in childhood and adolescence (Wrotniak, Epstein, Dorn, *et al*., 2006; Stodden, Roberton, *et al*., 2007). Low levels of competence and confidence may result in children avoiding physical activity settings, thereby removing themselves from the context that are most needed.

One way of envisaging this situation is as a 'virtuous cycle', which is offered in Figure 7, below.

Figure 7 - A 'Virtuous Cycle' of the Interaction between movement skill development and psycho-social development. Source: Bailey, Doherty & Pickup (2007)

The key variable is, of course, the quality of the physical activity experience. If positive experiences are replaced with negative ones, the cycle is transformed into a 'vicious cycle', through which the child becomes progressively disaffected from activity. This highlights a recurring finding from the empirical base: physical activity's contribution to human development is, in most respects, conditional on certain types of contexts and settings (Bailey, Armour, Kirk, *et al*., 2009; Petitpas, Cornelius & van Raalte, 2008). In other words, the outcomes of physical activity are mediated by a host of factors, of which the most significant seem to be the adults who present, organise and supervise it.

Movement skills track quite consistently during childhood (Burton & Miller, 1998), so greater motor competence in youth may predict later physical activity. Children and young people with better motor competence may find it easier to be physically active and may be more likely to engage in physical activity compared with peers with poorer motor skill competence. Children with poor motor proficiency may subsequently choose a more sedentary lifestyle to avoid these movement difficulties (Wrotniak, Epstein, Dorn, *et al*., 2006). Consequently, difficulties in developing a basic level of movement confidence, what is sometimes called 'physical literacy' (Whitehead, 2010), can create a 'proficiency barrier' to participation as children will not have the necessary skills to be active or play sport (Seefeldt, 1979; Clark, 2005). The development of these fundamental skills can have a long-lasting effect on physical fitness and participation, both during childhood and adulthood, because learning a broad base of movement skills in childhood opens up opportunities to take part in a large range of activities. An equally important corollary of the proficiency barrier claim is that the absence of these skills means that individuals will fail to develop the necessary range of options to be active because he or she lacks the necessary physical competence (Clark & Metcalfe, 2002). This goes some way in explaining why participation in structured physical activity programmes during childhood can track to participation in adulthood, which in turn results in improved physical health for life (Stodden, Langendorfer & Roberton, 2009). Children who are more proficient in movement skills are more likely to be more physically active and fit in adolescence (Barnett, van Beurden, Morgan, *et al*., 2008, 2009; Wrotniak, Epstein, Dorn, *et al*., 2006).

A popular way of talking about the outcome of effective physical activity experiences is 'Physical Literacy'. In fact, it is more difficult than it seems, as physical literacy is what philosophers sometimes call a 'slippery concept' and use has often been ill-defined. Consider some influential definitions:

> "Physical literacy is the ability, confidence, and desire to be physically active for life." (Aspen Institute, undated)
>
> "Physical literacy is the development of fundamental movement skills (see page 7) and

> fundamental sport skills (see page 12) that permit a child to move confidently and with control, in a wide range of physical activity, rhythmic (dance) and sport situations. Physical literacy also includes the ability to "read" what is going on around them in an activity setting and react appropriately to those events." (Canadian Sport for Life, undated)
>
> "Physical literacy can be described as the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life." (International Physical Literacy Association / Whitehead, 2016)

There are obvious overlaps between these definitions (which is most likely because different authors have borrowed language from each other), but there are also clear differences in focus and content. The Canadian definition seems to be synonymous with 'physical education', and give priority to the development of fundamental and specialist movement skills. The Aspen and IPLA definitions include psychological and cognitive elements, and conceive of physical literacy as setting a foundation for lifelong activity. Sadly, there have been very few quality empirical studies of explicitly physical literacy programmes and the lack of conceptual clarity makes it difficult to envisage a situation in which rigorous research would be possible. So perhaps physical literacy is best thought of a slogan or motto, rather than a coherent research programme? Movement and motor skill development is currently a much clearer way of discussing these important issues.

4.5 - Obesity

A second aspect of the relationship between physical activity and health is that, unlike motor development, certainly does grab significant attention from policy makers and the public alike is obesity (Sikorski, Luppa, Kaiser, *et al*., 2011; Gortmaker, Swinburn, Levy, *et al*., 2011). Obesity is a source of several serious non-communicable diseases, including Type 2 Diabetes, cancer, cardiovascular and respiratory diseases. According to the World Health

Organisation (WHO, 2013), obesity and overweight are estimated to be the principal causes of 44% of all cases of diabetes around the world, 23% of ischaemic heart diseases (caused by restriction in blood supply, leading to damage to dysfunction), and between 7-41% of all cancer cases. Consequently, obesity is a source of considerable health care expenditures, and it is predicted that these costs will increase over the coming decades (Erixon, Brand, & Krol, 2014).

In an influential review of the evidence available at the time addressing the specific questions of the effects of physical inactivity and obesity on morbidity and mortality, it was concluded from the best available evidence that not only did physical activity appear to reduce the force of the health risks associated with overweight and obesity, but also that active obese individuals have a lower morbidity and mortality than sedentary normal-weight individuals (Blair & Brodney 1999). Subsequent evidence has generally supported the view that physical activity, in conjunction with other behaviour change, is an effective strategy against obesity (Astrup, 2001; Epstein, Coleman, and Myers, 1996). In addition, evidence suggests that physical activity is a useful way of preventing the emergence of obesity in the first place (Reilly, Kelly, Montgomery, *et al*., 2006). Even more exciting is the possibility that physical activity helps to decrease the effect of genetic predisposition on obesity (Silventoinen & Kaprio, 2010). All of this leads to the conclusion that physical activity ought to play a central role in strategies to combat obesity.

The prevalence of obesity and overweight at both international and national levels is a serious crisis. Obesity rates in the developed, and increasingly the developing world, have been growing at an accelerated speed in the past two decades. Worldwide, the proportion of men assessed as either overweight or obese rose from 28.8% in 1980 to 36.9% in 2013; the figures for women were 29.8% and 38%, respectively (Ng, Fleming, Robinson, *et al*., 2014). In the European Union, between 36.9% and 56.7% of all women, and between 51% and 69.3% of all men, are overweight or obese (Eurostat, 2013). Estimates on the growth of obesity suggest that by 2030, more than 40% of the population in some countries in Europe will be obese (Table 8, below).

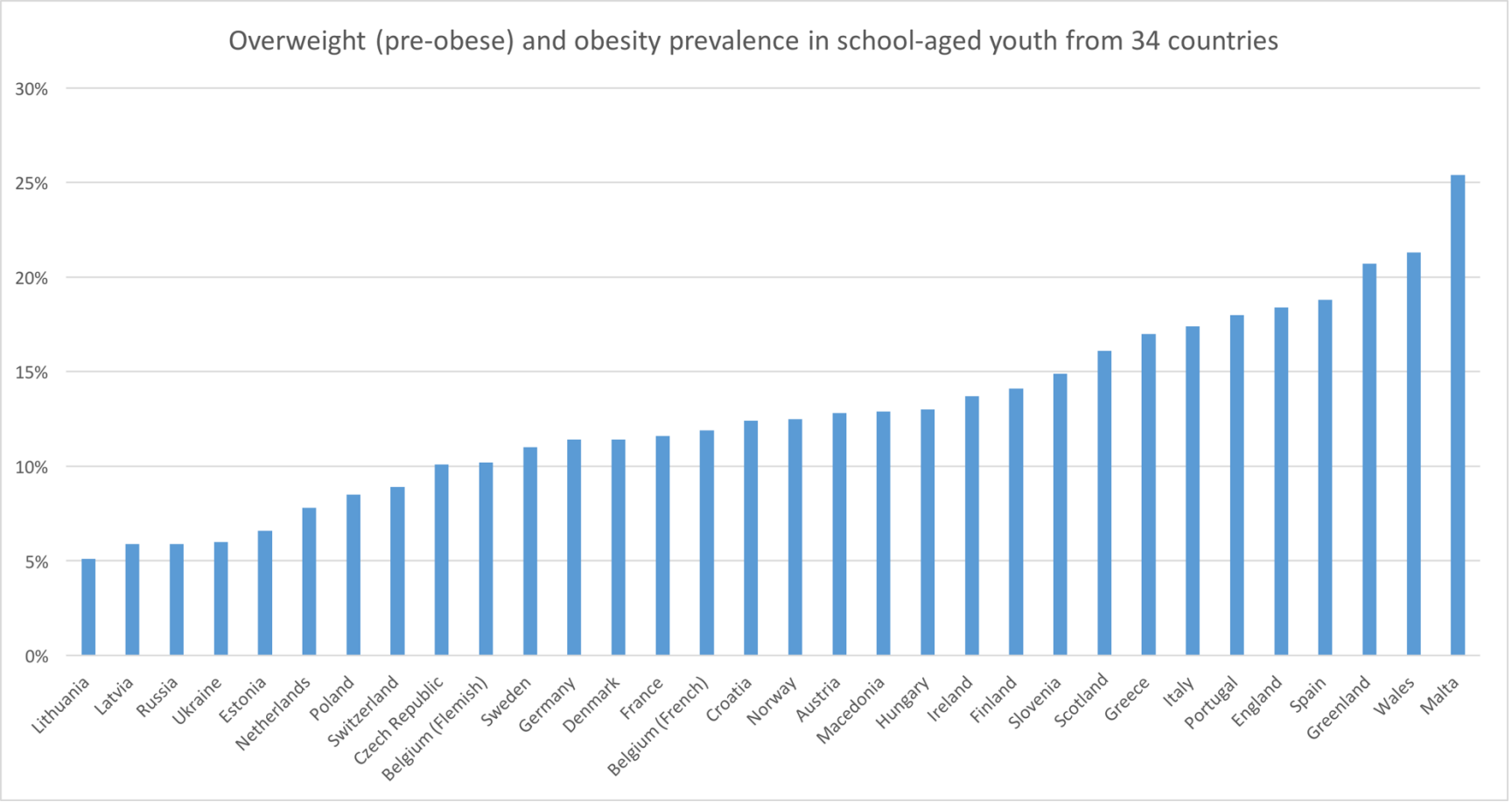
Table 8 - *Projected obesity rates (%), baseline scenario (Source, Erixon, Brand, & Krol, 2014; based on OECD National Statistics)*

	2010	2015	2020	2025	2030
UK	25.31	29.43	32.79	36.79	41.29
Spain	12.46	13.68	16.20	17.05	17.95
France	9.66	11.18	13.19	14.23	15.35
Germany	19.10	21.20	23.50	26.20	28.20
Sweden	7.32	8.23	9.27	10.43	11.74

Adult levels of obesity are cause for concern, however the alarming rise in childhood levels is, perhaps, even more worrying. Prevalence of childhood obesity has increased substantially in in developed countries, to current estimates that 23.8% of boys and 22.6% of girls in 2013. Levels of childhood and adolescent obesity have also increased in developing countries, to 12.9% of boys and 13.4% of girls (Ng, Fleming, Robinson, *et al*., 2014). In some regions, the problem of childhood obesity is particularly acute. In the United States levels of obesity have doubled in children and quadrupled in adolescents in the past 30 years (Ogden, Carroll, Kit, *et al*., 2014). Between 1980 and 2012, the proportion of 6–11 year olds who were obese increased from 7% to nearly 18%, and the percentage of obese 12–19 year olds increased from 5% to nearly 21%. Similar patterns are emerging in Europe. If current trends continue the number of obese young children globally will increase to 70 million by 2025 (WHO, 2015).

Figure 8 shows the prevalence of obesity and overweight in 31 European countries and region.

Figure 8 - Overweight (pre-obese) and obesity prevalence in school-aged youth from 34 countries (Source: Extracted and redrawn from data in Janssen, Katzmarzyk, Boyce, et al.*, 2005).*



Obesity in childhood is associated with both immediate and long-term consequences for the individual's health and well-being, both as a child and later as an adult. Obese young people are more likely to have risk factors for cardiovascular disease, such as high cholesterol or high blood pressure. For example, in a sample of 5- to 17-year-olds, 70% of obese youth had at least one risk factor for cardiovascular disease. (Freedman, Mei, Srinivasan, *et al*., 2007). In addition, obese adolescents are more likely to have blood glucose levels indicative of a high risk for development of diabetes (Li, Ford, Zhao, *et al*., 2009), and children and adolescents who are obese are at greater risk for bone and joint problems, sleep apnoea, and social and psychological problems such as stigmatization and poor self-esteem (Daniels, Arnett, Eckel, *et al*., 2005). There are long-term risks, too, as young people who are obese are likely to be obese as adults and are therefore more at risk for adult health problems such as heart disease, type 2 diabetes, stroke, several types of cancer and osteoarthritis (WHO, 2013).

4.6 - The Human Capital Model

Generally speaking, discussions of the benefits of physical activity have focused almost exclusively on physical health and physical disease. The "Exercise is Medicine" campaign of the American College of Sports Medicine (2011) is a good example of an evidence-based initiative that focuses on the contribution that activity can make to physical health and specifically to combat physical ill-health. It is right, of course, that exercise can be medicinal, since there is little doubt of its health-enhancing benefits (Cavill, Kahlmeier Racioppi, *et al*., 2007). However, it has been argued that these health benefits are merely aspects, or even positive side effects, of a more wide-reaching, holistic contribution that physical activity makes to human development (Bailey, Hillman, Arent, & Petitpas, 2013). If this is the case, it would be expected that the positive outcomes of engagement in physical activities would extend beyond improvements to health. As it turns out, this is the case.

The Human Capital Model (HCM) (Bailey, *et al*., 2012; 2013; in press) is framework for thinking about the outcomes and processes of physical activity, and is part of a wider research, development and advocacy initiative called Designed to Move (https://www.designedtomove.org/). Part of its motivation is that despite the mounting evidence of the benefits of physical activities, there continues to be a general under-appreciation of the importance of sports and physical activity - both to individuals and the wider society. When the value of physical activity is discussed, it tends to focus on a narrow range of issues, such as obesity and coronary heart disease.

Underlying the HCM is an assertion that the stock of competencies, knowledge and personal attributes are embodied in the ability to take part in sporting and other physical activities, and that these activities produce values that are realized through increased well-being, educational achievement and, ultimately, economic value. This is not to suggest that the importance of sports and physical activity is overlooked by policymakers or the wider society. Indeed, there is increasing acceptance that regular sports and physical activities form important and necessary features of healthy living and development precisely because of the consequences of inactivity. However, the evident escalating costs to personal and societal well-being suggests that there remains an urgent need to gather, analyse and present a coherent and compelling framework of the state of the science. The HCM offers the view that physical activity is an investment capable of delivering valuable returns. Underlying the model is a claim that the stock of competencies, knowledge and personal attributes are embodied in the ability to participate in physical activity, and that these activities produce values that are realized through increased well-being, educational achievement, economic value, and so on.

The HCM conceptualizes development in terms of different forms of 'capital', as follows:

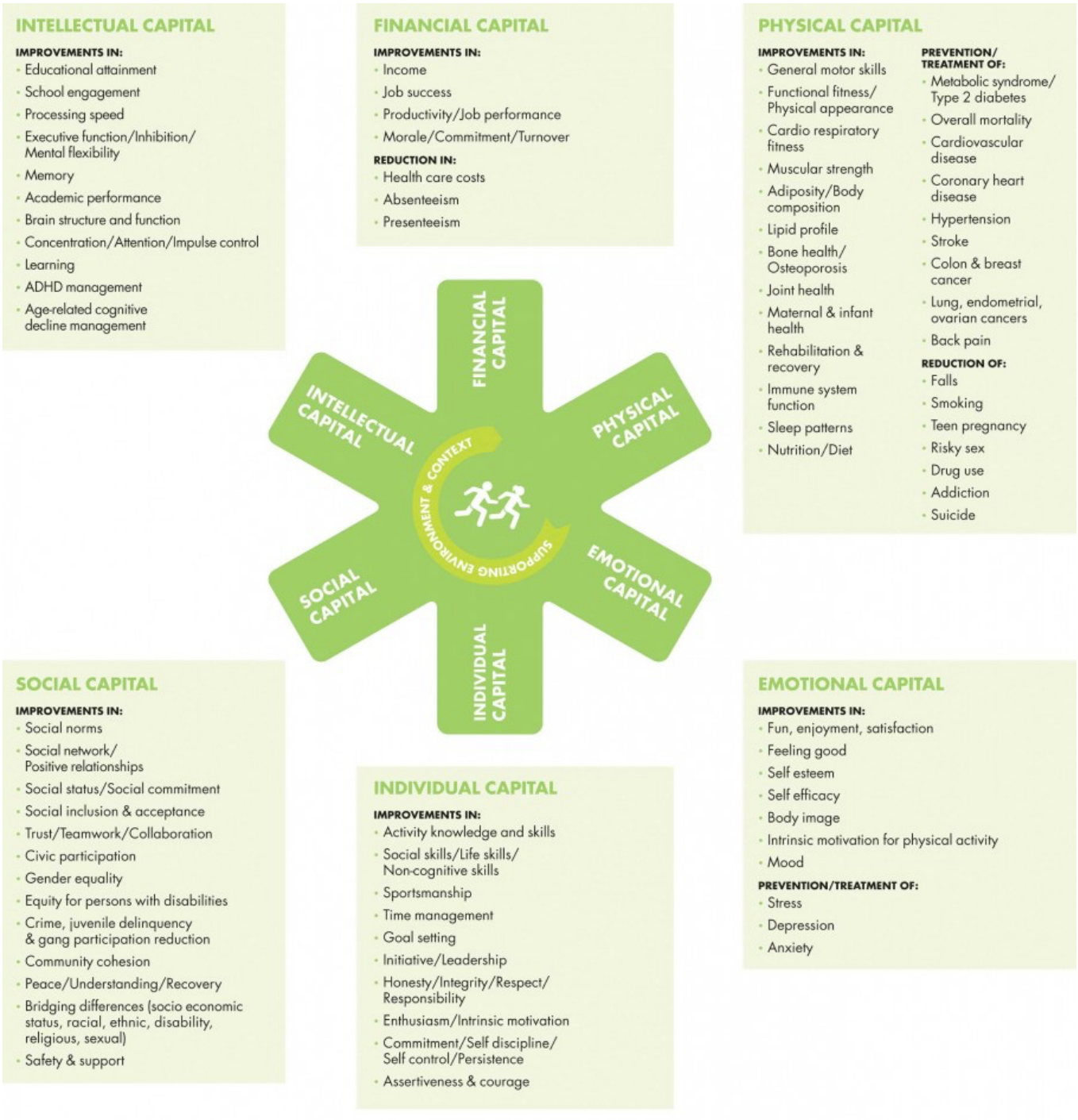
1. Physical Capital: The direct benefits to physical health and positive influences on healthy behaviours.

2. Emotional Capital: The psychological and mental health benefits associated with physical activity.
3. Individual Capital: The elements of a person's character—e.g., life skills, interpersonal skills, values—that accrue through participation in physically active play, sports and other forms of physical activity.
4. Social Capital: The outcomes that arise when networks between people, groups, organizations, and civil society are strengthened because of participation in group-based physical activity, play, or competitive sports.
5. Intellectual Capital: The cognitive and educational gains that are increasingly linked to participation in physical activity.
6. Financial Capital: Gains in terms of earning power, job performance, productivity and job attainment, alongside reduced costs of health care and absenteeism/presenteeism (i.e., lower productivity among those who are "present") linked to physical activity.

The classification of these themes was the result of an extended process of model building, critique, and revision, involving a comprehensive literature search, group workshops, and interviews with a range of authorities on specific aspects of the outcomes of physical activity. The resultant capitals themselves were general themes that imposed order and meaning on 88 distinct benefits that were supported by the peer review process.

Figure 9 shows the 6 capitals, and the 88 specific benefits.

Figure 9 - The Human Capital Model. Source; Bailey, Hillman, Arent et al., 2013



According to the Model, each of the capitals are resources that can be invested and drawn on throughout life. The model suggests not only that physical activity is a key driver of different types of capital formation, but that each of the capitals in turn influence both activity and each other, thus forming a synergistic feedback network whose whole is greater than the sum of its parts.

The HCM is a positive way of framing discussions about the case for physical activity. It builds on existing work in the field, but adds two particularly important elements to the debate: first, that physical activity is a wise investment that can deliver valuable returns, both in the present and throughout the future; and second, that the range of these returns is much greater than are commonly assumed. The proposal is that significant and wider-ranging benefits can be gained through investing in and developing the human capitals.

Furthermore, the Model reinforces the fact that the outcomes of physical activity are not automatic; participation in these activities is a necessary condition for the growth of the capitals, but it is not sufficient. The qualities of interactions and the relationships that underlie them have pivotal effects on the extent to which benefits are realized, not least because they significantly influence adherence to the activities.

4.7 – Economics of Physical Activity

The benefits of physical activity for individual health, well-being and success have been discussed. However, many conditions associated with low levels of physical activity, such as obesity, are not only a threat to an individual, but it also cause high costs for medical systems around the world (Breuer, 2014). Data from the United States is both most readily available and alarming. For example, the costs related to obesity in the United States reached estimated $70 billion dollars in towards the end of the last Century, thereby accounting for 9.4% of the national health care System costs (Colditz, 1999). A more recent study from the United States examined four different cost

categories: direct medical costs; productivity costs; transportation costs; and human capital accumulation costs. The resulting calculated costs due to obesity was $215 billion (Hammond & Levine, 2010). As the authors of this paper commented: “The overall economic impact of obesity in the US appears to be substantial” (p. 294). They estimated, for example, direct medical costs could be as much as 100% higher for the obese as for healthy weight adults, and that additional medical spending an associated with obesity could amount to $147 billion annually for adults, and $14.3 billion for children. In addition, productivity costs work linked to obesity in terms of absenteeism, presenteeism, disability, and premature mortality. The total productivity costs were estimated at $66 billion annually.

Similar results can be observed in Europe, and obesity appears to be responsible for a substantial economic burden in many European countries. One systematic review of 797 publications dealing with the economic impact of obesity in ten Western European countries reported that overweight and obesity are responsible for a substantial economic burden in Europe (Müller-Riemenschneider, Reinhold, Berghöfer, *et al*., 2008). According to their analysis, estimated obesity-related costs range from 0.09 to 0.61% of total annual gross domestic income in Western European countries. Obesity-related healthcare burdens of up to 10.4 billion euros were found.

There are financial costs associated with many non-communicable diseases such as diabetes. As discussed above physical activity has been found to play an important role in treatment of this condition. Recent estimates of the costs associated with diabetes from the United States total $245 billion, including $176 billion of direct medical costs, and $69 billion in the reduced productivity (American Diabetes Association, 2013).

As the Human Capital Model made clear, the benefits of physical activity extend beyond the body. The benefits of activity for psychological and social well-being are now well-established, and there is increasingly persuasive evidence that physical activity can support a range of psychological difficulties, such as depression, anxiety

and stress (Jones and O'Beney, 2004). One study calculated the cost in Europe of depression alone to be 118 billion Euros, including direct medical costs totalling 41 billion Euros. ICSA / CEBR (2015) in their study calculated that inactivity imposes economic costs of more than € 80 billion per year to the EU-28 through four major non-communicable diseases (coronary heart disease, type II diabetes, colorectal and breast cancer) and through the indirect costs of inactivity-related mood and anxiety disorders (see ISCA, 2015, p. 6). Indirect costs due to morbidity and mortality were estimated at 76 billion Euros (Sobocki, Jönsson, Angst, *et al*., 2006). It must be acknowledged, of course, that it would be an error to equate such costs with physical inactivity in a simple manner. In the one hand, a range of factors are likely to influence health outcomes, such as diet, sleep and subjective well-being. On the other hand, such costs are routinely calculated without reference to the full range of outcomes of physical activity participation, such as psychosocial benefits, educational achievement and income enhancement (Bailey, Hillman, Arent, *et al*., 2013Breuer (2014) usefully identified studies of the economics of inactivity, and the small number of Europe-based studies are summarised in Table 9, below.

Table 9 - Empirical Results for the Economic Impact of Physical (In)activity. Source: adapted from Breuer, 2014. (all figures have been translated to Euros)

Author(s)	**Relevant Year**	**Country**	**Main Findings**
Martin, Beeler, Szucs, *et al*., 2001	1999	Switzerland	Physical inactivity lead to costs of 3.69 billion Euros
Allender, Foster, Scarborough, *et al*., 2007	2002	UK	Physical inactivity accounted for 1.44 billion Euros of direct costs
Department of Culture, Media and Sport, Sports Strategy Unit	2002	UK	Physical inactivity created costs of 11.13 billion Euros, including 2.31 billion Euros to the national health care system, 7.33 billion Euros due to work absences, and 1.36 billion Euros due to early mortality.
Scarborough, Bhatnagar, Wickramasinghe, *et al*., 2011	2006	UK	Direct costs of 1.22 billion Euros

Whilst bearing in mind the economic costs of physical inactivity, described above, it is also important to acknowledge the other side of the coin – the economic benefits associated with active lifestyles. A number of studies have identified sport, in its different forms, and physical activity as drivers for economic growth. For example, European findings of the *Study on the Contribution of Sport to Economic Growth and Employment in the European Union* (2012), based on data collection in all 27 EU Member States, suggest that the real share of sport in terms of production and income

is about six times as high as reported in official statistics. According to that study the share of sport-related gross value added of total EU gross value added is 1.13% (narrow definition of sport) respectively 1.76% (broad definition of sport). In addition, by taking a deeper look at the economic impact of outdoor recreation in their study *Reconomics* Butler and Comley (2014) found that walking tourism was estimated to generate up to GBP 2.76 billion for the English economy and the outdoor specialist market in the United Kingdom was estimated to be worth more than GBP 1.40 billion.

Economic benefits are apparent at both the national and individual level. In their review-of-reviews for UNESCO, Bailey and Reeves (2013) found evidence of multiple contributions from participation in sport a physical activity in terms of educational attainment, employability and career progression. Researchers have demonstrated a negative link between obesity and employment/wages (Lundborg, Bolin, Höjgård, *et al*, 2007), although it is unclear whether this is due to discrimination towards the the obese or a lack of productivity (potentially due to their increased likelihood of illness). Conversely, it has been suggested that the physically active look fitter and more "presentable" than the less active, and this can have a positive effect upon their employability (Kavetsos, 2011). It appears to be the case that physically active people, because they are healthier, have higher levels of individual productivity. Consequently, there is evidence that participation in physical activity is seen as a marker for general health status by potential employers. Table 10 summarises some of the the recent evidence in this area.

Table 10 – European studies examining the relationships between participation in sport and physical activities and individual financial benefit

Authors (date)	**Country(ies)**	**Main Findings**
Kavetsos (2011)	25 European countries	Individuals who are active are more likely to be employed, after controlling for a number of individual characteristics and country specific fixed effects, irrespective of gender. The results suggest that the probability of employment increases with higher frequency levels of exercise.
Hyytinen & Lahtonen (2013)	Finland	Being physically active had a positive impact on the long-term income of a sample of more than 5,000 male twins, which may be due to various non-cognitive mechanisms. Physical activity can, for example, make people more persistent in the face of work-related difficulties and increase their desire to partake in competitive situations, with greater expected pecuniary rewards.
Rooth (2010)	Germany	Physical fitness represented an earnings premium of 7%; being physically fit was equivalent to one additional year of schooling. In addition, engagement in sports and other physical activities equated to a greater probability of callback for interview; equivalent to 1.5 additional years of work

		experience. Moreover, there was a general perception that being engaged in sports indicates individuals as having important social skills.
Lechner (2009)	Germany	Engagement with sport increases earning by about $1,700 per annum over a 16 year period compared to no or very low sports activities. This effect was probably due to improvements in health and well-being in general, and specifically through reduction in sick days and increased productivity.

4.8 Conclusion

Physical activity is an important contributor to human health and well-being, and the full extent of its benefit is only now becoming realized by researchers and policy makers. The physical health outcomes of regular physical activity are compelling and urgent. The well-known scientist, Steven Blair, described physical inactivity as “the biggest health problem of the 21st-century”. In fact, concerns are so compelling and urgent that there is a danger that they over-shadow the wider benefits of exercise and sport, such as psychological and social well-being, the development of life skills, and career advancement. There is currently no evidence to indicate the economic value of these non-physical outcomes. For now, the only available evidence relates to the economic cost of physical inactivity mainly in terms of physical ill-health, and this makes it clear that it is not just individuals who bear the burden of inactivity.

5 What Influences participation in physical activity?

5.1 - Introduction

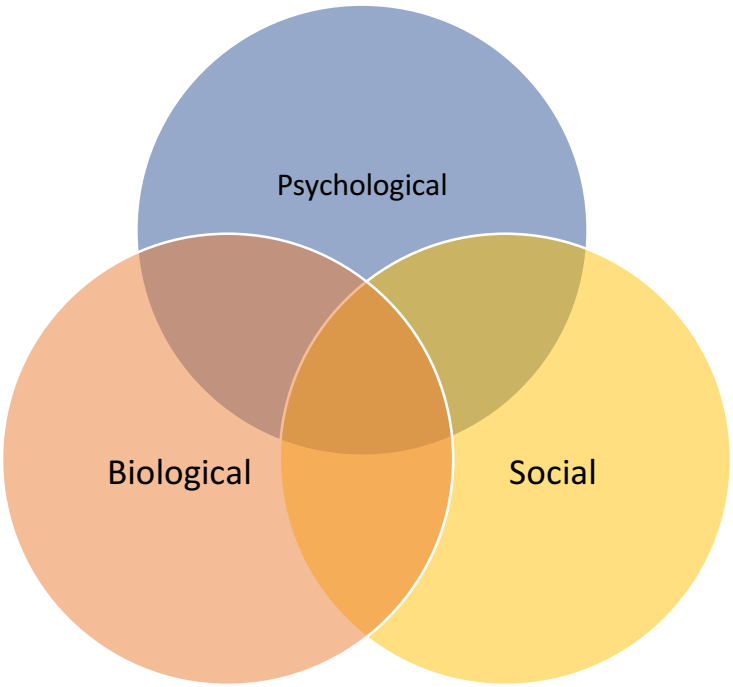
Identifying the factors and their mechanisms of influence are critical for increasing the effectiveness of interventions in the area of physical activity. It is well-known that many physical activity interventions are not as effective as intended. One well-known review examined 23 physical activity intervention programmes and determined: 1) a substantial number of physical activity intervention programmes had little to no impact on physical activity; and 2) demonstrated effects were indicated in some outcome measures, but not in others, or in some subgroups, but not in others (Baranowski, Anderson, & Carmack, 1998).

5.2 - Understanding Physical Activity

There are, of course, numerous models seeking to explain the determinants of engagement in physical activity. One popular model involves dividing the facilitators or barriers to physical activity into two types: personal; and environmental factors (e.g., Chen, 2010; Sallis & Owens, 1998). Examples of the personal factors category might include physical health, past lifestyle or understanding about physical activity. Examples of the environmental factors might be accessibility of resources, public transport links, availability of equipment. The challenge of these models is to reflect adequately the complexity inherent in changing people's behaviours. For this reason, some have suggested that the processes of engagement in sport and physical activity should be understood within a framework that recognizes biological, psychological and social factors (Bailey, Collins, Ford, *et al*., 2010). The 'biopsychosocial model' (abbreviated "BPS") is a general model or approach stating that biological, and psychological (which entails thoughts, emotions, and behaviours), and social (socio-economical, socio-environmental, and cultural) factors, all play a significant role in human functioning in the context of health.


ICSSPE

Figure 11 - A biopsychosocial model of health



A model like the BPS model undermines simplistic equations of physical activity with only biology (e.g., girls are 'naturally' being less active than boys, or certain ethnic groups are biologically inclined towards activity or inactivity), psychology (e.g., it's all down to attitude or motivation), or sociology (it's impossible for certain groups to become physically active or play sports). Something as complex as physical activity behaviour necessarily involves the interaction of all three sources of influence.

An alternative approach is the 'ecological perspective'. This conceptualises the opportunity for physical activity as the availability of relevant settings (e.g., neighbourhoods, schools, worksites), facilities (e.g., health clubs, parks, paths), and programmes (e.g., classes, teams, clubs, supervised recreation) (Sallis, Bauman, & Pratt, 1998). The strength of this approach is its emphasis on the effectiveness of

environmental interventions. And there is no doubt that the built environment is an important influence on participation. Numerous studies have reported the importance on places and spaces for the promotion or obstruction of physical activity, but research also highlights the psychological dimension, too. For example, one review summarized the primary 'environmental and societal 'influences on physical activity, such as: public recreation facilities; commercial use of school facilities; physical activity promotion policy; after-school physical activity programmes; physical education class availability; youth sports; "walkable" communities; physical education class content and training; crime and perceived safety; and sedentary stimuli for leisure. There is no doubt that these are important factors that influence physical activity, but it is important not to overlook the psychological aspect: the question of whether or not an area is a 'walkable' communities is as much about the perception of the residents as the physical structures; and perceptions of crime and safety are known to be heavily mediated by emotions like fear, vulnerability and familiarity (De Meester, Van Dyck, De Bourdeaudhuij, *et al*., 2013). Other studies have demonstrated the difficulty of separating equipment accessibility, neighbourhood safety, social support and physical activity from the psychological sense of control necessary to access them (Motl, Dishman, Saunders, *et al*., 2007).

So, physical activity, like any human behaviour, is complex, and interventions that focus on a narrow range of determinants are unlikely to be as successful those that acknowledge this complexity. Table 11 summarises some of the main factors that influence participation in physical activity. The different elements of the biological, psychological and social factors have been isolated for clarity, but this should not be read to mean they can be so easily isolated in the real-world!

Table 11 - Factors affecting participation in physical activity

Biological Factors		
Factor	**Evidence**	**Source**
Age	Children are the most active population in society. There is a drop in activity levels in early adolescence, particularly for girls, which continues throughout adulthood.	Biddle, Atkin, Cavill, *et al*., 2011; Leslie, Fotheringham, Owen, *et al*., 2001; Sleddens, Kremers, Hughes, *et al*., 2012.
Gender	In almost all countries, boys are more active than girls, and men are more active than women.	Bailey, Wellard, & Dismore, 2004; Martín, Barripedro, del Castillo, *et al*., 2014; Saffer, Dave, Grossman, *et al*., 2012.

Psychological Factors		
Facilitators	Generally speaking, people are more likely to be physically active when they perceive opportunities to be positive and worthwhile. Individuals, and especially children and young people, inclined towards activity when they have an interest and belief in the value of that activity, they feel competent to participate, there are opportunities to challenge themselves and to improve. Psychological research with adults and older adults has shown that perceptions of positive and negative consequences (attitudes), social approval (subjective norm), and capability (perceived behavioural control), all influence decision making and behaviour.	Biddle & Mutrie, 2007; Biddle, Wang, Kavussanu, *et al*., 2003; Lemoyne & Valois, 2014; McMurdo, Argo, Crombie, *et al*., 2012; Tomporowski, Lambourne, & Okumura, 2011.
Barriers	Research identifies a number of psychological barriers to taking part in physical activity. These range from perceived practical difficulties, such as lack of time or access to facilities, to a lack of interest in the activity opportunities available. One of the most frequently mentioned mediating factors for adolescent girls and young women relates to issues of body image and appearance.	Bethancourt, Rosenberg, Beatty, *et al*., 2014; Leyk, Witzki, Sievert, *et al*., 2012; Moschny, Platen, Klaaßen-Mielke, *et al*., 2011; Zunft, Friebe, Seppelt, *et al*., 1999.

Social Factors – Demographic Factors		
Ethnicity	In Europe, members of white social groups are more likely to be physically active than those from other ethnic groups. The distinction is less clear among children.	He & Baker, 2005; Verloigne, Van Lippevelde, Maes, *et al*., 2012; Saffer, Dave, Grossman, *et al*., 2012.
Socio-economic Status (SES)	Those from higher SES tend to be about 10% more physically active than those from lower SES groups. Also, higher SES groups play more organised activities, while those from lower SES groups tend to do more incidental and work-related physical activities.	Bauman, Reis, Sallis, *et al*., 2012; Currie, Zanotti, Morgan, *et al*., 2012; Powell, Slater, & Chaloupka, 2004.
Education	Lower levels of physical activity during childhood, and a greater decline in participation throughout adolescence, are associated with a lower levels of educational attainment.	Bauman, Ainsworth, Sallis, *et al*., 2011; CDC, 2010; Singh, Uijtdewilligen, Twisk, *et al*., 2012.
Social Factors – Influencers		
Family	Family has the greatest influence on children's perceptions of physical and sport competence, particularly during childhood, affecting: - Promoting positive attitudes - Providing practical support - Encourage participation - Acting as role models	Kirby, Levin, & Inchley, 2012; McMinn, van Sluijs, Nightingale, *et al*., 2011; Sleddens, Kremers, Hughes, *et al*., 2012.
Peers and Friends	Peers have a significant effect on the physical activity of children and young people, especially during adolescence.	Fitzgerald, Fitzgerald, Aherne, *et al*., 2012; Salvy, Roemmich, Bowker, *et al*., 2009; Seefeldt, Malina, &

		Clark, 2002.
Schools	Schools represent the leading societal institution for the development of physical skills and the provision of physical activity in children and young people: - Physical Education - Recess / Playtime - After-school cubs	Kirby, Levin, & Inchley, 2012; Trudeau & Shephard, 2005; Wechsler, Devereaux, Davis, *et al*., 2000.
Environment	The built environment is an important aspect of physical activity promotion. Services a number of characteristics of physical activity environments: - the ability to safely away from traffic - easily accessible shops/services/work - availability of leisure facilities - cycle paths - lighting at night	Carver, Timperio, & Crawford, 2008; Sallis, Bauman, & Pratt, 1998; Van Holle, Deforche, Van Cauwenberg, *et al*., 2012

5.3 - Conclusion

As our knowledge of the importance of physical activity grows, so does our awareness of the concerning rates of inactivity across Europe, for all ages and all social groups. In most countries in Europe, significant proportions of the population are so inactive that their health is at risk. In the case of children, millions live sedentary lifestyles that place them at increased risk of a range on non-communicable diseases in both the short-term and the long-term.

ICSSPE

6 Endnote

Physical activity is an important contributor to human health, and the full extent of its benefit has only recently started to be realised. Activity improves health, well-being and functioning in a wide range of settings. Ironically, the physical health outcomes of regular exercise are so compelling and urgent that they are in danger of excluding other outcomes by their dominance. This would be unfortunate, as the cases for the wider benefits of physical activity suggest that it can make distinctive contributions to a wide range of domains, including educational achievement, the development of life skills and social skills, and psychological well-being.

This document outlines a number of areas of knowledge in order to offer an overview of the physical activity situation in Europe. It offers an analysis of the benefits of physical activity, and discusses the financial costs - to individuals and to the wider society - of inactivity and sedentary lifestyles. It then reports on a number of studies of physical activity levels around the world, and especially in Europe. The main findings, to be brief, are that there are genuine causes for concern, and large proportions of the European population are too inactive too often. The review then moves onto the factors that influence participation in physical activities. While the data of physical activity patterns might lead to anxiety, any fear can, at least, been mitigated by a recognition of the growing awareness of and to promote physical activity.

By way of a conclusion, it is worthwhile to consider some of the ways in which this knowledge might be used. Designed to Move, which was referred to earlier in this paper, emphasises a number of contexts in which physical activity could and should play a role. Why is physical activity important in these settings? How can individuals or groups succeed in capitalising upon the potential offered by physical activity?

6.1 - Active Families

Families, and especially parents, are the greatest influences on children's lives, especially during the early years. They spend more time with children than anyone else, and can create the expectation that physical activity is normal and necessary. Parents can play a number of vital roles in supporting and facilitating children's physical activity. Parents are role models to children, companions and financiers of children's physical activity. Families can support physical activity in numerous ways. They can offer involvement, encouragement and confidence. Parents and older siblings can introduce children to new activities, and can play alongside them. Early positive physical activity experiences in the family lay the foundation for all that follows.

6.2 - Active Schools

Schools represent the main social institution for the promotion and support of physical activity. Primary/elementary schools teach children precisely during their sensitive period of movement skill development, when movement patterns, habits and attitudes are established in children's behaviour. School is the overly setting where every child can be reached, and in which positive health messages can be promoted. It is also the only place where a range of positive health messages can be shared with an audience that is uniquely open to health messages.

Physical activity can take many forms and active schools. Physical education lessons, of course, can introduce children to new skills and ways of working, offering the knowledge, skills and understanding necessary for lifelong physical activity. There are other contexts for physical activity at school, too: recess/break times; extra-curricular clubs; active transport to and from school; and activity breaks during other lessons. Each of these can lead to the accumulation of physical activity and, as the evidence from the Human Capital Model demonstrates, they can also contribute to a wide range of other outcomes, including educational achievement.

6.3 - Active Youth Sports

For many people, especially children, sport is the most popular and enjoyable form of physical activity. Through individual and team sports children and adults usually experience elevated levels of physical activity, and they maintain that activity for longer. Youth sports, which are relatively universal, normally voluntary, and almost always social, create a distinctive setting for regular, sustainable physical activity. It has been shown that individuals who do sport are more likely to meet the recommendations for physical activity related to health than those who are not active in sport. However, not all sporting experiences are equally valuable, and there is evidence that negative experiences can lead to avoidance of sport and physical activity altogether. Positive early experiences reinforced by supportive and knowledgeable teachers and coaches seems to be the recipe for youth sports as foundations for lifelong activity.

6.4 - Active Cities

Cities are increasingly becoming the dominant form of environment in Europe, and represent the heart of many communities, as Table 12 shows.

Table 12 - *Patterns of urbanisation in EU countries (based in data from Guardian newspaper; 2009)*

Country	2030	2015	2010	2000	1990	1980	1970	1960	1950
Austria	73.1	67.7	66.6	65.8	65.8	65.8	65.4	65.3	64.6
Belgium	97.8	97.5	97.3	97.1	96.4	95.4	93.8	92.5	91.5
Bulgaria	77.8	72.8	71.3	68.9	66.4	62.1	52.3	37.1	27.6
Croatia	66.5	59.5	57.8	55.6	54	50.1	40.2	30.2	22.3
Cyprus	76.4	71.5	70.3	68.6	66.8	58.6	40.8	35.6	28.4
Czech Rep	78	74	73.5	74	75.2	74.6	52	45.8	40.9
Denmark	89.1	86.9	86.2	85.1	84.8	83.7	79.7	73.7	68
Estonia	74.9	70.1	69.3	69.4	71.1	69.7	64.9	57.5	49.7
Finland	68.8	62.7	61.6	61.1	61.4	59.8	50.3	38.1	31.9
France	82.9	79	77.8	75.8	74.1	73.3	71.1	61.9	55.2
Germany	80	76.3	75.6	75.1	73.4	72.6	72.9	69.8	64.7
Greece	67.4	61	59.7	58.8	58.8	57.7	52.5	42.9	37.3
Hungary	76.1	70.3	68.3	64.6	65.8	64.2	60.1	55.9	53
Ireland	70.4	63.8	62	59.1	56.9	55.3	51.7	45.8	40.1
Italy	74.6	69.5	68.4	67.2	66.7	66.6	64.3	59.4	54.1
Latvia	73.5	68.9	68.2	68.1	69.3	67.1	60.7	52.9	46.4

Lithuania	71.1	66.8	66.4	67	67.6	61.2	49.6	39.5	28.8
Luxembourg	84.1	82.1	82.2	83.8	80.9	80	74.4	69.6	67.2
Malta	98.1	97.2	96.5	93.4	90.4	89.8	89.7	90.1	88.9
Netherlands	88.6	84.9	82.9	76.8	68.7	64.7	61.7	59.8	56.1
Poland	70	64	62.8	61.7	61.3	58.1	52.1	47.9	38.3
Portugal	71.4	63.6	60.7	54.4	47.9	42.8	38.8	35	31.2
Romania	63.1	56.1	54.6	54.6	54.3	45.8	40.3	34.2	25.6
Slovakia	64.7	58	56.8	56.3	56.5	51.6	41.1	33.5	30
Slovenia	60.6	53.3	51.9	50.8	50.4	48	37	28.2	19.9
Spain	81.9	78.3	77.4	76.3	75.4	72.8	66	56.6	51.9
Sweden	87.5	85.1	84.5	84	83.1	83.1	81	72.5	65.7
UK	92.2	90.6	90.1	89.4	88.7	87.9	77.1	78.4	79

Cities offer numerous opportunities to be physically active, and some have turned their built environment into a space that encourages health and activity for all. Active cities are walkable and cyclable. They are safe and well lit, with good public transport and appropriate management of obstacles and barriers.

To date, physical activity promotion policies have tended to focus on the national level A currently under-utilised resource, there, has been the more local governmental agencies. In light of the evidence growth of urbanisation across Europe, it is worth considering the impact of policies at the cities / municipality level. For example, the Covenant of Mayors, which was launched by the European Commission after the adoption of the EU Climate and Energy Package in 2008 has direct influence over most

European's physical environment, yet have not be engaged with the physical activity seriously.

6.5 - Active Workplaces

There is increasing evidence that physical activity embedded into the workplace is associated with increased productivity, lower levels of sickness and absenteeism, increased staff stability, and improved motivation. For most people, the work environment is the place where they spend the second greatest amount of time, so it is a place where people have the time and opportunity to engage with physical activity opportunities, which can be combined with other health messages (such as nutrition and water) Strategies to capitalise upon the opportunities offered by active workplaces include flexible working hours, regular health checks, provision of bicycles for active transport, accessible showers and changing facilities, and subsidised fitness and sports memberships.

7 References

ACSM (American College of Sports Medicine) (Ed.). (2013). *ACSM's Health-related Physical Fitness Assessment Manual*. Baltimore MD / Philadelphia PA: Wolters Kluxers Health / Lippincott Williams & Wilkins.

Allender, S., Foster, C., Scarborough, P., & Rayner, M. (2007). The burden of physical activity-related ill health in the UK. *Journal of Epidemiology & Community Health, 61*(4), 344–348.

American Diabetes Association (2013). Economic costs of diabetes in the US in 2012. *Diabetes Care, 36*, 1033–1046.

Andersen, L. B., Schnohr, P., Schroll, M., & Hein, H. O. (2000). All-cause mortality

associated with physical activity during leisure time, work, sports, & cycling to work. *Archives of Internal Medicine, 160*(11), 1621–1628.

APA (American Psychological Association) (2015). *Education & Socio-economic Status*. Washington, DC: American Psychological Association.

Aspen Institute (undated) Physical Literacy in the United States: A Model, Strategic Plan, And Call To Action. Retrieved from: http://plreport.projectplay.us/

Astrup, A. (2001). Healthy Lifestyles in Europe: prevention of obesity & type II diabetes by diet & physical activity. *Public Health Nutrition, 4*(2b), 499–515.

Bailey, R. P., Collins, D., Ford, P., MacNamara, A., Toms, M., & Pearce, G. (2010). *Participant development in sport: An academic review*. Leeds: Sports Coach UK.

Bailey, R. P, Hillman, C., Arent, S., & Petitpas, A. (2013). Physical activity: an underestimated investment in human capital? *Journal of Physical Activity & Health, 10*, 289–308.

Bailey, R. P. (2000). Movement Development & the Primary School Child. In R. P. Bailey & T. M. Macfadyen (Eds.), *Teaching Physical Education* (pp. 5–11). London: Continuum.

Bailey, R. P., Armour, K., Kirk, D., Jess, M., Pickup, I., & Sandford, R. (2009). The Educational Benefits Claimed for Physical Education & School Sport: An Academic Review. *Research Papers in Education*, 24(1), pp. 1–27.

Bailey, R. P., Doherty, J., & Pickup, I. (2007). Physical Development & Physical Education. In J. Riley (Ed.), Learning in the Early Years. London: Sage.

Bailey R.P. & Reeves, M.J (2013) Research into Sport and Economic Benefits of Sport and Physical Activity. Paris: UNESCO.

Bailey, R. P., Wellard, I., & Dismore, H. (2004). *Girls' participation in physical activities & sports: Benefits, patterns, influences & ways forward*. Geneva: World Health Organisation.

Balyi, I. (2001). Sport system building & long-term athlete development in British Columbia. *Coaches Report*, 8(1), 22–28.

Baranowski, T., Anderson, C., & Carmack, C. (1998). Mediating variable framework in physical activity interventions. *American Journal of Preventive Medicine, 15*, 266–297.

Barbeau, P., Johnson, M. H., Howe, C. A., Allison, J., Davis, C. L., Gutin, B., & Lemmon, C. R. (2007). Ten months of exercise improves general & visceral adiposity, bone, & fitness in black girls. *Obesity, 15*(8), 2077–2085.

Barnett, L. M., van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2009). Childhood motor skill proficiency as a predictor of adolescent physical activity. *Journal of Adolescent Health, 44*, 252–259.

Barnett, L. M., van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2008). Does childhood motor skill proficiency predict adolescent fitness? *Medicine & Science in Exercise & Sport, 40*, 2137–2144.

Basterfield, L., Adamson, A. J., Frary, J. K., Parkinson, K. N., Pearce, M. S., & Reilly, J. J. (2011). Longitudinal study of physical activity and sedentary behavior in children. *Pediatrics, 127*(1), e24–e30

Baptista, F., Santos, D. A., Silva, A. M., Mota, J., Santos, R., Vale, S., ... & Sardinha, L. B. (2012). Prevalence of the Portuguese population attaining sufficient physical activity. Medicine and Science in Sports and Exercise, 44(3), 466-473.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., Martin, B. W., & Lancet Physical Activity Series Working Group. (2012). Correlates of physical activity: why are some people physically active & others not? *The Lancet, 380*(9838), 258–271.

Bauman, A. E., Sallis, J. F., Dzewaltowski, D. A., & Owen, N. (2002). Toward a better understanding of the influences on physical activity: the role of determinants, correlates, causal variables, mediators, moderators, & confounders. *American Journal of Preventive Medicine, 23*(2), 5–14.

Bauman, A., Ainsworth, B. E., Sallis, J. F., Hagströmer, M., Craig, C. L., Bull, F. C., ... & IPS Group. (2011). The descriptive epidemiology of sitting: a 20-country comparison using the International Physical Activity Questionnaire (IPAQ). *American Journal of Preventive Medicine, 41*(2), 228–235.

Berlin, J. A., & Colditz, G. A. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology, 132*(4), 612–628.

Bethancourt, H. J., Rosenberg, D. E., Beatty, T., & Arterburn, D. E. (2014). Barriers to & facilitators of physical activity program use among older adults. *Clinical Medicine & Research, 12*(1–2), 10–20.

Biddle, S. J., & Mutrie, N. (2007). *Psychology of physical activity: Determinants, well-being & interventions*. London: Routledge.

Biddle, S. J., Atkin, A. J., Cavill, N., & Foster, C. (2011). Correlates of physical activity in youth: a review of quantitative systematic reviews. *International Review of Sport & Exercise Psychology, 4*(1), 25–49.

Biddle, S., Wang, C. J., Kavussanu, M., & Spray, C. (2003). Correlates of achievement goal orientations in physical activity: A systematic review of research. *European Journal of Sport Science, 3*(5), 1–20.

Blair, S. N. (2009). Physical inactivity: the biggest public health problem of the 21st century. *British Journal of Sports Medicine, 43*(1), 1–2.

Blair, S. N., & Brodney, S. (1999). Effects of physical inactivity & obesity on morbidity & mortality: current evidence & research issues. *Medicine & Science in Sports & Exercise, 31*, S646–S662.

Blair, S. N., Kohl, H. W., Barlow, C. E., Paffenbarger, R. S., Gibbons, L. W., & Macera, C. A. (1995). Changes in physical fitness & all-cause mortality: a prospective study of healthy & unhealthy men. *Journal of the American Medical Association, 273*(14), 1093–

1098.

Booth, S. L., Sallis, J. F., Ritenbaugh, C., Hill, J. O., Birch, L. L., Frank, L. D., ... & Hays, N. P. (2001). Environmental & Societal Factors Affect Food Choice & Physical Activity: Rationale, Influences, & Leverage Points. *Nutrition Reviews, 59*(3), S21–S36.

Brage, S., Wedderkopp, N., Ekelund, U., Franks, P. W., Wareham, N. J., Andersen, L. B., & Froberg, K. (2004). Features of the Metabolic Syndrome Are Associated with Objectively Measured Physical Activity & Fitness in Danish Children - The European Youth Heart Study (EYHS). *Diabetes care, 27*(9), 2141–2148.

Breuer, C. (2014). Economic benefits of Physical Activity. In European Health & Fitness Association (Ed.), *The future of health & fitness. A plan for getting Europe active by 2025*. (pp. 42–52). Nijmegen: BlackBox Publishers.

Bull, F. C., Armstrong, T. P., Dixon, T., Ham, S., Neiman, A., & Pratt, M. (2004). Physical inactivity (pp. 729–881). *Comparative Quantification of Health Risks Global & Regional Burden of Disease Attributable to Selected Major Risk Factors*. Geneva: World Health Organization.

Burton, A., & Miller, D. (1998). *Movement Skill Assessment*. Champaign, IL: Human Kinetics.

Butler, S., & Comley, V. (2014). Reconomics. The economic impact of outdoor recreation. Retrieved from: www.sportandrecreation.org.uk/sites/sportandrecreation.org.uk/files/web/Reconomics%20FINAL.pdf

Canadian Sport for Life (undated) Developing Physical Literacyy: A Guide For Parents Of Children Ages 0 to12, Retrieved from: http://canadiansportforlife.ca/sites/default/files/resources/Developing%20Physical%20Literacy.pdf

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of

neighbourhood safety on children's physical activity—A review. *Health & Place,14*(2), 217–227.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, & physical fitness: definitions & distinctions for health-related research. *Public Health Reports, 100*(2), 126–131.

Cavill, N., Kahlmeier, S., & Racioppi, F., (2007) (Eds) *Physical activity and health in Europe: evidence for action*. Copenhagen: World Health Organization, Regional Office for Europe.

CDC (Centers for Disease Control). (2010). *The Association Between School-Based Physical Activity, Including Physical Education, & Academic Performance*. Atlanta, GA: Centers for Disease Control & Prevention: U.S. Department of Health & Human Services.

Chalkley, A., Milton, K., & Foster, C. (2015). *Change4Life Evidence Review: Rapid evidence review on the effect of physical activity participation among children aged 5 – 11 years*. London: Public Health England

Chen, Y. M. (2010). Perceived barriers to physical activity among older adults residing in long-term care institutions. *Journal of Clinical Nursing, 19*, 432–439.

Clark, J. E. (2005). From the beginning: A developmental perspective on movement & mobility. *Quest*, 57(1), 37–45.

Clark, J. E., & Metcalfe, J. S. (2002). The mountain of motor development: A metaphor. *Motor development: Research & reviews, 2*, 163–190.

Colditz, G. A. (1999). Economic costs of obesity & inactivity. *Medicine & science in sports & exercise, 31*(11), S663–67.

Colley, R. C., Brownrigg, M., & Tremblay, M. S. (2012). A Model of Knowledge Translation in Health: The Active Healthy Kids Canada Report Card on Physical Activity for Children & Youth. *Health Promotion Practice, 13*(3), 320–330.

Council of Europe (2001). *Recommendation No. R. (92) 13 REV of the Committee of Ministers of Members States on the Revised European Sports Charter*. Strasbourg, France: Council of Europe.

Craigie, A.M., Lake, A.A., Kelly, S.A., Adamson, A.J., & Mathers, J.C. (2011). Tracking of obesity-related behaviours from childhood to adulthood: a systematic review. *Maturitas*, *70*(3), 266-284.

Crocker, P. R., Eklund, R. C., & Kowalski, K. C. (2000). Children's physical activity & physical self-perceptions. *Journal of Sports Sciences, 18*(6), 383–394.

Currie, C., Zanotti, C., Morgan, A., Currie, D., de Looze, M., Roberts, C., ... & Barnekow, V. (2012). Social determinants of health & well-being among young people: HBSC international report from the 2009/2010 survey. *Health Policy for Children & Adolescents*, (No. 6). Copenhagen: WHO Regional Office for Europe.

Daniels, S. R., Arnett, D. K., Eckel, R. H., Gidding, S. S., Hayman, L. L., Kumanyika, S., ... & Williams, C. L. (2005). Overweight in children & adolescents: pathophysiology, consequences, prevention, & treatment. Circulation,111(15), 1999–2012.

DCMS (Department of Culture, Media & Sport) Strategy Unit (2002). *Game Plan: A strategy for Delivering Government's Sport & Physical Activity Objectives*. London: Cabinet Office.

De Meester, F., Van Dyck, D., De Bourdeaudhuij, I., Deforche, B., & Cardon, G. (2013). Does the perception of neighborhood built environmental attributes influence active transport in adolescents? *International Journal of Behavioral Nutrition & Physical Activity, 10*(1), 38.

DeBar, L. L., Ritenbaugh, C., Aickin, M., Orwoll, E., Elliot, D., Dickerson, J., ... & Irving, L. M. (2006). YOUTH: a health plan–based lifestyle intervention increases bone mineral density in adolescent girls. *Archives of Pediatrics & Adolescent Medicine, 160*(12), 1269–1276.

DFEE (Department for Education & Employment) (2000). *The National Curriculum for England & Wales - Physical Education*. London: Department for Education & Employment.

Dietz, W. H. (1994). Critical periods in childhood for the development of obesity. The American Journal of Clinical Nutrition, *59*(5), 955-959.

Dismore, H., Bailey, R., & Izaki, T. (2006). Japanese and English school students' views of physical education: a comparative study. International Journal of Sport and Health Science, 4, 74-85.

Eiðsdóttir, S. Þ., Kristjánsson, Á. L., Sigfúsdóttir, I. D., & Allegrante, J. P. (2008). Trends in physical activity and participation in sports clubs among Icelandic adolescents. The European Journal of Public Health, *18*(3), 289-293.

Ekström, S., Kull, I., Nilsson, S., & Bergström, A. (2015). Web-Based Self-Reported Height, Weight, & Body Mass Index Among Swedish Adolescents: A Validation Study. *Journal of Medical Internet Research, 17*(3), e73.

Engel, G. L. (1978). The biopsychosocial model & the education of health professionals. *Annals of the New York Academy of Sciences, 310*(1), 169–181.

Epstein, L. H., Coleman, K. J., & Myers, M. D. (1996). Exercise in treating obesity in children & adolescents. *Medicine & Science in Sports & Exercise, 28*(4), 428–435.

Erikssen, G., Liestøl, K., Bjørnholt, J., Thaulow, E., Sandvik, L., & Erikssen, J. (1998). Changes in physical fitness & changes in mortality. *The Lancet,352*(9130), 759–762.

Erixon, F., Brandt, L., & Krol, M. (2014). *Investing in Obesity Treatment to Deliver Significant Healthcare Savings: estimating the healthcare costs of obesity & the benefits of treatment*. Brussels: ECIPE.

EU (European Commission) (2014). *Special Eurobarometer 412 "Sport & physical activity"*. Brussels: European Commission.

EU (European Commission) (2012). *Study on the Contribution of Sport to Economic*

Growth and Employment in the EU. Final Report. Brussels: European Commission.

Eurostat (2013). *European Commission - Overweight & obesity – BMI statistics.* Retrieved from: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Overweight_&_obesity_-_BMI_statistics

Fitzgerald, A., Fitzgerald, N., & Aherne, C. (2012). Do peers matter? A review of peer &/or friends' influence on physical activity among American adolescents. *Journal of adolescence, 35*(4), 941–958.

Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors & excess adiposity among overweight children & adolescents: The Bogalusa Heart Study. *The Journal of pediatrics,150*(1), 12–17.

Fujiwara, D., Kudrna, L., & Dolan, P. (2014). Quantifying the social impacts of culture and sport. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304896/Quantifying_the_Social_Impacts_of_Culture_and_Sport.pdf

Gortmaker, S. L., Swinburn, B. A., Levy, D., Carter, R., Mabry, P. L., Finegood, D. T., ... & Moodie, M. L. (2011). Changing the future of obesity: science, policy, & action. *The Lancet, 378*(9793), 838–847.

Griffiths, L. J., Cortina-Borja, M., Sera, F., Pouliou, T., Geraci, M., Rich, C., ... & Jebb, S. A. (2013). How active are our children? Findings from the Millennium Cohort Study. BMJ open, 3(8).

Guardian newspaper; 2009) Percentage of global population living in cities, by continent. Retrieved from: http://www.theguardian.com/news/datablog/2009/aug/18/percentage-population-living-cities

Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012).

Global physical activity levels: surveillance progress, pitfalls, & prospects. *The Lancet, 380*(9838), 247–257.

Hammond, R. A., & Levine, R. (2010). The economic impact of obesity in the United States. Diabetes, Metabolic Syndrome & Obesity. Targets & Therapy, 3, 285–295.

Harrington, D. M., Belton, S., Coppinger, T., Cullen, M., Donnelly, A., Dowd, K., ... & Woods, C. (2014). Results From Ireland's 2014 Report Card on Physical Activity in Children & Youth. *Journal of Physical Activity & Health, 11,* S63–68.

He, X. & Baker, D. (2005). Differences in Leisure-time, Household, & Work Physical Activity. by Race, Ethnicity, & Education. *Journal of General Internal Medicine 20*(3), 259–266.

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioural & Brain Sciences, 33*, 61–81.

Hersch, J. (1996). Smoking, Seat Belts, & Other Risky Consumer Decisions: Differences by. *Managerial & Decision Economics, 17*, 471–481.

Hills, A. P., King, N. A., & Armstrong, T. J. (2007). The contribution of physical activity & sedentary behaviours to the growth & development of children & adolescents: implications for overweight & obesity. *Sports Medicine, 37*(6), 533–546.

Hu, F. B., Willett, W. C., Li, T., Stampfer, M. J., Colditz, G. A., & Manson, J. E. (2004). Adiposity as compared with physical activity in predicting mortality among women. *New England Journal of Medicine, 351*(26), 2694–2703.

Hyytinen, A., and Lahtonen, J. (2013). The effect of physical activity on long-term income. *Social Science and Medicine, 96,* 129-137.

ICSA (International Sport & Culture Association) / CEBR (Centre for Economic & Business Research) (2015). *The economic cost of physical inactivity in Europe*. Copenhagen/London: ISCA / CEBR.

Institute for Health Metrics & Evaluation (2015). *Global Burden of Disease Compare*.

Seattle, WA: IHM.

Jaffe, M., & Kosakov, C. (1982). The motor development of fat babies. *Clinical Pediatrics, 21*(10), 619–621.

Janseen, I., & LeBlanc, A. (2010). Systematic review of the health benefits of physical activity & fitness in school-aged children & youth. *International Journal of Behavioral Nutrition & Physical Activity 7*(40), 1–16.

Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., ... & Pickett, W. (2005). Comparison of overweight & obesity prevalence in school-aged youth from 34 countries & their relationships with physical activity & dietary patterns. *Obesity Reviews, 6*(2), 123–132.

Janz, K.F., Burns, T.L., & Levy, S.M. (2005). Tracking of activity and sedentary behaviors in childhood: the Iowa Bone Development Study. *American journal of Preventive Medicine*, *29*(3), 171-178.

Jekauc, D., Reimers, A. K., Wagner, M. O., & Woll, A. (2012). Prevalence & socio-demographic correlates of the compliance with the physical activity guidelines in children & adolescents in Germany. *BMC Public Health, 12*(1), 1–9.

Jennett, S. (2008). *Dictionary of Sport & Exercise Science & Medicine*. London: Churchill Livingstone.

Jones, M., & O'Beney, C. (2004). Promoting mental health through physical activity: examples from practice. *Journal of Public Mental Health, 3*(1), 39–47.

Jones, R. A., Okely, A. D., Caputi, P., & Cliff, D. P. (2010). Perceived & actual competence among overweight & non-overweight children. *Journal of Science & Medicine in Sport, 13*(6), 589–596.

Kavetsos, G. (2011). The impact of physical activity on employment. Journal of Socio-economics, *40*(6), 775-779.

Khan, K. M., Thompson, A. M., Blair, S. N., Sallis, J. F., Powell, K. E., Bull, F. C., &

Bauman, A. E. (2012). Sport & exercise as contributors to the health of nations. *The Lancet, 380*(9836), 59–64.

Kimiecik, J. C., & Horn, T. S. (2012). Examining the relationship between family context & children's physical activity beliefs: the role of parenting style. *Psychology of Sport & Exercise, 13*(1), 10–18.

Kirby, J., Levin, K. A., & Inchley, J. (2012). Associations between the school environment & adolescent girls' physical activity. *Health education research, 27*(1), 101–114.

Knuth, A. G., & Hallal, P. C. (2009). Temporal trends in physical activity: a systematic review. *Journal of Physical Activity & Health, 6*(5), 548–559.

Kodama, S., Saito, K., Tanaka, S., Maki, M., Yachi, Y., Asumi, M., ... & Sone, H. (2009). Cardiorespiratory fitness as a quantitative predictor of all-cause mortality & cardiovascular events in healthy men & women: a meta-analysis. *Journal of the American Medical Association, 301*(19), 2024–2035.

Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., ... & Lancet Physical Activity Series Working Group (2012). The pandemic of physical inactivity: global action for public health. *The Lancet, 380*(9838), 294–305.

Konstabel, K., Veidebaum, T., Verbestel, V., Moreno, L. A., Bammann, K., Tornaritis, M., ... & Wirsik, N. (2014). Objectively measured physical activity in European children: the IDEFICS study. *International Journal of Obesity, 38*, S135-S143.

Lake, A. M. (2012). Pediatric Obesity Preventive Measures in Early Childhood. *Journal of Parenteral & Enteral Nutrition, 36*(1), 76S–80S.

Laukkanen, A., Pesola, A., Havu, M., Sääkslahti, A., & Finni, T. (2015). Relationship between habitual physical activity & gross motor skills is multifaceted in 5- to 8-year-old children. *Scandinavian Journal of Medicine & Science in Sports, 24*(2), e102–e10.

Lawlor, D. A., & Chaturvedi, N. (2006). Treatment and prevention of obesity—are there

critical periods for intervention?. *International Journal of Epidemiology*, *35*(1), 3-9.

Lee, I. M., & Paffenbarger, R. S. (2000). Associations of light, moderate, & vigorous intensity physical activity with longevity The Harvard Alumni Health Study. *American Journal of Epidemiology, 151*(3), 293–299.

Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., Katzmarzyk, P. T., & Lancet Physical Activity Series Working Group (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease & life expectancy. *The Lancet, 380*(9838), 219–229.

Lee, I. M., & Skerrett, P. J. (1993). Physical activity & all-cause mortality: What is the dose–response relation? [discussion S493–4]. *Medicine & Science in Sports & Exercise*, 33: S459–71.

Lemoyne, J., & Valois, P. (2014). Prédicteurs de la pratique de l'activité physique chez des étudiants du collégial. *Revue canadienne des sciences du comportement, 46*(2), 262.

Leon, A. S., Connett, J., Jacobs, D. R., & Rauramaa, R. (1987). Leisure-time physical activity levels & risk of coronary heart disease & death: The Multiple Risk Factor Intervention Trial. *Journal of the American Medical Association, 258*(17), 2388–2395.

Leslie, E., Fotheringham, M. J., Owen, N., & Bauman, A. (2001). Age-related differences in physical activity levels of young adults. *Medicine & Science in Sports & Exercise, 33*(2), 255–258.

Leyk, D., Witzki, A., Sievert, A., Rohde, U., Moedl, A., Rüther, T., ... & Hackfort, D. (2012). Importance of sports during youth & exercise barriers in 20-to 29-year-old male nonathletes differently motivated for regular physical activities. *Journal of Strength & Conditioning Research, 26*, S15–S22.

Li, C., Ford, E. S., Zhao, G., & Mokdad, A. H. (2009). Prevalence of pre-diabetes & its association with clustering of cardiometabolic risk factors & hyperinsulinemia among

US adolescents National Health & Nutrition Examination Survey 2005–2006. *Diabetes Care, 32*(2), 342–347.

Liukkonen, J., Jaakkola, T., Kokko, S., Gråstén, A., Yli-Piipari, S., Koski, P., ... & Tammelin, T. (2014). Results From Finland's 2014 Report Card on Physical Activity for Children & Youth. *Journal of Physical Activity & Health, 11*(4), S51–S57.

Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children & adolescents. *Sports medicine, 40*(12), 1019–1035.

Lundborg, P., Bolin, K., Höjgård, S., and Lindgren, B. (2007). Obesity and occupational attainment among the 50+ of Europe. Advances in health economics and health services research, 17, 219-251. Morris, S. (2007). The impact of obesity on employment. *Labour Economics, 14*(3), 413-433.

Martin, B. W., Beeler, I., Szucs, T., Smala, A., & Brügger, O. C. & Casparis, C. (2001). Economic benefits of the health-enhancing effects of physical activity: first estimates for Switzerland. *Schweizerische Zeitschrift für Sportmedizin und Sporttraumatologie, 49*(3), 131–133.

Martín, M., Barripedro, M. I., del Castillo, J. M., Jiménez-Beatty, J. E., & Rivero-Herráiz, A. (2014). Gender differences in the habits of physical activity of the adult population in the Community of Madrid. *RICYDE: Revista Internacional de Ciencias del Deporte, 10*(38), 319–335.

McMinn, A. M., van Sluijs, E. M., Nightingale, C. M., Griffin, S. J., Cook, D. G., Owen, C. G., ... & Whincup, P. H. (2011). Family & home correlates of children's physical activity in a multi-ethnic population: the cross-sectional child heart & health study in England (CHASE). *International Journal of Behavioral Nutrition & Physical Activity*, 8(1), 11.

McMurdo, M. E., Argo, I., Crombie, I. K., Feng, Z., Sniehotta, F. F., Vadiveloo, T., ... & Donnan, P. T. (2012). Social, environmental & psychological factors associated with

objective physical activity levels in the over 65s. *PloS One, 7*(2), e31878–e31878.

Morris, J. N., Heady, J. A., Raffle, P. A., Roberts, C., & Parks, J. (1953). Coronary heart-disease & physical activity of work. *The Lancet, 265,* 1111–20.

Moschny, A., Platen, P., Klaaßen-Mielke, R., Trampisch, U., & Hinrichs, T. (2011). Barriers to physical activity in older adults in Germany: a cross-sectional study. *International Journal of Behavioral Nutrition & Physical Activity, 8*(1), 121.

Motl, R. W., Dishman, R. K., Saunders, R. P., Dowda, & Pate, R. R. (2007). Perceptions of physical & social environment variables & self-efficacy as correlates of self- reported physical activity among adolescent girls. *Journal of Pediatric Psychology, 32*, 6–12.

Müller-Riemenschneider, F., Reinhold, T., Berghöfer, A., & Willich, S. N. (2008). Health-economic burden of obesity in Europe. *European Journal of Epidemiology, 23*(8), 499–509.

Myers, J., Kaykha, A., George, S., Abella, J., Zaheer, N., Lear, S., ... & Froelicher, V. (2004). Fitness versus physical activity patterns in predicting mortality in men. *The American jJurnal of Medicine, 117*(12), 912–918.

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... & Gupta, R. (2014). Global, regional, & national prevalence of overweight & obesity in children & adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet, 384*(9945), 766–781.

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood & adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806–814.

Oja, P. (2008). Health-Enhancing Physical Activity. Directory of Sport Science: A Journey Through Time: The Changing Face of ICSSPE. Berlin: ICSSPE.

Ortega, F. B., Ruiz, J. R., & Sjöström, M. (2007). Physical activity, overweight and central adiposity in Swedish children and adolescents: the European Youth Heart

Study. *International Journal of Behavioral Nutrition and Physical Activity*, *4*(1), 61.

Paffenbarger, R. S., & Hale, W. E. (1975). Work activity & coronary heart mortality. *New England Journal Medicine, 292*, 545–50.

Paffenbarger, R. S., Hyde, R. T., Wing, A.L., & Kampert, J. B. (1993). The association of changes in physical-activity level & other lifestyle characteristics with mortality among men. *New England Journal Medicine, 328*, 538–45

Petitpas, A. J., Cornelius, A., & van Raalte, J. (2008). Youth development through sport: It's all about relationships. In Holt, N. L. (Ed.), *Positive Youth Development through Sport* (pp. 61–70). New York: Routledge.

Physical Activity Guidelines Advisory Committee (2008). *Physical Activity Guidelines Advisory Committee Report 2008*. Washington, DC: US Department of Health & Human Services.

Powell, L. M., Slater, S., & Chaloupka, F. J. (2004). The relationship between community physical activity settings & race, ethnicity & socioeconomic status. *Evidence-Based Preventive Medicine, 1*(2), 135–44.

Raudsepp, L., & Liblik, R. (2002). Relationship of perceived & actual motor competence in children. *Perceptual & Motor Skills, 94*(3c), 1059–70.

Reilly, J. J., Kelly, L, Montgomery, C, Williamson, A., Fisher, A., McColl, J. H., Grant, S. (2006). Physical activity to prevent obesity in young children: Cluster randomised controlled trial. *British Medical Journal, 333*(7577), 1041.

Reilly, J., Dick, S., McNeill, G., & Tremblay, M. S. (2014). Results from the Scottish report card on physical activity for children & youth. *Journal of Physical Activity & Health, 11*(1), S93–S97.

Rey-López, J. P., Vicente-Rodriguez, G., Ortega, F. B., Ruiz, J. R., Martinez-Gómez, D., De Henauw, S., ... & Castillo, M. J. (2010). Sedentary patterns and media availability in European adolescents: The HELENA study. *Preventive Medicine*, *51*(1), 50-55.

Richardson, C. R., Faulkner, G., McDevitt, J., Skrinar, G. S., Hutchinson, D. S., & Piette, J. D. (2005). Integrating Physical Activity into Mental Health Services for Persons with Serious Mental Illness. *Psychiatric Services, 56*(3), 324–331.

Rooth, D. (2010). *Work Out or Out of Work: The Labor Market Return to Physical Fitness and Leisure Sport Activities.* Bonn: IZA.

Ruiz, J. R., Ortega, F. B., Martínez-Gómez, D., Labayen, I., Moreno, L. A., De Bourdeaudhuij, I., ... & Widhalm, K. (2011). Objectively measured physical activity and sedentary time in European adolescents the HELENA study. *American Journal of Epidemiology, 174*: 173–184.

Saffer, H., Dave, D., Grossman, M., & Leung, L. A. (2012). Racial, Ethnic, & Gender Differences in Physical Activity. *Journal of Human Capital, 7*(4), 378–410.

Sallis, J. F., & Owen, N. (1998). *Physical Activity & Behavioral Medicine*. Thousand Oaks, CA: Sage Publications.

Sallis, J. F., Bauman, A., & Pratt, M. (1998). Environmental & policy interventions to promote physical activity. *American Journal of Preventive Medicine, 15*, 379–397.

Salvy, S. J., Roemmich, J. N., Bowker, J. C., Romero, N. D., Stadler, P. J., & Epstein, L. H. (2009). Effect of peers & friends on youth physical activity & motivation to be physically active. *Journal of Pediatric Psychology, 34*(2), 217–225.

Sandercock, G., Ogunleye, A., & Voss, C. (2014). Associations between showering behaviours following physical education, physical activity & fitness in English schoolchildren. *European Journal of Sport Science*, (ahead-of-print), 1–7.

Sarafino, E. P. (1994). *Health Psychology: Biopsychosocial interactions*. New York: Wiley.

Scarborough, P., Bhatnagar, P., Wickramasinghe, K. K., Allender, S., Foster, C., & Rayner, M. (2011). The economic burden of ill health due to diet, physical inactivity, smoking, alcohol & obesity in the UK: an update to 2006–07 NHS costs. *Journal of*

Public Health, 33(4), 527–535.

Seefeldt, V. (1979). Developmental motor patterns: implications for elementary school physical education. In K. Newell, G. Roberts, W. Hallarell, & G. Nadean (Eds.), *Psychology of Motor Behaviour & Sport* (pp. 309–318). Champaign, IL: Human Kinetics.

Seefeldt, V., Malina, R. M., & Clark, M. A. (2002). Factors affecting levels of physical activity in adults. *Sports Medicine, 32*(3), 143–168.

Sherwood, N. E., & Jeffery, R. W. (2000). The behavioral determinants of exercise: implications for physical activity interventions. *Annual Review of Nutrition, 20*(1), 21–44.

Sikorski, C., Luppa, M., Kaiser, M., Glaesmer, H., Schomerus, G., König, H. H., & Riedel-Heller, S. G. (2011). The stigma of obesity in the general public & its implications for public health-a systematic review. *BMC Public Health, 11*(1), 661.

Silventoinen, K., & Kaprio, J. (2010). Liikunta auttaa vähentämään geneettisen alttiuden vaikutusta lihavuuteen. *Duodeci, 126*, 1031–1036.

Simons, D., Rosenberg, M., Salmon, J., Knuiman, M., Granich, J., Deforche, B., & Timperio, A. (2015). Psychosocial moderators of associations between life events & changes in physical activity after leaving high school. *Preventive Medicine, 72*, 30–33.

Singh, A., Uijtdewilligen, L., Twisk, J. W., van Mechelen, W., & Chinapaw, M. J. (2012). Physical Activity & Performance at School: A Systematic Review of the Literature Including a Methodological Quality Assessment. *Archives of Pediatrics & Adolescent Medicine, 166*(1), 49–55.

Sleddens, E. F. C., Kremers, S. P. J., Hughes, S. O., Cross, M. B., Thijs, C., De Vries, N. K., & O'Connor, T. M. (2012). Physical activity parenting: a systematic review of questionnaires & their associations with child activity levels. *Obesity Reviews, 13*(11), 1015–1033.

Sobocki, P., Jönsson, B., Angst, J., & Rehnberg, C. (2006). Cost of depression in Europe. *Journal of Mental Health Policy & Economics, 9*(2), 87–98.

Spittaels, H., Van Cauwenberghe, E., Verbestel, V., De Meester, F., Van Dyck, D., Verloigne, M., ... & De Bourdeaudhuij, I. (2012). Objectively measured sedentary time and physical activity time across the lifespan: a cross-sectional study in four age groups. *International Journal Behavioral Nutrition and Physical Activity, 9*, 149.

Standage, M., Wilkie, H., Jago, R., Foster, C., Goad, M. A., & Cumming, S. P. (2014). Results from England's 2014 Report Card on Physical Activity for Children & Youth. *Journal of Physical Activity & Health, 11*(1), S45–S50.

Stodden, D. F., Langendorfer, S. J., Roberton, M. A., & Kelbley, L. (2007). Association between motor skill competence & health-related physical fitness. *Journal of Sport & Exercise Psychology, 29*, s45–s46.

Stodden, D., Langendorfer, S., & Roberton, M. A. (2009). The association between motor skill competence and physical fitness in young adults. *Research Quarterly for Exercise and Sport, 80*(2), 223–229.

Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). A developmental perspective on the role of motor skill competence in physical activity: an emergent relationship. *Quest, 60*, 290–306.

Street, S. J., Wells, J. C. K., & Hills, A. P. (2015). Windows of opportunity for physical activity in the prevention of obesity. *Obesity Reviews*, *16*(10), 857-870.

Strong, W. B., Malina, R. M., Blimkie, C. J. R., … & Trudeau, F. (2005). Evidence based physical activity for school youth. *Journal of Pediatrics, 146*, 732–737.

Taylor, P., Davies, L., Wells, P., Gilbertson, J., & Tayleur, W. (2015). A review of the social impacts of culture and sport. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416279/A_review_of_the_Social_Impacts_of_Culture_and_Sport.pdf

Telama, R. (2009). Tracking of physical activity from childhood to adulthood: a review. *Obesity Facts, 2*(3), 187–195.

Tomporowski, P. D., Lambourne, K., & Okumura, M. S. (2011). Physical activity interventions & children's mental function: an introduction & overview. *Preventive Medicine, 52*, S3–S9.

Tremblay, M. S., Colley, R. C., Saunders, T. J., Healy, G. N., & Owen, N. (2010). Physiological & health implications of a sedentary lifestyle. *Applied Physiology, Nutrition, & Metabolism, 35*(6), 725–740.

Trudeau, F., & Shephard, R. J. (2005). Contribution of school programmes to physical activity levels & attitudes in children & adults. *Sports Medicine, 35*(2), 89–105.

UN (2011). *Prevention & control of non-communicable diseases–Report of the Secretary-General*. New York: United Nations Headquarters.

Van Holle, V., Deforche, B., Van Cauwenberg, J., Goubert, L., Maes, L., Van de Weghe, N., & De Bourdeaudhuij, I. (2012). Relationship between the physical environment & different domains of physical activity in European adults: a systematic review. *BMC public health, 12*(1), 807.

Veijalainen, A., Tompuri, T., Haapala, E. A., Viitasalo, A., Lintu, N., Väistö, J., ... & Lakka, T. A. (2015). Associations of cardiorespiratory fitness, physical activity, & adiposity with arterial stiffness in children. *Scandinavian Journal of Medicine & Science in Sports, 31*, 9–34.

Verloigne, M., Van Lippevelde, W., Maes, L., Yildirim, M., Chinapaw, M., Manios, Y., ... & De Bourdeaudhuij, I. (2012). Levels of physical activity & sedentary time among 10-to 12-year-old boys & girls across 5 European countries using accelerometers: an observational study within the ENERGY-project. *International Journal of Behavioral Nutrition & Physical Activity, 9*(1), 1–8.

Wannamethee, S. G., Shaper, A. G., & Walker, M. (1998). Changes in physical activity, mortality, & incidence of coronary heart disease in older men. *The Lancet, 351*(9116), 1603–1608.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*(6), 801–809.

Wechsler, H., Devereaux, R. S., Davis, M., & Collins, J. (2000). Using the school environment to promote physical activity & healthy eating. *Preventive Medicine, 31*(2), S121–S137.

Wen, C. P., Wai, J. P. M., Tsai, M. K., Yang, Y. C., Cheng, T. Y. D., Lee, M. C., ... & Wu, X. (2011). Minimum amount of physical activity for reduced mortality & extended life expectancy: a prospective cohort study. *The Lancet, 378*(9798), 1244–1253.

Wheeler, S. (2012). The significance of family culture for sports participation. *International Review for the Sociology of Sport*, *47*(2), 235-252.

Whitehead, M. (Ed.). (2010). *Physical Literacy: throughout the lifecourse*. London: Routledge.

WHO (2015). *Facts & figures on childhood obesity.* Retrieved from: www.who.int/end-childhood-obesity/facts/en

WHO (2015). *STEPwise approach to surveillance (STEPS).* Retrieved from: www.who.int/chp/steps/en

WHO (World Health Organization) (2010). *Global recommendations on physical activity for health*. Geneva: WHO.

WHO (World Health Organisation) (2013). *Obesity & overweight: Fact sheet Number 311*. Geneva: WHO.

World Health Organisation (2009). *Global Health Risks: Mortality & burden of diseases attributable to selected major risks*. Geneva: WHO.

Wrotniak, B. H., Epstein, L. H., Dorn, J. M., Jones, K. E., & Kondilis, V. A. (2006). The relationship between motor proficiency & physical activity in children. *Pediatrics, 118*(6), e1758–e1765.

Zunft, H. J. F., Friebe, D., Seppelt, B., Widhalm, K., de Winter, A. M. R., Vaz de Almeida, M. D., ... & Gibney, M. (1999). Perceived benefits & barriers to physical activity in a nationally representative sample in the European Union. *Public Health Nutrition, 2*(1a), 153–160.

APPENDIX 1: Overview of European/worldwide Key Policy Documents

	Author	Title	Year of publication
1	2nd World Summit on Physical Education	Magglingen Commitment for Physical Education	2005
2	Commission of the European Communities	White Paper on Sport	2007
3	Commission of the European Communities	White Paper on a Strategy for Europe on Nutrition, Overweight and Obesity related Health Issues	2007
4	Council of the European Unions	Council Conclusions on Nutrition and Physical Activity	2014
5	Council of Europe (EPAS)	Overview of the Key Stakeholders in International and European Sports Policy in 2014	2015
6	European Commission XG HEPA	Expert Group "Health-Enhancing Physical Activity": Report from the 1st Meeting	2014
7	European Commission	Special Eurobarometer 412: Sport and Physical Activity	2014
8	European Commission	Eurydice Report: Physical Education and Sport at School in Europe	2013
9	European Commission	Special Eurobarometer 334: Sport and Physical Activity	2010
10	European Commission	EU Physical Activity Guidelines	2008

11	European Platform for Action on Diet, Physical Activity and	Monitoring the European Platform for Action on Diet, Physical Activity and Health Activities: Annual Report 2015	2015
12	European Platform for Action on Diet, Physical Activity and	Monitoring the European Platform for Action on Diet, Physical Activity and Health Activities: Annual Report 2014	2015
13	European Platform for Action on Diet, Physical Activity and	Monitoring the European Platform for Action on Diet, Physical Activity and Health Activities: Annual Report 2013	2014
14	European Platform for Action on Diet, Physical Activity and	Monitoring the European Platform for Action on Diet, Physical Activity and Health Activities: Annual Report 2012	2013
15	European Platform for Action on Diet, Physical Activity and	Monitoring the European Platform for Action on Diet, Physical Activity and Health Activities: Special Report on the EU Platform	2013
16	United Nations Educational Scientific and	Quality Physical Education	2015
17	United Nations Educational, Scientific and	World-wide Survey of School Physical Education	2013
18	United Nations Educational Scientific and	Declaration of Berlin	2013
19	United Nations Educational Scientific and	International Charter of Physical Education and Sport	1978
20	World Health Organization (WHO)	Girls' Participation in Physical Activities and Sports: Benefits, Patterns, Influences and Ways forward	2011
21	World Health Organization (WHO)	Global Recommendations on Physical Activity for Health	2010
22	World Health Organization (WHO)	Interventions on Diet and Physical Activity: What works (Summary-report)	2009

23	World Health Organization (WHO)	Interventions on Diet and Physical Activity: What works (Evidence Tables)	2009
24	World Health Organization (WHO)	A Framework to monitor and evaluate Implementation	2008
25	World Health Organization (WHO)	School Policy Framework	2008
26	World Health Organization (WHO)	Increasing Physical Activity	2007
27	World Health Organization (WHO)	Physical activity promotion in socially disadvantaged groups: principles for action. Policy summary	2013