Consensus statement on the health and fitness of young people through physical activity and sport

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Introduction

The International Olympic Committee (IOC) recognizes the health and fitness benefits of physical activity (PA) and sport as stated in recommendation #51 from the Olympic Movement in Society Congress held in Copenhagen, 2009:

Everyone involved in the Olympic Movement must become more aware of the fundamental importance of physical activity and sport for a healthy lifestyle, not least in the growing battle against obesity, and must reach out to parents and schools as part of a strategy to counter the rising inactivity of young people.[1]

The IOC assembled an expert group (January 2011) to discuss the role of PA and sport on the health and fitness of young people and to critically evaluate the scientific evidence as a basis for decision making. Specifically, the purpose of this consensus paper is to identify potential solutions through collaboration between sport and existing programs and to review the research gaps in this field. The ultimate aim of the paper is to provide recommendations for young people's sport and PA stakeholders.

After an introduction to the scope of the problem (i), issues addressed included how best to define the current state of fitness and PA of young people (ii); health consequences of lack of PA and/or sport (iii); correlates and determinants of PA and sedentary behaviour (iv); options for change: studies on effectiveness of intervention (v); context for action: potential solutions (vi); and finally, a summary and recommendations (vii).

i) The scope of the problem

Insufficient PA has been classified by the World Health Organization (WHO) as the 4th leading risk factor for global mortality from non-communicable diseases (NCDs) after hypertension, tobacco use and high blood glucose. Insufficient PA is responsible for 3.2 million or 5.5% of all deaths.[2,3] In addition, scientific evidence shows that insufficient levels of PA are adversely

affecting the health and the health trajectory of young people. [4,5] Another alarming trend is that young people's PA levels are declining as they move through childhood into adolescence [6] and these patterns of sedentary behaviour may even track into adulthood [7,8]. The detrimental health effects of inadequate levels of PA in young people are well established [9-12] and the evidence is growing on the negative health effects of sedentary behavior. [13] Physical activity, including through involvement in sport, is instrumental in the prevention of NCDs that carry a high burden of individual health costs as well as economic consequences to society.

ii) Defining the current state of fitness and PA of young people (723)

Are today's young people active? (723)

The assessment and interpretation of young people's PA is one of the most difficult tasks in epidemiology. PA and sport participation during youth have historically been assessed by self-report but the criterion validity of self-reported instruments is low to moderate with correlation coefficients usually between 0.3 to 0.4. [14-16] Furthermore, self-report instruments tend to overestimate the intensity and duration of PA and sport participation.[15] However, self-report methods can provide information about types of PA, the setting and contexts in which PA takes place and the amount of PA devoted to specific domains.

Recent, large scale observational studies have used objective monitoring of PA by accelerometry. This innovation has substantially increased our knowledge of PA and how PA is associated with health outcomes in youth.[17] However, interpreting PA data from accelerometry during childhood and adolescence is challenging. Methodological issues include the definition of PA intensity thresholds and there is no consensus on the most appropriate PA intensity thresholds to use when measuring young people's PA by accelerometry.[14,18] Self-reported PA suggests that 30 to 40% of young people satisfy current health-related PA recommendations.[19,20] Accelerometry data are more variable but most studies using PA intensity thresholds above 3000 counts per minute (broadly equivalent to brisk walking) indicate

that they are achieved by less than 25% of young people.[21-23] Sport participation contributes to higher levels of PA in youth.[24]

It is unlikely that any self-report method is sufficiently accurate for examining cross-cultural differences and temporal trends in young people's sport participation and PA. However, recent self-report studies suggest that PA levels have not declined during recent decades.[20] This observation is supported by the few studies that have assessed PA objectively.[25,26] However, data on temporal trends should be interpreted cautiously as PA levels may have declined in domains not assessed by these instruments.[27]

Are today's young people fit?

Peak oxygen uptake ($\dot{V}O_{2)}$ is the best single measure of young people's aerobic fitness. During growth and maturation, peak $\dot{V}O_2$ benefits from increases in muscle mass, stroke volume and, particularly in boys, blood haemoglobin concentration. Young people's peak $\dot{V}O_2$ increases with age and boys' values are higher than those of girls throughout childhood and adolescence, regardless of whether peak $\dot{V}O_2$ is expressed in absolute ($L.min^{-1}$) or body mass-related ($mL.kg^{-1}.min^{-1}$) terms.[28,29]

A high peak $\dot{V}O_2$ is a pre-requisite of elite performance in many sports but, in several sports and in everyday life, intermittent exercise and the ability to engage in rapid changes of exercise intensity is at least as important as achieving maximal aerobic performance. Under these conditions it is the transient kinetics of $\dot{V}O_2$ which best describe the relevant component of aerobic fitness. In youth, peak $\dot{V}O_2$ is not related to the primary component time constant (τ) during the transition from rest to exercise. The $\dot{V}O_2$ kinetics response to exercise is age-dependent and boys have a shorter τ than girls during the transition from rest to heavy intensity exercise.[30,31]

Young athletes have higher peak $\dot{V}O_2$ and faster τ than their untrained peers. Both trained and untrained youth benefit from exercise training.[32] Young people, however, rarely experience

habitual PA of the duration and intensity sufficient to enhance peak $\dot{V}O_2$ and there is no meaningful relationship between habitual PA and this component of aerobic fitness.[33] The relationship between habitual PA and $\dot{V}O_2$ kinetics remains to be investigated.

Data on $\dot{V}O_2$ kinetics during youth are sparse but the peak $\dot{V}O_2$ of young people is well documented. There are no widely recognised recommendations for health-related levels of aerobic fitness in youth and no compelling evidence to suggest that young people have low levels of peak $\dot{V}O_2$ ($L.min^{-1}$) or that they are less aerobically fit than young people of previous generations.[34] There has been a very small decline of about 0.1% per decade in mass-related peak $\dot{V}O_2$ ($mL.kg^{-1}.min^{-1}$) between 1962 and 1994. In contrast, there has been a substantial deterioration of about 4.0% per decade in maximal aerobic performance, since 1975. It is not clear whether these temporal changes have been uniform or skewed over time, although changes were typically more marked in young people who are less fit.[35] Declines in maximal aerobic performance are likely the result of a network of social, behavioural, physical, psychological and physiological factors. Irrespective of the underlying mechanisms, it is the diminished aerobic performance that has the greatest implications for youth health and well-being, and successful sport participation.[36]

iii) The health consequences of lack of physical fitness, PA and/or sport

Cardiovascular and metabolic health

Research focused on the cardiovascular consequences of inactivity in young people has primarily used two methodologies: interventional studies in which PA is increased in a given population and observational studies, in which cardiovascular markers have been compared to levels of PA in a subject population.[5,37-39]

Exercise training interventions in normotensive youth have been found to have little effect on blood pressure, but prolonged programs in hypertensive youth have had a salutary effect. [40-49] In addition, observational studies have reported a positive association between aerobic

fitness levels and blood pressure.[48,49] It can be concluded that a PA intervention of at least 30 minutes, three times per week with intensity sufficient to increase aerobic fitness can effectively reduce blood pressure in youth with essential hypertension.

Studies of the effect of activity levels and exercise interventions on blood lipid levels in young people suggest that a minimum of 40 minutes of activity per day, 5 days per week and with a duration of at least 4 months is required to achieve improvement in lipid and lipoprotein levels, demonstrating primarily increased HDL-C and decreased triglyceride levels.[37,50,51] Interventions have included aerobic training, resistance training and circuit training.[5,46,52]

Metabolic syndrome was first described as a constellation of risk factors for cardiovascular disease in adults, including abdominal obesity, type II diabetes, hypertension and increased levels of inflammatory markers. However it is now estimated that metabolic syndrome characteristics exist in 3 to 14% of all youth and is increasing as obesity in youth increases.[53-56] Observational studies have found a close association between low PA levels and metabolic syndrome in youth.[5,57,60] Interventional studies have shown improvements of elements of metabolic syndrome with increased PA in both obese and non-obese youth. The amount of PA necessary to prevent or treat metabolic syndrome has not yet been defined.[46,52,61-64]

Few studies have examined the relationship of muscular fitness to cardiovascular risk factors in young people but the studies available demonstrate a negative association between muscle fitness and clustered metabolic risk.[65-67]

In summary, the current scientific literature suggests that low levels of PA in young people are associated with higher levels of obesity, hypertension and cardiovascular risk factors including increased instances of metabolic syndrome.

Bone health

Bone is a dynamic tissue that varies between individuals as a function of age, sex, genetics and lifestyle. Bone geometry, mass and structure contribute to bone strength, which largely determines bone's susceptibility to fracture. Fractures affect approximately 30 to 50% of both

young [68,69] and old populations.[70] PA is key to enhanced bone mass, structure and strength and these beneficial effects were summarized in recent reviews.[71-76]

Animal studies clearly demonstrate that dynamic loading of short duration with multiple rest pauses is most effective for bone formation.[77] Young athletes engaged in weight-bearing activities across a range of sports have augmented bone mass compared with non-athletic peers.[78-81] Racquet sport athletes who began training in early puberty have significantly stronger bones on their playing arm [82] compared with their non-playing arm and benefits persist over time.[83] Thus, early puberty provides a “window of opportunity” when bone is most responsive to physical activity and sport than at any other time during the life course.

A number of effective interventions have typically involved vigorous jumping and other activities across the school day, at least three times per week for between 6 to 24 months. A recent systematic review of randomized and non-randomized controlled trials of weight bearing exercise concluded that bone mass and density gains at the femoral neck and lumbar spine ranged from 1 to 6% before puberty and from 0.3 to 2% post-puberty.[84] However, attention has increasingly shifted from measures of bone mass to potentially more important measures of bone geometry, structure and strength. Recent studies,[85], reviews [86] and meta-analyses [75] assessed exercise effects on bone strength during growth and reported small but significant effects on the lower extremities in young people. The bone response to exercise depends upon the sex and maturity level of the young person, the anatomical site measured and the length and intensity of the intervention. Epidemiological studies used objective measures of PA [87-89] and corroborated the benefit of weight bearing PA for young people’s bone health.

Taken together, a wide range of extra-curricular sports, other activities and targeted school-based programs provide a weight bearing stimulus that promotes young people’s bone health.[90] Although bone strength benefits persist into old age in animal studies,[91] there is little direct evidence that the enhanced “bone bank” similarly persists into old age in humans as

these long-term studies are challenging to conduct. However, longer term follow up studies in young people [92] and retrospective studies of athletes [93,94] support this notion.

Obesity

Globally, obesity is affecting an increasing proportion of young people.[95,96] PA during the growing years is important for the physical growth and development of all young people [97] and is associated with numerous health benefits, including lower levels of overweight and obesity and reducing the risk of obesity in adulthood. Higher levels of PA and exercise, including sports participation, may translate to greater benefits. In recent decades, active behaviours have been displaced by more sedentary pursuits, which have contributed to reductions in PA energy expenditure. Typically, obese young people are less active than their normal-weight peers.[98] Whilst many reports suggest that young people's participation in organized sport and PA is high or has increased in some populations, incidental PA and exercise, including active transport such as walking to and from school, has declined in recent decades. Numerous environmental and lifestyle changes have contributed to these reductions.[99]

From a public health perspective, the promotion of a healthy diet and of PA and exercise are equally important factors for the maintenance of a healthy weight and body composition and reduction of chronic disease risk.[100,101]

Mental Health

Review-level evidence with young people has shown small-to-moderate beneficial effects for reduced depression and anxiety from PA, but the evidence base is weak. Intervention designs are low in quality, and many reviews include cross-sectional studies. However, the beneficial effects of PA on reducing depression and anxiety are comparable to psychosocial interventions.[102] PA can lead to small improvements in global self-esteem, at least in the short term.[103] However, there is a paucity of good quality research and future work may need to focus on physical aspects of the self. Reviews of PA and cognitive functioning have shown

evidence that routine PA can be associated with improved cognitive performance, classroom behaviour and academic achievement in young people, but these associations are usually small. Additional allocation of time to PA in schools at the expense of academic class time does not affect academic performance.[104]

Results from recent primary studies have shown consistent small negative associations between mental health and sedentary behaviour, primarily screen viewing, with half controlling for PA. One longitudinal study did show that TV viewing was associated with increased odds of depression after a 7y follow-up.[105]

Little research has specifically addressed sport participation and mental health separate from participation in PA more broadly. Moreover, it is difficult to ascertain effects for low fit or low active youth.

Injury Risk

Another health problem to be considered in young people lacking adequate PA is lower fitness levels which, over time, can increase the risk of injury in sport.[106]

Inadequate physical fitness is an intrusive risk factor for sports injury in young people and has been cited for some years.[107] More recently, Emery has identified it as one of the potentially modifiable risk factors.[108,109]

Training measures to improve fitness and prevent injury in the young athlete include strength and flexibility training, plyometrics, balance and coordination training and techniques of cutting, landing and agility.[110-121]

One injury which has received increased attention in recent years is non-contact ACL injuries in adolescent female athletes.[111] Interventional studies have emphasized plyometrics, flexibility and aerobic training, balance and proprioception training with most studies finding an association between training interaction and decreased injuries.[111,113-123]

Prevention of ankle sprains in young athletes through training interventions has also received much attention.[124-129]

A recent series of studies from the Netherlands of young people exposed to a fitness education and classroom training program demonstrated a decrease in sports injuries, particularly in the previously less active participants.[130,131]

An ideal system for preventing sports injuries due to lower levels of fitness would entail a pre-participation evaluation of each participant followed by a training prescription to address individual deficits in fitness levels.

iv) Correlates and determinants of PA and sedentariness

In order to better understand the 'mechanism' behind PA and sedentariness of young people, it is necessary to have insight into the correlates and determinants of these behaviours. Roughly speaking, the correlates and determinants of these behaviours can be categorized into biological, psychosocial, behavioural, social and environmental factors. In reference to these five categories, the main findings of two reviews that were carried out for the purpose of this consensus statement are summarized below.

Determinants of PA

Uijtdewilligen et al. conducted a systematic review on the determinants of PA building on a review on the same topic published in 2007.[132] In contrast to the 2007 review, the current review only took into account prospective studies. The review concerned studies that were published between January 2004 and November 2010. Twenty-seven papers were identified. A best-evidence synthesis was applied to summarize the results. The following conclusions were drawn from the data regarding 6 to 12 year olds: insufficient evidence was found for a longitudinal association between parent education and PA; moderate evidence was found for a longitudinal association between intention and the child's PA. Determinants of adolescents' PA were age (being older), ethnicity (not being African American) and planning. From the review of

Uijtenwilligen, one must conclude that we have little 'true' high quality information about the determinants of PA in youth.

Correlates and determinants of sedentariness

Two reviews addressed sedentariness. Uijtdewilligen et al.[132] looked at determinants of sedentariness by reviewing four prospective studies. They concluded for all determinants of sedentary behaviour insufficient evidence for both children and adolescents. Pate et al.[133] looked at correlates of sedentary behaviour and found that demographic, biological, psychosocial, environmental and behavioural factors have been studied as potential correlates of sedentary behaviour. From these studies, it was concluded that time spent in sedentary behaviour has been shown to be higher in lower socioeconomic groups, in older versus younger youth, in non-white youth, in more mature youth, and in young people who live in homes that present heavy exposure to electronic forms of entertainment (televisions and computers). In addition, several studies have shown that young people spend less time in sedentary behaviours if their parents set limits regarding time of participation in screen-based entertainment.

v) Options for change: the evidence from intervention studies

PA promotion in community and family settings

PA is influenced by a number of ecological levels, including the family and community environment. A limited evidence base is available on the effectiveness of PA promotion in young people in these settings. To update our knowledge on this topic, Van Sluijs et al. conducted a review of reviews, as well as an updated systematic review from August 2007 to October 2010.[134] Only 13 family and three community-based studies were identified in the three previous reviews combined, and all independently concluded that the evidence was limited in both family and community settings. Preliminary evidence however hinted that family-based interventions set in the home and including self-monitoring and goal setting may be a useful

strategy to pursue. The updated literature search identified a further 10 intervention studies: six family-based and four community-based. Although more evaluations showed significant positive effects on PA (three family-based, one community-based studies), no distinctive characteristics of the effective interventions compared to those that were ineffective were identified when studying differences in intervention characteristics, target population or methodology. Based on the cumulative evidence to date, however, it also appears that creating safe environments in which young people can engage in free play or that they can use for active travel may have the potential to increase population levels of PA. Five studies showed positive effects on body composition, three of which were conducted on overweight or obese populations.

PA promotion in school settings

School-based interventions are thought to be the most universally applicable and effective way to counteract low PA and fitness since children and adolescents spend at least half of their waking hours in this setting. Kriemler et al.[135] performed a review of school-based interventions by applying a similar approach to Van Sluijs et al.; i.e. conducting an analysis of four reviews, as well as a systematic review on papers published between January 2007 and December 2010. The review of reviews led to the following conclusions: 47 to 65% of trials considered were found to be effective. The effect was mostly seen in school-related PA, while effects on outside school on overall PA were often not observed or not assessed. The school-based application of multi-component intervention strategies was the most consistent promising intervention strategy, while controversy existed regarding the effectiveness of family involvement, focus on risk populations, or duration and intensity of the intervention. The current review included 20 trials. All of these trials showed a positive effect on in-school, out-of-school and in overall PA in 9/10 studies, and 55% of studies showed an increase in fitness. By taking the highest combined hierarchy level of quality and Public Health relevance (i.e. objective assessment of overall PA), these studies all included children (≤12 years) and applied multi-component programs with involvement of the families. While these results support the notion

that school-based PA interventions are effective, time is ripe to look at long-term effects and implementation strategies.

vi) The context for action: potential solutions

The International Olympic Committee (IOC)

The IOC Congress in Copenhagen, 2009 outlined future priorities for the IOC emphasizing the importance of sports participation from a public health perspective and protection of the health of the athlete through prevention of injuries and diseases. To promote PA effectively, the IOC acknowledges the need to care for the health problems of the active patient. This not only involves providing effective care for the injured patient, but also developing and promoting injury prevention measures actively.[136] In 2010, the first Youth Olympic Games were held in Singapore emphasizing culture, education and sports in 14 to18 year-old athletes. During these Games, the athletes were exposed to educational tools developed by the IOC. Since 2005, the IOC has developed programs for prevention of injuries and diseases in high level and recreational sports. Some examples are the IOC Periodic Health Exam,[137], and protection of the child athlete, consensus meeting on training of the elite athlete [138] and age determination.[139]

International Federations (IFs)

Few IFs have programs that address the issue of inactivity in young people and youth (unpublished survey of a selection of IFs 2010). Many IFs host Junior or Youth Championships. Other IFs have modified their sport to encourage youth participation. The Gymnastics Federation (FIG) is unique in that its athlete population is almost solely comprised of child and youth athletes. The Football Federation (FIFA) has published two studies on sport promotion in youth showing that football is as effective as an established obesity training program for improving PA and fitness in young people.[140,141] IFs can be instrumental in supporting National Federation programs that address inactivity in youth.

National Olympic Committees (NOCs)

A few NOCs have developed programs to promote PA and sport in young people. One example is the Canadian Olympic Committee which developed an educational tool for students from grades 2 to12. The Canadian Olympic School Program was designed in collaboration with physical health educators to support the development of a healthy, active, physically literate nation and to proactively combat the epidemic of physical inactivity in children and adolescents. The curriculum focuses on participation, effort and pride in the pursuit of excellence. This example illustrates the important role that NOCs can have in promoting PA and sport in youth.[142]

World Health Organization (WHO)

In 2010, the WHO and the IOC agreed to cooperate to ”...promote, physical activity and sport..." The WHO Global Strategy on Diet, PA and Health (2004) and the WHO Global Action Plan for NCD prevention and Control (2008) provides a clear mandate for WHO’s role in providing evidence based recommendations, technical support, capacity building, surveillance, and collaboration with United Nations (UN) agencies and international partners. In 2010, the WHO published the Global Recommendations on Physical Activity for Health which includes recommendations for 5 to 17 year olds. The UN General Assembly high level meeting on NCD prevention and control 2011 provides all stakeholders an opportunity to highlight the important impact PA and sport can play in health of young people.[143-145]

International PA Networks

There are two global and four regional PA promotion networks. Agita Mundo is the global network for PA promotion [146] and GAPA [147] acts as the advocacy council of the International Society for Physical Activity and Health (ISPAH). The regional PA promotion

networks are RAFA/PANA for the Americas,[148], HEPA Europe,[149], the Asia-Pacific Physical Activity Network (APPAN) [150] and the African Physical Activity Network (AFPAN).[151] These networks can play a crucial role in promoting the health and fitness of young people in several ways: by providing exchange platforms and access to key experts; analyzing practice-led evidence to identify good practice, developing guidance and fostering monitoring and evaluation;[152] by distributing recommendations to expert communities and local implementers; by contributing to more effective dissemination of recommendations and good practice regionally, nationally or locally. However, availability of practice-led evidence has so far been non-systematic. While these networks have become instrumental platforms for exchange, their scope and reach is constrained by limited funding as they depend largely on voluntary contributions.

Non-Governmental Organizations (NGOs)

NGOs use PA and sport as platforms to develop social capital and social cohesion.[153,154] NGOs involved in Sports for All (http://www.tafisa.net) and Sports for Development (http://www.sportanddev.org) identified health as one key outcome.[154] The right to 'participate in sport, physical activity or play' are considered fundamental human rights.[155,156] NGOs fundraise, educate, mentor, advocate, implement programs, and develop local capacity.[157] These organizations use the vehicle of sports participation as a platform in the fight against HIV/AIDS, tuberculosis and malaria in the developing world and to promote PA in other settings.[140,158]

There is however, limited central coordination to promote inter-agency cooperation and inadequate evaluation of program implementation. Evaluation needs to be planned early and adapted to local realities. NGO partnerships must ensure sustainability, equity, appropriate allocation of resources and community participation.[159]

Governments

Reviews of actions taken by governments in many countries show mixed results in terms of operationalized plans for sports and PA promotion for young people. Lessons learned from one program, the Agita Galera Program, which deals with 6000 schools, and about 6 million students, in the State of São Paulo Brazil, provided an opportunity for the government to identify and promote PA and sports participation, a surveillance system, support for building partnerships; to build infrastructures for sports participation; to facilitate the development and implementation of an “Active-School Curriculum”; to promote active transport to school; and to incentivise the practice of PA and sports inside and outside school.[160]

Education

Health and fitness promotion via PA represents a complex issue which can only be resolved by multi-sectoral interventions because no one sector can independently resolve the challenges involved. The education sector in general, and physical education (PE) in particular, comprise a primacy setting for interventions throughout formative development which can influence positive attitudes and behaviours of young people during compulsory school attendance years.

PE makes a unique contribution to education through the development of ‘physical and health literacy’. Together, they seek to help pupils develop the necessary skills to make healthy choices and are key in sowing the seeds in the formation of the physically educated person. Physical movement education is the only educational experience where the focus is on the body, its movement and physical development, and it helps young people to learn to respect and to value their own bodies and abilities, and those of others.

A school's role extends to encouraging young people to continue participation in PA, through the provision of links and co-ordinated opportunities for all young people at all levels. Schools should also develop partnerships with the wider community (health and sport) to extend and to improve the opportunities available for students to remain physically active: bridges need to be

built and pathways created to foster partnerships and so increase the potential for positive interventions.

Comprehensive whole-of-school approaches to child health represent an effective strategy to address childhood physical inactivity.[161-166] Successful models incorporate strategies across settings, emphasize partnerships and advocate for political and financial support. Factors deemed key to success are political will, sustained funding, shared vision and decision-making, policy, evaluation and teacher training and support, multiple components, adaptability and compatibility.

Implementation of effective school-based models into the real world setting is complex and demands a multi-partner investment over the long term. Ecological approaches that integrate government, schools, the community, individuals and settings are likely key to successful and sustained implementation.[162,165-168]

There is a gap between demonstrating the effectiveness of PA interventions and our understanding of the wide scale implementation and/or dissemination of them.[168]

Health Care System

The health care setting can play an important role for promotion of PA, fitness and health in adults.[169-171] The few health care-based studies to date that have addressed young people have dealt with exercise groups, counseling and computer-based behaviour change programs.[169] The scientific evidence is insufficient to draw any conclusions about how these methods affect PA among young people. That said, PA is regarded as a corner-stone in the treatment of common child and adolescent diseases.[172,173] Through the provision of adequate education of primary health care professionals on the benefits and prescription of PA, the health care system can play an important role in the promotion of PA and sport involvement in young people.

vii) Summary and Recommendations

To realize Recommendation #<51>from the Olympic Movement in Society Congress (Copenhagen 2009), a coordinated, collaborative, global effort involving many stakeholders including members of the Olympic Movement is required. It is essential for the success of future programs that young people are involved to plan, implement, deliver and evaluate sport and PA programs. The following recommendations are formulated based on a review of the current scientific evidence and the collective expertise of the authors in their respective fields relating to the health and fitness of young people.

Sport Organizations

Sport organizations have a role to play in the realization of the global recommendations for young people to accumulate at least 60 minutes per day of moderate-to-vigorous intensity PA in addition to the activity they accrue as part of everyday living.

It is recommended that sport organizations strengthen their role in the promotion of PA and sport for health and fitness in youth in the following ways:

- ensure that sport programs include youth oriented activities to engage and retain young athletes;
- educate sport coaches to incorporate appropriate health-related fitness training in relation to growth and maturation;
- identify and lower the barriers to participation in sport;
- collaborate with youth, parents, school personnel and community programs to design and deliver sports programs that attract and retain young people;
- foster collaboration with international, regional and national PA promotion networks;
- evaluate and improve the quality and delivery of sport programs for young developing athletes;

- encourage research into the efficacy and effectiveness of delivery of sport and PA for young people.

Governments

It is recommended that governments:

- advocate for PA and health promotion on global health and regional agency agendas;
- foster collaboration with international, regional and national PA promotion networks;
- place health and PA higher on the national political agenda;
- develop, implement and evaluate policy to promote sport and PA in young people;
- enhance funding for youth involvement in sport and PA programs across sectors;
- support multi-sectoral policies and provision of school-wider community (sport, recreation, health agencies) partnerships to improve PA opportunities for young people;
- ensure that providers of recreational programs for young people limit the time spent in sedentary pursuits such as television watching, video game playing, and computer use;
- support research to better understand the role of PA in the health trends of young people.

  Educational System: With regards to the educational system, it is recommended that governments:

- provide effective PE in school delivered by qualified professionals at all levels of the curriculum;
- provide a minimum of three lessons of PE totaling 120 to180 minutes per week;
- ensure that opportunities for PE/PA are provided in a variety of settings and are embedded within the curriculum;
- collaborate with community organizations to create accessible and safe PA and sport environments;

- implement adaptable whole of school models that utilize multiple component strategies and routes of entry;
- allocate adequate resources to PE/PA programs.

Health Care System: With regards to the health care system, it is recommended that governments:

- provide mandatory education of health care professionals on the benefits and prescription of PA for young people;
- increase collaboration between health care professionals and other providers of PA and sport in the community;
- revise the health care financing system to include reimbursement for individualized life style counseling and follow-up.

Non Governmental Organizations

It is recommended that:

- Sport for Development programs be evaluated for efficacy of health outcomes and impact;
- a registry of NGOs, both sport and non-sport, be established to promote PA and sport as a vehicle for health and community development;
- NGOs develop a filter for partnerships to ensure sustainability, equity, allocation of resources, community ownership and buy-in, and to limit unintended consequences of PA and sport programming.

Research Recommendations

It is recommended that research be conducted:

- with respect to sport, to assess if

i) current structures of organized sport are adequate to meet the needs of young people and

ii) coaches are adequately prepared to cope with the unique pedagogical physiological and psychological needs of young people during growth and development;

- to use new non-invasive technologies such as magnetic resonance imaging and spectroscopy and near-infra red spectroscopy to better understand responses to exercise and young people's fitness during growth and maturation;
- to evaluate setting and types of young people's habitual PA, sport participation and fitness through large scale, standardized national and international surveys;
- to evaluate the effect of PA promotion interventions on intermediate factors, and at long-term follow-up with objective measures of the behavior, fitness and health outcomes;
- to better define the dose-response mechanisms and effects of PA/exercise and sedentary behaviour on fitness and health during growth and development;
- to assess which method of PA promotion is best for a given population taking into consideration factors such as disease state, socio-economic conditions, culture, ethnicity, gender and age;
- to assess reach and implementation issues beyond attendance rates in intervention studies to establish the potential for wider implementation;
- to use objective measures of PA whenever possible to enhance the quality of assessment and interpretation of data.

It is recommended that a web-based repository for surveillance data on objectively measured PA be developed to better compile, evaluate and disseminate the scientific evidence in this field.

Reviews Informing the Consensus Statement

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