

Still and Heavy - Obesity and Physical Inactivity Among Singaporean Youths- Consequences and Challenges for the 21st Century

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Abstract

Singaporean youths are a very sedentary lot where current levels of habitual physical activity in school and outside of school are grossly inadequate to meet guidelines for having a normal body mass index and for good metabolic health. Though youth obesity rates among Singaporeans appear to be stable over the last 10 years, hovering about 10%, emergent evidence shows that Singaporean youth who were sitting for too much of the day, as a consequence had twice the risk of suffering from insulin resistance which is a precursor to metabolic syndrome. Sedentary behaviours including schooling-associated activities have also contributed to worrisome rates of myopia among young people. Inactive physiology research among Singaporean youths represents a challenge and a fertile area for future attention. Innovative whole school, home and community approaches are required to keep active youths moving on a sustained basis and to engage sedentary youths in becoming physically active.

Introduction

The health and economic perils of obesity in adulthood in the developed and developing nations are substantial, debated and well established. Emergent research suggests that physical inactivity in adulthood contributes to shortened lifespan [1]. Concomitantly, physical inactivity throughout childhood and adolescence could hasten an earlier onset of chronic metabolic disorders, cardiovascular diseases, musculoskeletal disorders, vascular diseases, psychological disorders and some cancers. Youth obesity in boys and girls, especially in late adolescence significantly predicts adult physical inactivity and adult abdominal obesity [2,3]. These data are suggestive that strategies to increase regular physical activity habits and to reduce sedentary behaviours should commence in early childhood through adolescence and employ a holistic and multifaceted approach.

Physically Still Most of the Time

Singaporean children and adolescents are increasingly sedentary, spending almost all their daily hours awake engaged in activities that do not require much physical exertion. Adolescent boys and girls polled in 2006 (N=1200) spent an average of 15 hours a day engaged in sedentary activities- six hours of schooling, three hours of homework, four hours of screen-time and two hours travelling to and from school on motorized transport (unpublished data). Equivalent research using objective motion sensors (heart-rate monitors) showed that older children and young adolescents (total N=520; aged 9-15 years) of normal body weight spent 86% and 94% over a 10-hour monitoring time at heart rates that were below 120 beats per minute (bpm) over three week days and that there were even more less physically active over the weekend day-96% and 99% of the monitored time at HR<120 bpm [4]. Chia [5] reported on pedometer step count on 877 participants aged 9-18 years in three schooling cohorts [primary (age, 9-12 years; n=150 male; 156 female), secondary (age, 13-16 years; n=137 male; 138 female) and junior college (age, 17-18 years; n=140 male; 156 female)] in Singapore. He reported significant main effects for step count taken outside of school compared to within school (5568 vs. 3881, p<0.05). No significant difference was found for steps accumulated within or outside the school in boys and girls across the schooling levels. He concluded that daily accumulated step count was deficient by 35% of the 16,000 and 13,000 steps recommended, respectively for male and female youths to remain in the healthy body mass index range [6].

Yet unpublished data in studies conducted between 2011 and 2012 (Chia et al, unpublished) further established that: (i) Weekday accumulated physical activity, measured using accelerometers on 220 youths, aged 13-15 years showed that 18 minutes were spent engaged in moderate-to-vigorous physical activity (MVPA) but this declined to 8 minutes over the weekend. Male adolescents engaged in significantly more MVPA than female adolescents on the weekday (22 vs. 14 minutes; p<0.05) but not over the weekend day (7 vs. 8 minutes, p>0.05); (ii) total sedentary time for the weekday was 291 minutes for male youths and 337 minutes for female youths (p<0.05) (pooled mean for both sexes was 313 minutes). Total time spent engaged in sedentary activities for the weekend was 155 minutes for male youths and 223 minutes for female youths (p<0.05) (pooled mean for both sexes was 187 minutes); and (iii) total accumulated step count for the weekday was 7818 and 2871 for the weekend day.

Collectively these data suggest that in youths, behaviours of physical activity and physical inactivity are distinctly different, that among youths, there are different clusters-for example, high activity-low inactivity; high activity-high inactivity; low activity-high inactivity; that youths can exhibit different combinations of the physical activity-physical inactivity spectrum. Importantly, further research is necessary to tease out what will work in getting different cohorts of youth to be physically more active and/or reduce the time spent in sedentary activities especially while sitting or lying down. This mirrors the recommendation by others reported elsewhere [7]. Emergent data on adults using meta-analytics suggest that deleterious health outcomes (especially metabolic syndrome or insulin insensitivity), which are independent of body mass index, physical activity or exercise are associated with time spent engaged in sedentary behaviors [8,9].

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Innovative programmes to ameliorate sedentary youth lifestyles should focus on all forms of sedentary behaviours like reading, doing homework and worksheets, screen time spent on the computer, smart phones and television viewing, passive travel, sitting or lying down. Understanding why the different activity-inactivity clusters of youths are physically active or not provides a framework for intervention that is relevant, context-focused and sustainable and represents an urgent area for research.

Heavy-Youth Overweight and Obesity

Information garnered from press reports and communications from the Ministry of Education in Singapore show that youth obesity in schools (greater than 120% of median weight for height), increased from 2% in 1976 to a high of 15.5% in 1992, and thereafter was reduced to about 10% in 2003 and has remained relatively stable at 10-12%. Nonetheless, compelling data show that Singapore adults have higher risks of heart disease than Caucasians [10] for a stipulated body mass index and if adjusted for equivalent risk (BMI-body fat nexus), would raise adult obesity of about 6% of the adult population (18-69 years) to about 33%. Additionally, the international cut-off criterion for youth obesity show that during puberty, growth curves for overweight and obesity in youth among Singaporean male and females were outliers and were greater than those of USA, Great Britain, Brazil, and Netherlands [11].

Youth Perils of Being Still and Heavy

Singapore has one of the highest rates of childhood myopia and this is worrisome because an earlier onset of myopia increases the risk of severe myopia in adulthood where complications could lead to blindness. While there is a genetic influence to developing myopia [12], some studies show a link between the time spent engaged in near work (reading, screen time, etc), and also an inverse relationship between the incidence of myopia, and also severity of myopia and time spent outdoors, and total sports engaged in among more than 1400 Singaporean adolescents [13].

Yet to be published data on the metabolic health of Singaporean youth (N=233; aged 13-15years), using accelerometers to measure physical activity and blood tests to measure insulin resistance showed that adolescents with elevated body mass index (BMI) were (i) twice more likely to have elevated cholesterol (increased LDL-C, decreased HDL-C and increased fasting glucose); (ii) thrice more likely to have elevated resting blood pressure and (iii) 6.5 times more likely to have elevated blood triglycerides. Importantly, Singaporean youths with higher levels of MVPA were 2.5 times less likely to have insulin resistance and those with faster 2.4 km run times were 3 times less likely to have insulin resistance. Conversely, sedentary youths were twice more likely to have insulin resistance.

Some data show that weight status affects the short-term cognitive verbal memory recall among the nation's top 10% of adolescent male achievers from two premier schools. Male adolescents of normal body weight correctly and significantly recalled more words than their peers who were classified as overweight (>120% for height and weight) over eight verbal memory recall trials [14] but others show no significant and meaningful relationship between physical activity and performance in Mathematics, English, and Second Language, in pen and paper tests among lower primary school pupils aged 9-10 years [15]. Such equivocal findings from Singapore, which echo the review findings of international research [16] suggest that further research is warranted.

Cyber sport	Physical sport
Anytime, anywhere, whenever- easy access to players and computer terminal	Limited by time, number of players, location and access to facility
Not weather dependent	Weather-dependent
Not dependent on physical fitness	Dependent on physical fitness
Does not depend on a high level of physical skill	Dependent on physical skill
Game skill level is not important for game enjoyment	Game skill level is important for game enjoyment
Relative ease in skill mastery	Time-consuming to master skill
Gratification and enjoyment are immediate	Enjoyment and gratification are delayed
Low level of physical exertion	Great deal of physical exertion

Table 1: Cyber versus physical sport (adapted from 19).

Engaging Digital Natives and Epic Learners

Singapore has the third highest internet penetration rate (77.2% in 2011) in Asia, after Japan (80%) and South Korea (82.7%) [17], with youths aged between 7 and 24 years having the highest adoption rates of internet and computer use ranging from 96-99%, in the last 12 months [18]. Singaporean youths of the 21st century can be described as 'Digital Natives' and EPIC learners that they learn best through Experience, that they engage best when they are invited to Participate, that they learn through Imagery and that they are learners who are Connected, with access to multiple sources of information.

Chia [19] reported that Singaporean youths are exposed to cyber sports at a young age even before they experience the physical sport. This is not surprising since the ease and engagement offered by cyber sports compared to the physical sport is compelling. The comparisons are summarized in (Table 1).

The challenge for physical education teachers and parents is how to make the physical sport and game less unattractive to youths, either by introducing some elements of cyber sports into the teaching and learning of the physical sport or to offer a physical experience of sport that is compelling and attractive and cannot be replicated by the cyber sport.

Schools play a leadership role in inculcating healthy habits for activity [20] and also for alternative choices for sedentary behaviours because children and adolescents spend a great deal of time in school and formal schooling in Singapore is compulsory for 10 years (age 7-16 years). PRIDE for PLAY™ is an award-winning school programme that infuses between 20-40 minutes of daily physical play in primary and secondary schools in Singapore [21] and is an example of a ground-up initiative that has multilayered effects in developing happier and holistically healthy children and adolescents [22]. Much work and research remains to be done and not a moment is to be lost and we need 'all hands on deck'- schools, parents, community groups, national sport associations, physical education teachers, coaches and health care professionals in ameliorating the deleterious effects of too much sitting and not enough 'standing up' for doing the right thing. The future health and well-being of Singaporeans is at stake.

About the Author

Professor Michael Chia, PhD is Professor of Paediatric Exercise Physiology at the National Institute of Education (NIE), Nanyang Technological University in Singapore. He was Head of Physical Education & Sports Science at the NIE. He is an active researcher on the physical activity, sedentary behavior and fitness of Singapore youths. He marshaled PRIDE for PLAY?, a 2010 World Leisure

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