

THE NATURE AND PROMOTION OF PHYSICAL ACTIVITY IN SINGAPOREAN YOUTHS

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The conveniences of modern living for work and for play pose serious challenges for young people in school and outside of school, to be physically active on a daily basis. Physical play offers many benefits for the holistic development-cognitive, physical, psychomotor and affective domains- of young people. Physical activity guidelines for young persons and youths reveal that they should be accumulate at least 90 minutes or more of at least moderate intensity activity on a daily basis for health benefits to accrue in terms of having a positive metabolic profile. Girls should accumulate at least 12 000 steps or 120 minutes and boys, 15 000 steps or 150 minutes of physical activity daily. These guidelines are established for cohorts that are from the West and should be tested and validated against cohorts from the East. Physical activity and physical inactivity behaviours is complex and are resistant to simplistic explanations such as hours of computer use and/or television viewing. Instead clusters of cohorts, with different characteristics, such as vulnerability to being overweight and physically inactive and should be identified. No singular factor strongly predicts either behaviour; rather the behaviours are based upon a basket of factors and the interplay among the factors of the physically active or physically inactive person. Intervention programmes that target the holistic development of young people can be successful and sustainable when there is whole school acceptance of the programme, a strong trust between the school management, stakeholders (school, parents, and MOE) and the researchers, when the interventions are multifaceted- before, during and after school programmes, active recess, an extended recess, tuck-shop or canteen nutritional programme, the availability of safe equipment and facilities, parental involvement, school events and school partnerships with the community. The use of electronic gadgets such as PDAs, mobile phones and new technology monitors, coupled with youth-friendly software programs can help increase awareness of the need for a healthy lifestyle among youths in Singapore.

1. Introduction

Physical activity is the natural inclination of all young people, regardless of race, language or religion in Singapore. Physical activity is the capstone for the growth and development of toddlers, children, adolescents and young adults. Among toddlers and young children, physical activity through physical play offers ample opportunities for holistic development. Child-directed play fosters creativity, problem-solving, social interaction, motor development, physical fitness and enhances parent-child relationships (Chia, 2007). Conversely, a serious deprivation or restriction of physical activity may impair or retard physical, social, mental and emotional development of young children.

Among adolescent and young adults, physical activity through sports and games provide opportunities to build a sport-loving culture, for social intercourse, for stress-release and for the pursuit of a healthy lifestyle. However, there is a compelling attractiveness in embracing lives of convenience and sedentary forms of entertainment with the advancement of technology and innovation. In Singapore, young people are at a very young age 'socialised' into study, transport and leisure habits and activities that require minimal amounts of physical exertion and energy expenditure. This is exacerbated by the ease high-calorie convenience foods via food delivery services and lifestyle choices for study, work and leisure that are mostly sedentary.

Indeed physical inactivity appears to be better tracked over time than physical activity from childhood to adolescence to adulthood (Raitakan et al, 1994). This means that it is easier for sedentary habits or the cycle of very little physical activity in daily life to be entrenched than it is for active physical activity habits to take root. Modern-day technological conveniences include the television, computers, the cell phones, elevators and lifts, forms of vehicular transport (cars, buses, and trains), and all forms of labour-saving electrical appliances (e.g. washing machines and vacuum cleaners). Reduced daily and total energy expenditure, coupled with an over-consumption of calories in childhood and adolescence, increases the likelihood of heart-disease, stroke and some forms of cancers in adulthood. This threatens both life-span and the quality of life of youths. In the USA, there are already projected warning signs that the lifespan of the present population of youths could be shorter than those of their parents because of a 'tsunami of obesity' that affects the USA (Ludwig, 2007). Singapore, a first-world nation must not go down this route and must instead make haste and exercise a resolute determination to take on the road less

travelled, where the youths morph into physically active, sport-loving and healthy adults.

The cardinal purpose of this chapter is to provide information about the nature of physical activity among Singaporean youths and some innovative approaches at promoting physical activity among school-going youths in Singapore. The purpose of the overview is to provide a firm foundation for school administrators, physical activity, play and sport advocates and school teachers to justify, plan and craft beneficial programmes for the advancement of holistic health among youths in Singapore.

2. Benefits of physical activity through physical play

Research informs that physical play is beneficial to the holistic development of young children and that the benefits of physical play out-weigh the disincentives of physical play such as accidents and physical injuries (Chia, 2008). Play is natural and is a simple joy that is a most cherished part of childhood. Play fosters creativity, promotes imagination, practices dexterity and encourages emotional, cognitive and physical strength. Indeed, play is important for the healthy development of the brain (Tamis-LeMonda et al, 2004). Through play, children can explore the world, interact and engage with peers and adults, practising mastery and resiliency and acquiring competencies that will help them to face future uncertainty (Chia, 2008).

Play that is undirected by adults, allows children to learn to share, to care, to negotiate, to get along in groups, to resolve conflicts and also to learn self-advocacy skills (Hurwitz, 2003). When play is child-directed, children practise decision-making, move at their own, discover their own interests and children ultimately engage in the passions that they wish to pursue. When play is adult-directed, which is common, children acquiesce to adult standards and this sometimes compromises creativity, leadership and group skills (MacDonald, 1993). This should be a cautionary reminder that adult-based interventions should be tampered to allow for a greater licence for children to freely mingle and interact, rather than to inhibit physical activity without intent.

Play builds active and healthy bodies and encouraging unstructured play every day of the week that is interspersed throughout the day could increase the habitual physical activity of children and help ameliorate childhood obesity or delay it, helps with stress alleviation and allows for 'good mood' hormones, which are released into the circulation when physical activity thresholds are achieved, to take effect (Chia & Wang, 2002).

Parents who spend time at play with young children get a glimpse of the world through the 'child's eyes' and apart from opportunities to offer gentle and nurturing guidance, the interactions also promote enduring relationships between the child and parent (Smith, 1995). Interestingly, play is also used to foster academic and social-emotional learning. Play helps children to adjust to the school environment, heightens children's readiness to learn, enhances positive learning behaviours and fine-tunes problem-solving skills (Fisher, 1992).

Apparently, no other medium apart from physical play allows for so much gain for so little investment. Persuasive anecdotal evidence garnered from the parents of pre-school children who make their transition into primary school and from principals of primary schools show that young pupils miss the daily opportunities for physical play in their pre-schooling years that become limited and more restrictive once enter primary school. Researchers, education specialists and physical activity protagonists should re-energise their efforts in exploring intervention programmes that can facilitate increased daily physical activity engagement through play, either through expanded physical education sessions, in terms of duration and frequency, co-curricular sport and game activities conducted during and after-school hours and other events that 'regularise' physical activity.

This will buttress the notion that daily physical play is fundamental and a pre-cursor requirement for the holistic development of young persons, without and without disabilities. Our data suggest that youths with disabilities have reduced functional performance capabilities and perhaps reduced daily physical activity compared to their normal peers and therefore it is important that youths with special needs are accorded special attention and provided with opportunities for play or development remediation (Chia, 2002). In the cited study, Chia reported that in the 16 adolescent boys with moderate intellectual disability, peak power and mean power in the Wingate Anaerobic Test and the subsequent post-blood lactate concentrations were markedly lower (i.e. up to 35 % lower) than that of age-matched peers, using a similar test methodology.

Importantly, the mindset that physical play is most important will become entrenched and pervasive and provide a clear societal mirror that Singapore recognises and enshrines the right of children to play as espoused by the United Nations High Commission for Human Rights (General Assembly Resolution 44/25, 1989).

3. Consequences of physical activity insufficiency and associated conditions

Extended periods of physical inactivity once entrenched as a daily habit may result in adult ailments like cardiovascular disease and altered glucose metabolism, which are documented to begin in infancy and childhood (Williams et al, 2002). Other paediatric conditions arising from severe physical activity insufficiency include obesity, orthopaedic problems such as joint pains in the feet, knees and hip, which are exacerbated by excessive body weight, and disrupted sleep due to obstruction of the airflow because of too much fat around the neck (Kimm & Obarzanek, 2002). Obese and overweight children, including those in pre-schools experience weight-teasing by peers and they are bothered by the teasing episodes (Chia, 2006). Bruce (1975) summarises the deleterious psychological impact of obesity in the young:-

“The lot of fat children is a sad one. They are bashful & ashamed of their shapeless figures yet unable to conceal them. Wherever they go, they attract attention...Obesity is a serious handicap in the social life of the child... Obesity does not have the dignity of other diseases, and is not often taken seriously by adults”. (pp. 95).

Weight-teasing in schools is associated with disordered eating behaviours that may place overweight children at risk for weight gain. In a survey of 4746 young people in the USA, 63 % of the very overweight girls and 58 % of the very overweight boys reported being teased by their peers, while weight teasing by family members was reported by 47 % by these girls and 34 % by these boys (Neumark-Sztainer et al., 2002)

In an eight-year retrospective prevalence study on eating disorders (anorexia nervosa) in Singapore, Lee et al (2005) reported a six-fold increase in patient referrals, between 1994 and 2002, to the Child Guidance Eating Disorder Clinic at the Institute of Mental Health. The following results are instructive: the mean age of onset of the disorder was at 15.5 ± 3.9 years; 91 % were female, 94 % were Chinese and 74 % of the patients were of school-going age with 47 % coming from all-girl schools; the mean BMI at diagnosis was 15.6; 25 % suffered from depression and the 27 % identified the triggers as weight teasing and comments from others, with 11 % having been members of the Trim and Fit (TAF) Scheme in schools. These results highlighted that perceived weight teasing was significantly associated with disordered eating behaviours among overweight and non-overweight boys and girls (Neumark-Sztainer et al, 2002), echoing in the Straits Times on eating disorders in all-girl-school in Singapore (Davie, 2006).

The TAF scheme was launched in 1992 and was successful in reducing national school rates of overweight from about 15 % in 1991 to about 10 % in 1998 and has largely stayed about 10 % since year 2000 (Chia, via personal communication with MOE, PE Unit, 2007). Chia (1998) in his published discourse on rethinking TAF programme strategies raised concerns about some of the deleterious effects that the programme may have on some vulnerable school students and also furnished suggestions about engaging overweight youths with forms of physical activity and exercise that are more suited and personalised to the conditions of overweight youths.

The MOE reviewed the TAF scheme and with the MOH launched a nationwide holistic health framework for schools in 2000, (CHERISH; Championing Effort Resulting in Improved School Health) which targets the holistic development of students, which included a healthy maintenance of body weight for all students, not just those who are under-weight weight or overweight. Importantly CHERISH echoes the WHO's Health Promoting Schools concept, adopted by many countries.

In 2003, Chia and Wang published survey results among primary school children that showed that a sizeable proportion of children of normal body weight voiced the intention to lose body weight, rather than to gain body weight. In the study that involved 518 pupils in a primary school in Singapore, where the relationships between weight-for-height classifications, body weight satisfaction, perceived physical self-worth and physical fitness among 275 boys and 243 girls aged between nine and 13 years were examined, results revealed that across the three weight-for-height classifications, more pupils intended to want to lose body weight than to gain body weight. Underweight pupils were the most satisfied with their body weight, were the most physically fit and had the highest rating for perceived physical self-worth than the healthy weight and overweight groupings. It is noteworthy that girls and boys had similar ratings for perceived physical self-worth but younger pupils had higher perceived physical self-worth than older pupils.

These data suggest that programme leaders in physical activity, exercise and sport must practise sensitivity and care by not perpetuating negative stereotypes about body weight. Concomitantly, education and awareness of the dangers of body image disorders among school youths particularly in all-girl schools and in young secondary school students should be stepped up. Apart from health and physical ailments, other social and emotional and disciplinary deficiencies are also likely to accrue, as the opportunities and outlets for stress-alleviation through exercise and physical play become limited. However, such an assertion

awaits research validation among Singaporean youths. This is a fertile area for future research.

In Singapore, paediatric growth charts had to be revised in the late 1990s to take into account the increased body mass of children aged 1 to 6 years, where there was an average increase of half a kilogram in of body mass for all ages without any corresponding increase in stature. These changes were attributed to increased energy storage because of better nutrition but equally could be attributed to reduced energy expenditure at the paediatric ages. Research informs that in the USA, young people within the 95 % percentile for BMI are likely to remain obese and overweight in adulthood and also suffer from obesity-related ailments (Williams et al, 2002). Therefore it seems prudent to monitor young people's BMI when they appear to be on an upward trend so as to ameliorate large groups of young people become overweight and obese in adulthood.

Another indirect consequence of the lack of activity in childhood is also one of the highest incidence rates of adult-onset diabetes in the world among Singaporeans. Since the 1990s, heart disease and stroke continues to be the leading cause of premature death in Singaporean adults (Singapore Heart Foundation, 2006). Yet, against this backdrop, regular physical activity in youth has a strong and effective preventative role in the onset of Type II diabetes (Chia, 2002).

Singapore apparently also has one of the highest rates of childhood and juvenile myopia in the world and many youths suffer from myopia at a younger age than before. In 2001, 34 % of Primary 1 students were myopic. This increased to 66 % for Primary 6 students and 68 % for Secondary 4 students (Teo, 2001). Cogent data suggest a negative relationship between the rates of myopia and the amounts of physical activity, sports and outdoor activity. In a longitudinal study of 514 children from 1989 to 2001, Jones et al (2007) reported that the chances of children with parents without myopia becoming myopic were lowest in the children with the largest amounts of sports and outdoor activities. These health conditions among young Singaporeans are a wake-up call for action that much more needs to be done to motivate our young towards an active lifestyle imbued with regular physical activity. Research data in the Singaporean context are urgently needed to verify if these observations are also valid in our youths.

4. Physical activity guidelines for young persons and youths

There are apparently no universally accepted guidelines for physical activity that are promoted or accepted by all countries for toddlers, young children and

youths. This is not surprising since there is a dearth of relevant, reliable and adequate data on dose-response benefit of physical activity (i.e. amount of activity engaged with corresponding results in health benefits) for these age groups. Moreover, the nature and context of physical activity among different communities in different countries are likely to be dissimilar.

The National Association for Sport and Physical Education (NASPE, 2002) in the USA enunciated physical activity guidelines for toddlers and young children. The guidelines were articulated based upon the premise that adopting a physically active lifestyle early in life increases the likelihood that infants and young children will learn to move skillfully.

The NASPE physical activity guidelines for toddlers (persons between 2 and 5 years old) are:

1. Toddlers should accumulate at least 30 minutes daily of structured physical activity and pre-school children, at least 60 minutes.
2. Toddlers and pre-school children should engage in at least 60 minutes & up to several hours per day of unstructured physical activity and should not be sedentary for more than 60 minutes at a time except when sleeping.
3. Toddlers and pre-school children should have indoor and outdoor areas that meet or exceed recommended safety standards for performing large muscle group activities.
4. Individuals responsible for the well-being of toddlers and pre-school children should be aware of the importance of physical activity & facilitate the child's movement skills.

For persons older than 5 years of age to adolescence, the current physical activity guidelines for the promotion of lifelong physical activity, the improvement in current health, physical fitness and well-being are:

1. Children should accumulate at least 60 minutes and up to several hours of age-appropriate physical activity on all or most days of the week. The daily accumulation should include moderate-to-vigorous physical activity of which the majority being intermittent in nature. Brisk walking is considered as moderate intensity. Continuous vigorous physical activity should not be expected for most children, nor should it be a condition for meeting the guideline.
2. Children should participate in several bouts of physical activity lasting 15 minutes or more. The majority of children's physical activity will be

intermittent in nature. For optimal benefits to accrue, 50 % of the accumulation should be in bouts of 15 minutes or more. These bouts can take place during recess, physical education, play or sport practices. Bouts of activities typically include activity time interspersed with rest or recovery periods.

3. Children should participate each day in a variety of age-appropriate physical activities designed to achieve optimal health, wellness, fitness and performance benefits.

A study by Anderson et al (2006) showed that a daily accumulation of least 90 minutes of moderate-to-vigorous intensity exercise or physical activity would be necessary in European children (Danish, Estonian and Portuguese) to prevent insulin resistance and to avoid a clustering of cardiovascular risk factors in European 9- and 15-year-old children (N=1156 girls and N=1045 boys). However the guideline for a minimum of 90 minutes of moderate-to-vigorous intensity exercise or physical activity is not well-publicized and has not yet gained widespread acceptance. These dose-response relationships for physical activity and disease antecedents in young people require further research and validation in the Singaporean context and should be pursued.

In Singapore, the Ministries of Community Development, Youth and Sport (MCYS), and the Ministry of Education (MOE) have apparently not articulated equivalent physical activity guidelines and in pre-schools, though physical activity sessions are encouraged, there is at the present time, no requirement for specialist physical education teachers to be deployed in pre-schools and in primary schools. All things considered, specialist PE teachers are better equipped to provide physical activities that are gainful and positive, and exercise and sport experiences that help children develop holistically.

The Ministry of Health (MOH) published New Dietary Guidelines for Children and Teenagers in 2007, which articulated the following guidelines for physical activity: Children and teenagers should engage in at least 60 minutes of at least moderate physical activity for at least 5 days of the week. PE time counts towards the 60 minutes. The guideline should be reinforced, practised and reiterated frequently and resolutely by school leaders. In terms of aggregated daily step count, researchers propose guidelines that are based upon tangible health outcomes. For instance, Tudor-Locke et al (2004) studied pedometer steps accumulated in 995 girls and 959 boys aged between 6 and 12 years, from the USA, Australia, and Sweden, in relation to weight status based on international cut-offs for normal and overweight in relation to BMI. They

recommended a median cut-off of 12 000 steps for girls and 15 000 steps for boys. The researchers reported that boys taking less than 15 000 steps and girls less than 12 000 steps a day were more likely to be classified as overweight or obese based on their BMI, which is a measure of relative fatness. Accordingly, this translates to 120 minutes per day of activity for girls and 150 minutes per day for boys (Welk et al, 2000). As the total daily step count recommendations furnished by Tudor-Locke et al (2004) are based on BMI of children from the West, the recommended total daily pedometer step counts should be validated in Asian or Singaporean children in relation to Asian standards of BMI. This represents another fertile area for research.

5. Prevalence of physically active and physically inactive behaviours

Physical activity measurement is complex and there are many instruments that are used to quantify amounts of physical activity (PA) - self report or proxy methods include the use of validated and age-appropriate PA questionnaires, physical activity diaries and logs, direct observation and associated computer software, doubly labeled water, mechanical devices such heart-rate monitors, pedometers and accelerometers and associated computer software. These measurement tools measure associated but non-identical aspects of PA and the merits and demerits of use in young persons and youths are reviewed elsewhere (e.g. Oliver et al, 2007; Reilly et al, 2008). The cited reviews are instructive and researchers must select the most appropriate measurement tool (s) based on validity, reliability, feasibility, human ethics and the availability of research resources and the objectives of the research.

6. Physical activity in pre-primary school pupils (toddlers)

There are apparently no data on the physical activity of pre-primary school children in Singapore. Baseline studies are particularly important. This area represents a compelling area for future research.

7. Physical activity in primary school pupils (children)

In a 1995 study, Gilbey and Gilbey examined the physical activity patterns of Singapore school children (43 boys and 53 girls) aged 9-10 years assessed by continuous heart rate monitoring over three 14-hour periods on week days and a single period on a Saturday. Only 13 children (11.4 %) experienced a daily 10-min period of continuous activity at a heart rate >140 bpm. Twenty percent of the boys and more than 50 % of the girls never achieved a single 10-minute

period >140 bpm. Boys achieved more periods of moderately intense activity ($p < .01$) than girls on weekdays. Lean girls were more active ($p < .05$) than the obese girls during weekdays. No differences were detected between activity levels on weekdays or on Saturday. The results indicate that school children in Singapore rarely experience the quantity or quality of physical activity needed for maintenance and development of cardiovascular health and cardiopulmonary fitness, articulated by the ACSM for adults. No physical activity guidelines for children were available then.

A study conducted by Chia et al (2002), using heart rate (HR) monitors in 120 boys and girls aged 10-11 years showed that they were mainly sedentary on a weekday (a median of 86 % of time spent at a heart rate intensity of less than 120 beats per minute and on a weekend day (a median of 96% of time spent at a heart rate intensity of less than 120 beats per minute). It is of interest that they were no sex significant difference in physical activity in this cohort of primary school pupils who were all of normal body weight (90-110 % for weight-for-height classification). However, primary school pupils were significantly more active than the secondary school students at HR thresholds that are described as light (120-139 bpm), moderate (140-159 bpm) and vigorous (>160 pbm) for both the week days and the week end day.

Wang, Chia, Quek and Liu (2006) used accelerometer-validated pedometers to examine in-school and out-of-school step count of 160 Primary 5 pupils from four schools. In-school step count was not significantly different from out-of-school step count (5364 vs 3805, $p > .05$) and the mean daily step count was 9169 ± 4551 . The daily total accumulated step count translated to 76 % and 61 % (12000 for girls and 15 000 for boys; Tudor Locke et al, 2004) of the daily recommended step count of girls and boys, respectively.

8. Physical activity in secondary school students (adolescents)

In the above cited study, HR monitors used to monitor PA intensity over 3 week days and the week end day (Saturday) revealed that for secondary school students, aged between 14-15 years, the median time spent at HR intensity <120 bmp were 94 % and 99.5 % for the week day and the week end day respectively. It is of interest that they were no sex significant difference in physical activity in this cohort of secondary school students who were all of normal body weight (90-110 % for weight-for-height classification).

Lee and Trost (2006) examined the physical activity patterns of 105 adolescent boys and 116 adolescent girls, aged 14.5 ± 1.1 years, using a 3-day recall questionnaire on physical activity and pedometers. Results showed that

boys reported higher overall mean activity (METs) and significantly higher level of vigorous activity blocks than girls but boys and girls reported similar number of blocks of moderate activity as the boys. Both boys and girls had similar mean total daily step counts over the average of three week days (boys-girls: 12134 ± 2574 vs 11714 ± 2339 , $p > .05$) and on the week end day (Saturday) (boys-girls; 11662 ± 2476 vs 11603 ± 3009 , $p > .05$). Though not reported in the study it appears that physical activity in adolescent boys and girls were not significantly different between week days and week end days as assessed using pedometers.

9. Explanations for physical inactivity among youths in Singapore

Emergent data suggest that it is the entire basket of physical inactive behaviours (e.g. reading and writing, doing homework, chatting with friends on the phone, listening to music, etc) rather than singular factors such as television viewing, video gaming activities and/or computer use that are responsible for youths being physically inactive.

For instance, Chia et al (2002) examined the associations between hours of computer use, physical activity using HR monitors and physical fitness among 120 primary school pupils aged 10.6 years and 120 secondary school students aged 14.8 years of normal body weight (80-110 % of weight-for-height charts). They reported no meaningful associations between hours of computer use, physical activity and physical fitness in secondary school students, and a significant positive correlation between hours of computer use and physical activity for primary school pupils ($r=0.23$, $p < .05$). However, the shared variance (i.e. coefficient of determination) was less than 6 %. Even so, the association was a positive one (as the hours of computer use increased, so did the level of physical activity) in primary school pupils.

Wang et al (2006) examined the physical activity and sedentary behaviours of a sample of 780 children aged between 10 and 14 years using a 7-day recall questionnaire. Results of one-way MANOVA showed that boys and girls had significant different patterns of physical activity and sedentary behaviours. Three distinct clusters were found for each sex using cluster analysis. 36 % of the boys spent much of their sedentary time in technology-based entertainment (e.g. computer/internet), and 38 % of them reported substantial amount of time spent studying and doing homework. The rest of the boys spent their time being physical active but they also played a lot of video games. Among the girls, time spent socialising with friends, studying as well as engaged in physical activity amounted to 57.3 %. 15 % of the girls reported spending most of their time studying and doing homework. A group of girls reported little study time, little

socialisation as well as low engagement in physical activity (27.8 %) compared to their peers.

These data suggested that activity programme interventions should aim at increasing physical activity behaviours and not simply reducing sedentary behaviours. Interventions aimed at increasing the perceptions of competence, autonomy, and incremental beliefs may also be influential at increasing physical activity engagement among Singaporean school children.

10. Innovative school-based interventions to increase physical activity and reduce physical inactivity

10.1. *HealthTrek Information Tracking System- a tool for building a health-enabling environment in schools*

NIE researchers juxtaposed the use of information and computer programming technology to create the world's first HealthTrek Information Tracking System (HITS) housed in a Personal Digital Device (PDA) (Quek, 2003). HITS, allows an individual to appraise his/her current body weight, food intake, physical activity patterns and mood status over time. Importantly, the system is able to prescribe suggestions for remediation based upon recommendations enunciated by the Health Promotion Board of Singapore. Highlights of the HITS' features include an age and a sex-specific weight gain/weight loss calculator, for safe weight gain or weight loss, a food planner that gives a breakdown of key nutrients in foods that are selected and a physical activity planner that gives the rates of energy expenditure for different activities selected. The food database encompasses over 2000 local and non-local food items, while the physical activity database has more than 800 specific activity-types. The mood gauge allows a person to track negative or positive feelings over time.

The attractiveness of HITS is that it offered real-time data of participants, overcoming the need for recall, which can be used on its own or pooled as group data in providing individualised evidence based data so that specific lifestyle changes can be made. The effectiveness of HITS for monitoring individualised physical activity and food consumption and mood states was evaluated in 37 primary school pupils, aged 9-10 years (Wang et al, 2005). Participants kept track of their daily food intake, physical activity consumption and mood state for seven days, by keying in the relevant data required as soon as they consumed food or engaged in physical activity while data on mood was keyed in immediately before and after food and/or physical activity consumption. Results affirmed the researchers' assertions that in IT-savvy primary school pupils, the

use of HITS housed in a PDA, provided an excellent means for the transmission of individualised and real time data that effected positive intentions and increased awareness for a healthy lifestyle- 92 % of pupils felt that HITS made them more discerning of their food choices and 95 % of the pupils reported that HITS made them more conscious of their daily energy expenditure and for a healthy lifestyle. Nearly 100 % of the pupils surveyed reported that they wished to continue using HITS and also continue to raise their levels of daily physical activity. At present, HITS is no longer available for use due to cost factors but its utility and effectiveness (real-time localised and holistic data- food, physical activity consumption and mood) as a health-enabling device can be further explored, when the cost of its implementation becomes more affordable.

10.2. *PRIDE for PLAY- personal responsibility in daily effort for participation in lifetime activity for youths*

PRIDE for PLAY is an acronym for Personal Responsibility in Daily Effort for Participation in Lifelong Activity for Youths (Chia, 2006). MOE advocates that schools should emphasize holistic development of pupils- this means paying sufficient and appropriate attention to the mental, physical, emotional, social and environmental development of all pupils and students.

Weekly compulsory physical education classes of 70 minutes in schools and the associated sports activities after classes are inadequate to meet emergent physical activity guidelines of a daily accumulation of at least 90 minutes of physical activity of at least moderate intensity.

Daily play sessions that are exclusive of an active daily recess, physical education classes taught by trained specialists and after-school sport sessions, can provide many developmental and holistic health benefits that may carry over into adulthood. A school environment that is play-encouraging, play-enabling and play-inviting can help a useful, innovative and natural way of inculcating a love for movement and help redress a serious trend of physical activity insufficiency while youngsters engage electronic gaming activities.

Pilot initiatives in two primary schools for the PRIDE for PLAY programme were conducted (Chia et al, 2007). This involved working closely with the school leaders and all teachers involved to forge a strong partnership for action and subsequent evaluation. The pilot study involved an infusion daily physical play of between 20 to 45 minutes during curriculum hours, either as stand-alone additional play and physical activity sessions or as part of an extended recess. Outcome deliverables like pre-and post school-based physical activity, assessed using pedometers, social-emotional outcomes among pupils, assessed using

age-modified questionnaires and indicators of academic achievement were garnered. For one pilot school that involved 270 Primary 2 pupils, daily step count in school was significantly increased by 24 % from 3742 to 4642. In the other pilot school that involved 225 Primary 2 pupils, daily step count in school increased by 10 % from 4520 to 4984. These amounted to achieving 39-42 % of the daily recommended step count for girls and 31-33 % of the recommended step count for boys (Tudor-Locke et al, 2004).

Social emotional learning outcomes of the pupils involved with the PRIDE for PLAY programme were also significantly improved with no compromise to academic standards. The principals of both schools raised the following points that are instructive for the success of PRIDE for PLAY- the programme had the support and buy-in from the key stakeholders- school management, teachers, parents and the pupils themselves. Other schools have translated, customised and adapted the PRDIE for PLAY programme into daily physical education. Further research directions associated with PRIDE for PLAY include establishing holistic or social-emotional learning outcomes as a result of programme implementation in a wider spectrum of schools in Singapore.

10.3. *Every step counts- how an active recess can help to buttress physical activity achieved during physical education lessons*

Wangye and Chia (2008), embarked on a study to evaluate the step rate of 125 boys and girls from Primary 2 and Primary 6, using the Omron HJ-005 pedometers during four 30-minute PE lessons, taught by specialist PE teachers with games-based activities, rope skipping, throwing, jogging and shuttle-run based activities and during an 30-minute unstructured recess where pupils were free to play with games equipment. Results revealed that the average number of steps achieved in a typical 30-minute PE lesson was 1660 ± 535 steps with a step rate of 55.4 ± 17.8 steps/min. Steps accumulated during daily recess averaged 1208 ± 526 steps or a step rate of 40.3 ± 17.5 steps/min. There was no significant sex difference ($p > 0.05$) in steps accumulated or step rate among the four structured PE lessons. However, the boys were significantly more physically active than girls ($p < 0.05$) during unstructured daily recess.

The difference in steps accumulated between Primary 2 and Primary 6 pupils was not significant during daily recess ($p > .05$). Aggregated step count or step rate during PE and recess among Primary school pupils in Singapore are within the range of findings documented elsewhere (e.g. Scruggs et al., 2005; Tudor-Locke et al., 2006). When the steps were aggregated for PE and recess, girls achieved 24 % and boys achieved 19 % of the daily recommended steps

(Tudor-Locke et al, 2004). Primary school girls were just as physically active as the boys during school structured PE, but boys were significantly more active during the unstructured daily recess. Primary 6 pupils were just as physically active as Primary 2 pupils during the daily recess periods and the results of the present study did not support the view that physical activity declines with age, (e.g. Trost et al, 2002) at least not during the daily recess periods, a finding that finds agreement with Ridgers et al (2005).

Schools should capitalise on young pupils' natural inclination for play and the availability of qualified PE teachers and games equipment during recess to chalk-up as many steps as possible so that more youths are able to meet the daily recommended step count of 12 000 for girls and 15 000 steps for boys (Tudor-Locke et al, 2004).

11. Conclusion

The nature of modern living poses serious challenges for young people to remain physical active on a daily basis. Yet the merits of daily physical activity through play and sporting activity in formal and informal settings in the holistic development of young people should not be underestimated and discounted. Physically active and physically inactive behaviours are different constructs are worthy for further research so that more appropriate programmes can be implemented to improve the current situation where habitual physical inactivity is more the norm than the exception among Singaporean youths. Current evidence suggest that Singaporean young people are not physically active on a daily basis and more should be done in integrating strategies for the promotion of physical activity at the school, home and community fronts

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