Current Journal of Applied Science and Technology

32(6): 1-13, 2019; Article no.CJAST.47550
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Screen Time and Physical Activity Pattern of School Children (11-17 Years) from Different Cultural Regions of Punjab, India

Sukhdeep Kaur[1*], Kiran Bains[1] and Harpreet Kaur[1]

[1]Department of Food and Nutrition, Punjab Agricultural University, Ludhiana – 141 004, Punjab, India.

Authors' contributions

This work was carried out in collaboration between all authors. Authors SK, KB and HK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SK managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/v32i630033
Editor(s):
(1) Kleopatra Nikolopoulou, Secondary Science Teacher and School of Education - University of Athens, Zanneio Model School, Kolokotroni 6, 18531, Piraeus, Greece.
(2) Ming-Chih Shi, Department of Health and Nutrition Science, Chinese Culture University, Taipei, Taiwan.
Reviewers:
(1) Lazarus Ndiku Makewa, Lukenya University, Kenya.
(2) Einar Arnbjörnsson, Lund University, Sweden.
Complete Peer review History: http://www.sdiarticle3.com/review-history/47550

Original Research Article

Received 25 October 2018
Accepted 11 February 2019
Published 15 February 2019

ABSTRACT

Aim: To assess regional disparity in the screen time and physical activity pattern of school children (11-17 years) from Punjab (India).
Study Design: A school-based cross sectional survey.
Place and Duration of Study: Government schools of three regions of Punjab, namely, Majha, Doaba and Malwa region, between June to December 2015.
Methodology: A survey was conducted including 1050 children, randomly selected from government schools of three regions of Punjab, namely, Majha (n=210), Doaba (n=210) and Malwa (n=630), to obtain information on their physical activity pattern (school sports, leisure time physical activity/LTPA and mode of commuting to school) and screen time.
Results: Malwa region children were spending more time (7.2 h/wk) in school sports than Majha (6.3 h/wk) and Doaba region (6.6 h/wk) children. Majha region children were spending more time (6.0 h/wk) in LTPA than Doaba (3.5 h/wk) and Malwa region (5.4 h/wk) children; whereas, Doaba (11.7 h/wk) region children had higher screen time than Majha (8.9 h/wk) and Malwa region (9.2 h/wk) children. Significant ($P \leq 0.01$) regional disparity was noted in the mean time spent by school

**Corresponding author: E-mail: greenmona29@gmail.com;*

children in LTPA and screen activities; whereas, no regional difference was found in the mean time spent in school sports. The percentage of active commuters was more from Doaba region (96%) as compared to Majha (89%) and Malwa (88%) region. Most (85, 85 and 72%) of the children from Majha, Doaba and Malwa region had low screen time, respectively.
Conclusion: Based on AAP and WHO levels, irrespective of region, school children studied had adequate physical activity level, low screen time and were mostly active commuters.

Keywords: LTPA; physical activity; Punjab; school children; screen time; sedentary behaviour.

1. INTRODUCTION

Physical activity pattern of school children should be considered simultaneously in the assessment of nutritional status [1]. According to American Academy of Pediatrics (AAP) [2] and WHO [3], children (5-17 years) should not spend more than 2 hours/day on screen activities, as it is considered high screen time; and should have at least one hour of moderate to vigorous physical activity (MVPA)/day. Leisure-time physical activity (LTPA) refers to any physical activity such as exercise, sports or recreation undertaken beyond school, regular work, or transport activities [4]. LTPA level may partly be determined on the basis of personal traits, needs and interests, and partly on external factors, such as environment and availability [5]. Sedentary behaviour includes low energy expenditure activities, usually performed in a sitting or reclining position at school, in the bus, car, at work, talking with friends; and screen activities such as watching television, using computer, among other similar activities, usually referred as screen time [6]. Television viewing is the most frequently surveyed type of sedentary behaviour, representing a major source of inactivity that changes over childhood and adolescence [7]. Active travel refers to commuting by walking or cycling (active commuting); thus using the physical activity of the human being; whereas, commuting by car or public transport is termed as passive commuting. Active transport to school offers children an opportunity to become more active and enjoy regular exercise, while performing a functional journey; whereas, dependence on motorized transport leads to environmental degradation, which has a significant negative impact on public health [8]. Children who walked to school had greater odds of having a smaller waist circumference and higher HDL cholesterol, lower BMI and adiposity, and higher muscular endurance and cardio-respiratory fitness than passive commuters [9,10].

Physical activity and sedentary behaviours are considered distinct constructs with different determinants [11], wherein, an individual can be physically active and still have excessive sedentary behaviour time [6]. Previous studies documented that frequent screen time is related to poor quality of life such as reduced psychological well-being, poor physical health, lower self-esteem, reduced life satisfaction, and poorer cognitive performance [12,13]. Regarding the possible influences of excessive screen time on the physical activity levels of adolescents, the data are still insufficient to confirm the hypothesis that this behaviour substitutes the time spent practicing MVPA [14]. Physical activity transition coupled with increasing sedentary behaviour over time [15], leading to decline in physical activity levels, results in overweight and obesity among children [16]. Family and home-related factors appear to be most influential on the sedentary behaviour and physical activity levels of children and young people [17]. Apart from family, school-based interventions have been found to have significant effects on adolescent's sedentary behaviour and physical activity [18]. Hence, schools could become the central element in a community system that ensures that students participate in enough physical activity to develop healthy lifestyles.

The Indian report card on physical activity for children and youth has highlighted that most Indian children spend major part of their day in sedentary pursuits and roughly half of children and youth meet physical activity guidelines [19]. Worldwide also, around 31% of adults and about 80% adolescents (13-15y) do not engage in enough physical activity [20]. Studies on physical activity pattern, and its correlates; and on screen activities among school children in Punjab are almost non-existent. Hence, it becomes imperative to determine these factors among school children.

2. METHODOLOGY

2.1 Study Area

Using a multistage sampling technique, 5 districts; 1 each from Majha (Amritsar) and

Doaba (Jalandhar) regions and 3 districts from Malwa region (Ludhiana, Faridkot and Patiala) of Punjab were selected targeting school-going children. In the next stage of sampling, 2 blocks from each district were selected. The last stage included selecting 2 rural and 1 urban government school from each block selected in order to have a total random sample size of 1050 children in the age group of 11-17 years, representing the school-going children of Punjab state. Out of the total sample, 210 subjects (20% each) were from Majha and Doaba region; whereas, Malwa region comprised of larger proportion of the subjects i.e. 630 (60%). The proportion of subjects from Malwa region was more than other regions, because Malwa region makes up the majority of Punjab state (65.1% of total area and 58.5% of total population) [21]. The summarized sampling design for the selection of the subjects is shown in Fig. 1.

Inclusion criteria consisted of healthy children aged 11-17 years, residing in the study area for a minimum period of 6 months; children enrolled in government schools; and who were able to provide verbal or written consent to participate in the study. Exclusion criteria comprised of children with significant medical conditions (e.g., asthma, comorbidities); who were unwilling to participate in the study; and age outside of study limits.

2.2 Data Collection Tools and Methods

A well-structured questionnaire was formulated and pre-tested to ensure the validity of the questionnaire. On the basis of information collected and difficulties faced, necessary modifications were incorporated into the final questionnaire. A survey was conducted using a questionnaire based interview to obtain information on socio-economic characteristics and physical activity pattern of school children (Appendix I).

2.3 Socio-economic Characteristics

Information regarding age (11-12, 13-15 and 16-17 y); gender (girls and boys); caste (general, scheduled caste/SC, and backward caste/BC); religion (Sikh, Hindu and Others-Muslim, Christian, Jain) of the subjects; and parent's occupation (farming, business, service, labour, self-employed, non-working); education (no education, up to matriculation (matric) and above matric); and monthly income (Rs. ≤ 5000, 5001-10000, 10,001-20,000 and > 20,000) was recorded.

2.4 Physical Activity Pattern

Information regarding the type and frequency of participation in school sports during school days was recorded. Self-reported LTPA was defined from a question on weekly hours of out-of-school sports, walking/running/jogging and household chores. Based on usual transport mode to and from school, subjects were classified as active (walking or cycling) and passive commuters (scooter/auto/bus/rickshaw). Screen time was measured from time spent watching television, using a computer and playing video games.

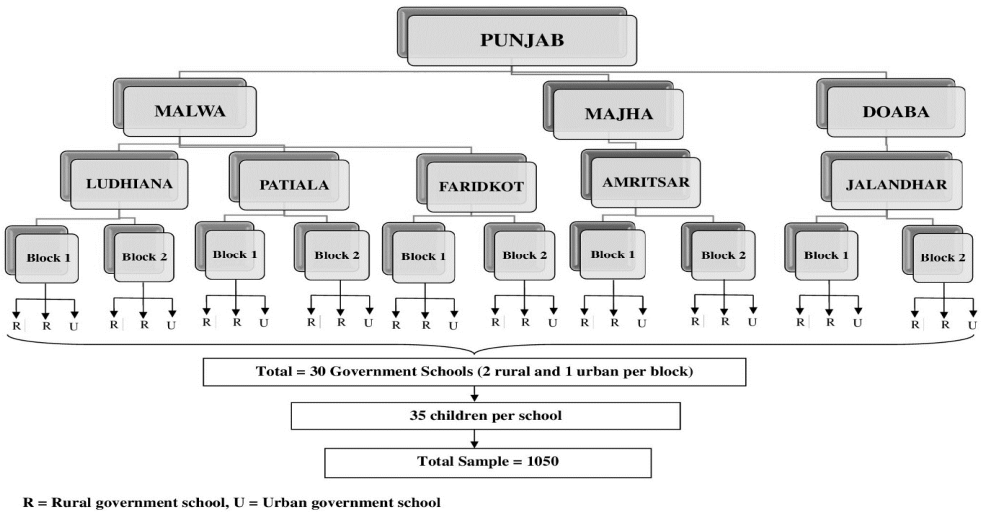

Fig. 1. Sampling design for the selection of school children from Punjab

Time spent was self-reported by the participants and was categorized into low (≤ 2h/day) and high (>2 h/day) screen time. The weighted average time spent on physical activities and screen activities was calculated from that reported on a typical day. The recommended screen time level of not more than 2 hours per day as recommended by AAP [2] and at least one hour of physical activity per day as suggested by WHO [3] was used for comparison in the study.

2.5 Statistical Analysis

The completed questionnaire was serially coded and tabulated for statistical analysis. The mean, standard deviation (SD) and percentages were calculated using SPSS Windows version 23.0 (SPSS Inc., USA). To assess regional disparity in physical activity pattern of school children, Tukey's Post-hoc-test was applied.

3. RESULTS AND DISCUSSION

Table 1 presents socio-economic characteristics of school children from three regions of Punjab.

3.1 Socio-economic Characteristics

Most of the children from Majha (71%) and Malwa (73%) regions were Sikhs; whereas, from Doaba region almost equal proportion of the subjects were Sikhs (49%) and Hindus (43%). Maximum number of children from all the regions belonged to Scheduled Castes (SC); and Doaba region had maximum number of SC subjects (73%). Majority of the children's parents were educated up to matric and very few had above matric education, thus indicating that number of those without any worthwhile schooling was quite substantial. Majha region had the highest and Doaba region had the least proportion of illiterate parents. Labour was the most pursued occupation of the fathers and mothers were mostly housewives. Data on monthly family income showed that from Majha and Doaba region, most (63 and 44%, respectively) of the subjects were belonging to families earning. Rs. 5001-10000; whereas, from Malwa region, majority (43%) of the subject's families were earning ≤ Rs. 5000, which indicated that most of the children studied were from low socio-economic status (SES) households, earning ≤ Rs. 10000/month.

3.2 Physical Activity Pattern

Fig. 2 depicts region-wise participation of school children in school sports and LTPA. Table 2 shows region-wise mean time spent by school children in school sports, LTPA and screen activities.

3.2.1 School sports

About 42, 52 and 51% of the subjects from Majha, Doaba and Malwa region were engaged in school sports, respectively. On an average, subjects from Malwa region (7.2 h/wk) were spending more time in school sports than those from Majha (6.3 h/wk) and Doaba (6.6 h/wk) regions. The results of the study indicated that although children from government schools of Punjab met the 1h/day MVPA recommendation as given by WHO [3]; the percentage of the subjects involved in school sports was low. Participation in sport and recreation is associated with less depression, better academic performance and social interaction, and better mental and social health, among children and adolescents [22]. Most countries around the world reported that less than 40% children take part in recommended levels of physical activity – although the levels vary widely between countries [23]. The global decline in adolescent physical activity is a serious public health issue, which needs to be addressed especially through schools [24].

3.2.2 LTPA

From Majha, Doaba and Malwa region, about 39 vs. 61 vs. 68%; 15 vs. 35 vs. 29%; and 37 vs. 40 vs. 33% of the subjects were involved in out-of-school sports, walking/running/jogging and household chores, respectively. The mean time spent in LTPA by school children from Majha region (6.0 h/wk) was significantly ($P \leq 0.01$) higher than Doaba (3.5 h/wk) and Malwa region subjects (5.4 h/wk). Another study conducted in India by CBSE, reported that only 30% of adolescents played regularly for at least 1 hour a day [25]; whereas, Tiwari et al. [26] observed that majority (45%) of school going adolescents of Allahabad district participated in outdoor games for more than 6 hours/week and only 15% participated in household activity for more than 3 hours/day and 53% participated in household activity for 1-3 hours/day.

Playing outdoor games more than an hour/day reduced the prevalence of overweight and obesity significantly in private school children; whereas raised the underweight prevalence ($\chi 2$ - 36.4, P = 0.0001) in government school children [27]; which is further supported by the findings of study conducted in Mangalore [28]. The results

of the study showed that subjects had adequate physical activity based on WHO [3] recommended limit of at least one hour of physical activity daily. In contrast, the Global School-based Student Health Survey, conducted among school children in 34 countries, indicated that only 24 vs. 15% of boys and girls across the countries met the physical-activity recommendations [29]. Outdoor activities are likely to aid in reducing children's screen time as well as lowers the prevalence of overweight and obesity [30]. A cross-sectional study conducted in Mysore city assessed the nutritional status of government and private primary school children (aged 6-12y) and concluded that private school children belonging to higher SES, follow sedentary lifestyle and have higher risk of becoming overweight/obese as compared to government school children belonging to lower SES who are more prone to under nutrition [27]. Hence, public health awareness directed to enhance physical activity and decrease sedentary lifestyle should focus equally to affluent and underprivileged children.

Table 1. Socio-economic characteristics of school children from three regions of Punjab

Parameter	Category	Majha (n=210)	Doaba (n=210)	Malwa (n=630)
Gender	Girls	119 (57)	130 (62)	364 (58)
	Boys	91 (43)	80 (38)	266 (42)
Religion	Sikh	149 (71)	103 (49)	458 (73)
	Hindu	46 (22)	91 (43)	166 (26)
	Others (Muslim, Christian, Jain)	15 (7)	16 (8)	6 (1)
Caste	General	47 (22)	26 (12)	169 (27)
	SC	111 (53)	152 (73)	323 (51)
	BC	52 (25)	32 (15)	138 (22)
Parent's education				
Mother	No education	100 (48)	41 (19)	242 (38)
	Up to Matric	103 (49)	146 (70)	342 (54)
	Above Matric	7 (3)	23 (11)	46 (7)
Father	No education	61 (29)	27 (13)	176 (28)
	Up to Matric	122 (58)	148 (70)	381 (60)
	Above Matric	27(13)	35 (17)	73 (12)
Parent's occupation				
Mother	Labour	39 (19)	10 (5)	121 (19)
	Housewife/non-working	159 (76)	182 (87)	462 (73)
	Self-employed/service/farming/any other	12 (6)	18 (8)	47 (8)
Father	Farming	23 (11)	14 (7)	99 (16)
	Service	18 (9)	31 (15)	70 (11)
	Labour	109 (52)	110 (52)	327 (52)
	Self-employed/Business	44 (21)	50 (24)	122 (19)
	Non-working/Late/Any Other	16 (7)	5 (2.3)	12 (2)
Family income, Rs.	≤ 5000	16 (8)	80 (39)	267 (43)
	5001-10,000	133 (63)	93 (44)	197 (31)
	10,001-20,000	48 (23)	26 (12)	90 (14)
	> 20,000	13 (6)	11 (5)	76 (12)

Figures in parentheses represent percentages

Table 2. Region-wise mean time spent by school children in school sports, LTPA and screen activities

Activity (Hours/week)	Majha (n=210)	Doaba (n=210)	Malwa (n=630)	F ratio
School sports	6.3 ± 4.8^{a}	6.6 ± 3.7^{a}	7.2 ± 4.2^{a}	2.051^{NS}
LTPA	6.0 ± 6.0^{a}	3.5 ± 2.5^{b}	5.4 ± 4.4^{c}	48.234**
Screen time	8.9 ± 3.8^{a}	11.7 ± 6.2^{b}	9.2 ± 6.2^{a}	16.468**

***Significant at 1%; ^{NS} Non-Significant; Means sharing same superscript are not significantly different from each other; Means sharing different superscript are significantly different from each other (Tukey's HSD)*

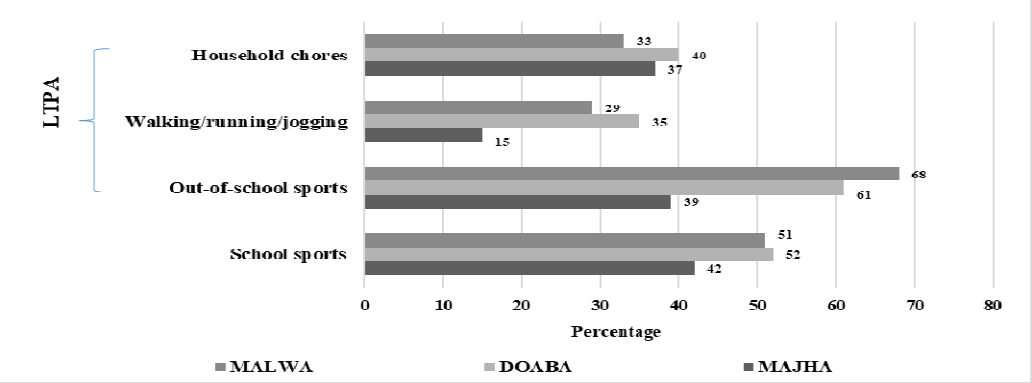

Fig. 2. Region-wise participation of school children, in school sports and LTPA

3.2.3 Mode of commuting to and from school

Region-wise distribution of school children, as active and passive commuters based on the mode of transportation used for school, is depicted in Fig. 3.

The results showed that majority (89, 96 and 88%) of the subjects from Majha, Doaba and Malwa region were active commuters; and rest were passive commuters, respectively. Main reasons observed for higher prevalence of active commuters, during a survey were lack of transportation for school as most of the government schools were located in villages; and the other was greater proximity to school. Distance to school remained the strongest predictor of mode of travel to school; which is consistent with previous research which has shown that greater proximity to school was associated with increased walking to school [31, 32]. Similarly, a study concluded that active commuters had a shorter distance to school than inactive commuters and spent less time in commuting to school. However, the differences in the factors associated with children who actively travel to school compared with their counterparts who are driven to school (passive commuters), are still not fully established. Some parenting practices are expected to be related to school travel mode as the active travel of school children is ultimately arranged by their parents [9].

The results of the study are almost similar to the findings of study among children from 40 elementary schools in Norway, which showed that 86% of the children were active commuters and 16% of the children passively commuted to school [33]. Similarly, a study showed that more than 90% of the subjects from rural South Africa (aged 7–8, 11–12 and 14–15 years) reported walking (active commuters) to and from school [34]. In agreement, WHO coordinated survey carried out in Siauliai region primary schools, involving 17 countries showed that adolescents spend less time in sedentary activities such as watching television and more time walking as a means of transport [35]. Conversely, studies from some western countries showed that most of the children adopted passive mode of travel to school [36-38]. Much lower proportion (72%) of children in Toronto, Canada was reported to walk for school as active commuters, than that observed in the study. It was further demonstrated that walking to school is associated with higher levels of MVPA in comparison to children who are driven to school [39]. Similarly, a study showed that over 62% of children aged 11 to 13 years from 21 schools throughout London, Ontario, walked or biked to school and 72% from school to home [40]; whereas Rosenberg et al. [41] reported that from seven suburban elementary schools of southern California, approximately 36% of boys and 29% of girls were classified as active commuters. Similarly, it has been shown that only 21% of Australian children walked or rode to school; while, about 45% of the UK children were active commuters and 36% reported passively commuting to school [42]. In the Czech Republic, active transport to and from school was opted by approximately 2/3rd (65%) of children aged 11 to 15y [43]. It is expected that changes in mode of transport will be different in countries where cycling is much more common (e.g. Denmark, Germany, and Netherlands) [44].

Household choices regarding opportunities for physical activity, perceived safety from traffic and crime, and school travel mode options are affected by SES and environmental

characteristics. Other factors like type of school, distance to school, road's infrastructures, peer influences, school's intervention programs, and preferences of parents to accompany children to school were significantly perceived as important [45-47].

Travelling using active methods (walking or cycling) may provide a convenient way of increasing physical activity significantly, thus helps to maintain healthy weight and improves cardiovascular health in children and young people [48]. Recognizing and understanding how multiple factors can affect behaviour change toward a more active lifestyle is imperative to plan effective interventions and programs. Considering the importance of physical activity, more research studies on active travel mode among school children are needed so that it can help policy-makers to take decisions regarding education, transport and public health [37].

3.3 Screen Time

Region-wise distribution of school children, based on screen time is presented in Fig. 4.

According to the study findings, majority (85, 85 and 72%) of the subjects from Majha, Doaba and Malwa region had low screen time, respectively. The mean screen time spent by school children from Doaba region (11.7 h/wk) was significantly ($P \leq 0.01$) higher than Majha (8.9 h/wk) and Malwa region (9.2 h/wk) subjects. A Tukey's post-hoc test further revealed that significant ($P \leq 0.01$) difference was found only between Doaba vs. Majha and Doaba vs. Malwa region. The findings of the study showed that children from all the regions met the recommended guidelines of AAP [2]; thus indicating that they were not leading a sedentary lifestyle. In contrast, study done among adolescents aged 14-19 years from Saudi Arabia, reported that only 16% of the boys and less than 11% of girls met the recommended screen time guidelines of 2 hours or less/day [49]. The average screen time of the subjects from all the region was less than that reported among Italian children [50]; whereas, much less time than that reported in the study, was among Hungarian children with an average of 4.7 hours/week, spent on all sedentary activities [51].

More prevalence of low screen time, as reported in the study could be attributed to their low SES as these families could not afford such types of entertainment sources like television, video games. This is partly an explanation why adolescents from higher SES and those who attend private schools are more likely to engage in sedentary activities [52]. Much higher prevalence of high screen time than that observed in the study have been reported in other studies from western countries [53-55]. Kumari et al. [56] showed that >2 hours of screen time/day had 3 times higher risk of becoming obese; whereas the risk of overweight was 7 times higher among those who had screen time ≥ 4 hours/day [28]. Corroborating the findings of other study (57), a longitudinal study showed that children who watched more television during childhood had the greatest increase in body fat over time [57], which was associated with unfavourable body composition, decreased fitness, lowered scores for self-esteem, decreased academic achievement and pro-social behaviour [7].

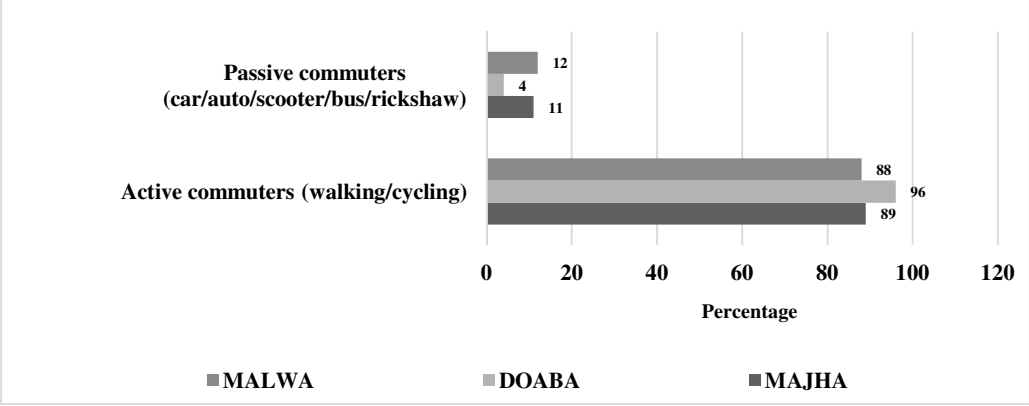

Fig. 3. Region-wise distribution of school children, as active and passive commuters based on the mode of transportation used for school

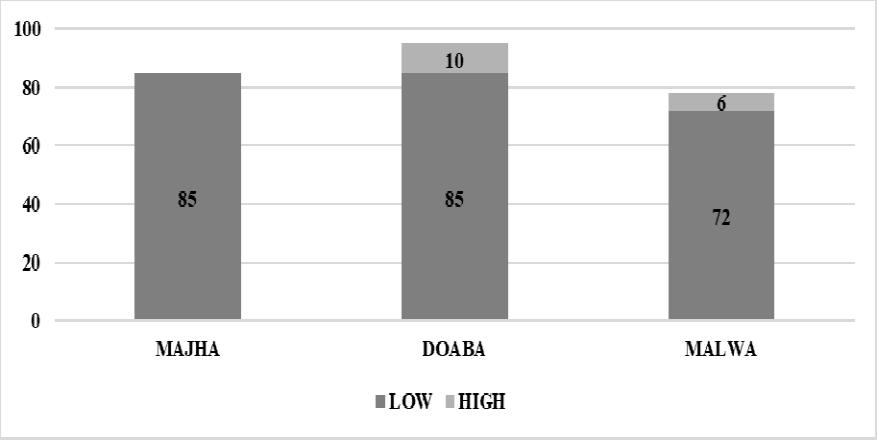

Fig. 4. Region-wise distribution of school children, based on screen time

Sedentary behaviour or lifestyle in childhood or adolescence is known to develop many health problems and diseases often independently of physical activity, that manifest only in adulthood; whereas decreasing any type of sedentary time is associated with lower health risk in children aged 5-17 years. A reduction in sedentary behaviour may be easier than increasing physical activity per se because there are fewer restrictions, and can be easily attained with minimal burden to a person's time or financial resources; however, in order to resolve the problem of inactivity, a sustained change in both sedentary lifestyle and physical activity pattern is required. Moreover, researchers should also recognize that sedentary behaviour is a distinct behaviour related to poor health and therefore, more studies should be focused on exploring the relationship between sedentary behaviour and health indicators [7,28,56,58-61].

4. CONCLUSION

The results showed no regional disparity in the mean time spent by school children in school sports; whereas, significant regional differences were observed in the mean time spent in LTPA and screen activities. Doaba region had the highest percentage of active commuters, followed by Majha and Malwa region. Based on WHO recommendations, irrespective of region, school children had adequate physical activity and met the screen time limit of AAP. Differences across geographic regions and with various methods of measuring physical activity illustrate the complexity of understanding how and where children are physically more or less active. Therefore, further research on regional disparity in physical activity pattern along with measurement of screen activities, is needed to provide useful information for making effective targeted strategies or interventions, including better education or promotion of healthy living [62].

CONSENT

Written consent was taken from the parents through school authorities.

ETHICAL APPROVAL

Institutional ethical committee's approval has been obtained prior to the start of the study. Consent to conduct the survey on the students was also ascertained from the parents through the school authorities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Platat C, Perrin AE, Oujaa M, Wagner A, Haan MC, Schlienger JL, Simon C. Diet and physical activity profiles in French preadolescents. Br J Nutr. 2006;96:501-7.
2. AAP. Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children. Policy Statement. Children, Adolescents, and the Media. American Academy of Pediatrics; 2013.
(Accessed 11 July 2015)
Available:http://pediatrics.aappublications.org/content/pediatrics/132/5/958.full.pdf

3. WHO. Global Strategy on Diet, Physical Activity and Health. Information Sheet: Global Recommendations on Physical Activity for Health 5-17 Years' Old; 2011. (Accessed 5 August 2015) Available:http://www.who.int/dietphysicalactivity/publications/recommendations5_17years/en/
4. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW. Correlates of physical activity: Why are some people physically active and others not? The Lancet. 2012; 380: 258-71.
5. Aaltonen S, Kujala MU, Kaprio J. Factors behind leisure-time physical activity behaviour based on Finnish twin studies: The role of genetic and environmental influences and the role of motives. BioMed Res Int. 2014;931820.
6. Pate RR, O'Neill JR, Lobelo F. The evolving definition of sedentary. Exerc Sport Sci Rev. 2008;36:173-8.
7. Tremblay MS, LeBlanc AG, Kho ME, Saunders TJ, Larouche R, Colley RC, Goldfield G, Connor Gorber S. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. Int J Behav Nutr Phys Act. 2011;8: 98.
8. Mackett RL, Brown B. Transport, physical activity and health: Present knowledge and the way ahead. Centre for Transport Studies. University College London; 2011. (Accessed 15 March 2015) Available:https://www.ucl.ac.uk/news/pdf/transportactivityhealth.pdf
9. Landsberg B, Plachta-Danielzik S, Much D, Johannsen M, Lange D, Muller MJ. Associations between active commuting to school, fat mass and lifestyle factors in adolescents: The Kiel Obesity Prevention Study (KOPS). Eur J Clin Nutr. 2008;62: 739-47.
10. Gropp KM, Pickett W, Janssen I. Multilevel examination of correlates of active transportation to school among youth living within 1 mile of their school. Int J Behav Nutr Phys Act. 2012;9:124.
11. Owen N, Healy GN, Matthews CE, Dunstan DW. Too much sitting: the population-health science of sedentary behavior. Exerc Sport Sci Rev. 2012;38: 105.
12. Okely AD, Salmon J, Vella SA, Cliff D, Timperio A, Tremblay M, Trost S, Shilton T, Hinkley T, Ridgers N, Phillipson L, Hesketh K, Parrish AM, Janssen X, Brown M, Emmel J, Marino N. A Systematic Review to update the Australian Physical Activity Guidelines for Children and Young People. Commonwealth of Australia, Australian Government Department of Health, Canberra; 2013. (Accessed 5 March 2015) Available:http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act guidelines/$file/sr-apagcyp.pdf
13. Hinkley T, Teychenne M, Downing KL, Ball K, Salmon J, Hesketh KD. Early childhood physical activity, sedentary behaviors and psychosocial well-being: A systematic review. Prev Med. 2014;62:182-92.
14. Sisson SB, Broyles ST, Baker BL, Katzmarzyk PT. Screen time, physical activity, and overweight in U.S. youth: National survey of children's health 2003. J Adolesc Health. 2010;47:309-11.
15. Katzmarzyk PT, Mason C. The physical activity transition. J Phys Act Health. 2009;6:269–80.
16. Goyal JP, Kumar N, Parmar I, Shah VB, Patel B. Determinants of Overweight and Obesity in Affluent Adolescent in Surat City, South Gujarat region, India. Indian J Community Med. 2011;36:296-300.
17. Craemer M, Decker E, Bourdeaudhuij I, Vereecken C, Deforche B, Manios Y, Cardon G, ToyBox-study group. Correlates of energy balance-related behaviours in preschool children: A systematic review. Obes Rev. 2012;13:13-2.
18. Lonsdale C, Rosenkranz RR, Peralta LR, Bennie A, Fahey P, Lubans DR. A systematic review and meta-analysis of interventions designed to increase moderate-to-vigorous physical activity in school physical education lessons. Preventive Medicine. 2013;56:152–61.
19. Katapally TR, Goenka S, Bhawra J, Mani S, Krishnaveni GV, Kehoe SH, Lamkang AS, Raj M, McNutt K. Results from India's 2016 report card on physical activity for children and youth. J Phys Act Health. 2016;13(Suppl 2):S176 -82.
20. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U. Global physical activity levels: Surveillance progress, pitfalls and prospects. Lancet. 2012;380: 247-57.
21. Census of India. Ministry of Home Affairs the Registrar General & Census Commissioner. Government of India, New Delhi, India; 2011.

22. Hoare E, Skouteris H, Fuller-Tyszkiewicz M, Millar L, Allender S. Associations between obesogenic risk factors and depression among adolescents: A Systematic Review. Obes Rev. 2014;15: 40-51.
23. Tremblay MS, Gray CE, Akinroye K, Harrington DM, Katzmarzyk PT, Lambert EV, Liukkonen J, Maddison R, Ocansey RT, Onywera VO, Prista A, Reilly JJ, Rodríguez Martínez MP, Sarmiento Duenas OL, Standage M, Tomkinson G. Physical activity of children: A global matrix of grades comparing 15 countries. J Phys Act Health. 2014;11:S113-25.
24. Swaminathan S, Selvam S, Thomas T, Kurpad AV, Vaz M. Longitudinal trends in physical activity patterns in selected urban south Indian school children. IJMR. 2011; 134:174-180.
25. CBSE. Global School Based Health Survey; 2007.
(Accessed 10 April 2015)
Available:http://www.who.int/
chp/gshs/2007_India_CBSE_fact_sheet.pd
f
26. Tiwari HC, Dwivedi S, Bali S, Parveen K. Overweight & obesity and its correlates among school going adolescents of district Allahabad - A cross sectional study. Indian J Prev Soc Med. 2014;45:77-82.
27. Ashok NC, Kavitha HS, Kulkarni PA. comparative study of nutritional status between government and private primary school children of Mysore city. Int J Health Allied Sci. 2014;3:164-9.
28. Kotian MS, Kumar GS, Kotian SS. Prevalence and determinants of overweight and obesity among adolescent school children of South Karnataka, India. Indian J Community Med. 2010;35:176-8.
29. Guthold R, Cowan MJ, Autenrieth CS, Kann L, Riley LM. Physical activity and sedentary behavior among school children: A 34-country comparison. J Pediatr. 2010; 157:43-9.
30. Dadvand P, Villanueva CM, Font-Ribera L, Martinez D, Basagaña X, Belmonte J, Vrijheid M, Grazuleviciene R, Kogevinas M, Nieuwenhuijsen MJ. Risks and benefits of green spaces for children: A cross-sectional study of associations with sedentary behavior, obesity, asthma, and allergy. Environ Health Perspect. 2014; 122:1329-35.
31. Mammen G, Faulkner G, Buliung R, Lay J. Understanding the drive to escort: A cross-sectional analysis examining parental attitudes towards children's school travel and independent mobility. BMC Public Health. 2012;12:862.
32. Su JG, Jerrett M, McConnell R, Berhane K, Dunton G, Shankardass K, Reynolds K, Chang R, Wolch J. Factors influencing whether children walk to school. Health Place. 2013;22:153-61.
33. Ostergaard L, Kolle E, Johannessen JS, Anderssen SA, Andersen LB. Cross sectional analysis of the association between mode of school transportation and physical fitness in children and adolescents. IJBNPA. 2013;10:91.
34. Micklesfield LK, Pedro TM, Kahn K, Kinsman J, Pettifor JM, Tollman S, Norris SA. Physical activity and sedentary behavior among adolescents in rural South Africa: levels, patterns and correlates. BMC Public Health. 2014;14:40.
35. Dregval L, Petrauskiene A. Associations between physical activity of primary school first-graders during leisure time and family socioeconomic status. Medicina (Kaunas). 2009;45:549.
36. Yee-Man Wong B, Faulkner G, Buliung R, Irving H. Mode of shifting in school travel mode: Examining the prevalence and correlates of active school transport in Ontario, Canada. BMC Public Health. 2011;11:618.
37. Larouche R, Chaput JP, Leduc G, Boyer C, Bélanger P, LeBlanc AG, Boyer C, Bélanger P, LeBlanc AG, Borghese MM, Tremblay MS. A cross-sectional examination of socio-demographic and school-level correlates of children's school travel mode in Ottawa, Canada. BMC Pub Health. 2014;14:497.
38. Goon DT. Do South African Children Actively Commute to School? Iran J Public Health. 2016;45:702-4.
39. Faulkner G, Stone M, Buliung R, Wong B, Mitra R. School travel and children's physical activity: a cross-sectional study examining the influence of distance. BMC Public Health. 2013;13:1166.
40. Larsen K, Gilliland J, Hess P, Tucker P, Irwin J, He M. The influence of the physical environment and sociodemographic characteristics on children's mode of travel to and from school. Am J Public Health. 2009;99:520-6.
41. Rosenberg DE, Sallis JF, Conway TL, Cain KL, McKenzie TL. Active transportation to school over 2 years in relation to weight

status and physical activity. Obesity. 2006; 14:1771-6.
42. Australian Bureau of Statistics. Census at School Australia – 2013 National Summary Tables, Australian Bureau of Statistics, Canberra; 2013.
43. Pavelka J, Sigmundova D, Hamřik Z, Kalman M. Active Transport among Czech School-Aged Children. Acta Univ Palacki Olomuc Gymn. 2012;42:17-26.
44. Pucher J, Dill J, Handy S. Infrastructure, programs and policies to increase bicycling: An international review. Prev Med. 2010;50:S106-25.
45. Badri M, Ustadi A, Pierson L, Dramaki M. Mode of travel and the decision to allow children to walk or bike to schools - The Abu Dhabi experience. Open J Prev Med. 2012;2:514-27.
46. Su JG, Jerrett M, McConnell R, Berhane K, Dunton G, Shankardass K, Reynolds K, Chang R, Wolch J. Factors influencing whether children walk to school. Health Place. 2013;22:153-61.
47. Tetali S, Edwards P, Roberts GV. How do children travel to school in urban India? A cross-sectional study of 5,842 children in Hyderabad. BMC Pub Health. 2016;16: 1099.
48. Tudor LC, Ainsworth BE, Popkin BM. Active commuting to school: An overlooked source of childrens' physical activity? Sports Med. 2001;31:309-13.
49. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region. Int J Behav Nutr Phys Act. 2011; 8:140.
50. Patriarca A, Di Giuseppe G, Albano L, Marinelli P, Angelillo IF. Use of television, videogames, and computer among children and adolescents in Italy. BMC Public Health. 2009;9:139.
51. Hamar P, Biddle S, Soos I, Takacs B, Huszar A. The prevalence of sedentary behaviours and physical activity in Hungarian youth. Eur J Public Health. 2010;20:85-90.
52. Singh AK, Maheshwari A, Sharma N, Anand K. Lifestyle associated risk factors in adolescents. Indian J Pediatr. 2006;73: 901-6.
53. Cui Z, Hardy LL, Dibley MJ, Bauman A. Temporal trends and recent correlates in sedentary behaviours in Chinese children. Int J Behav Nutr Phys Act. 2011;8:93.
54. Loucaides CA, Jago R, Theophanous M. Physical activity and sedentary behaviours in Greek-Cypriot children and adolescents: A cross-sectional study. Int J Behav Nutr Phys Act. 2011;8:90.
55. Rezali FW, Chin YS, Yusof MBN. Obesity-related behaviors of Malaysian adolescents: a sample from Kajang district of Selangor state. Nutr Res Pract. 2012;6: 458-65.
56. Kumari RM, Roopasingam T, Wickramasighe VP. Nutritional and behavioral determinants of adolescent obesity: a case–control study in Sri Lanka. BMC Pub Health. 2014;14:1291.
57. Proctor M, Moore L, Gao D, Cupples L, Bradlee M, Hood M, Ellison R. Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. Int J Obes. 2003;27:827-33.
58. Khan MS, Jehan S, Akram M, Zaib M, Lathif Z, Hussian F, Naeem M. Prevalence of Intestinal Protozoan & Worms Infestation in Primary School going Children 0f 5-10 years of age, in District Bannu. Ann Pak Inst Med Sci. 2012;8: 243-8.
59. Chinapaw MJ, Proper KI, Brug J, Van Mechelen W, Singh AS. Relationship between young peoples' sedentary behaviour and biomedical health indicators: A systematic review of prospective studies. Obes Rev. 2011;12: e621-e32.
60. Grontved A, Hu FB. Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality: A meta-analysis. JAMA. 2011;305:2448-555.
61. Proper KI, Singh AS, Van Mechelen W, Chinapaw MJ. Sedentary behaviors and health outcomes among adults: A systematic review of prospective studies. Am J Prev Med. 2011;40:174-82.
62. Husarova D, Veselska ZD, Sigmundova D, Geckova AM. Age and gender differences in prevalence of screen based behaviour, physical activity and health complaints among Slovak school-aged children. Cent Eur J Public Health. 2015;23.

APPENDIX– I

INTERVIEW SCHEDULE

1. General Information

- Name of the respondent: _____
- Age: _____
- Gender: Male/ Female
- Region: _____
- District: _____
- Block: _____
- Village: _____

2. Socio-economic profile

- **Caste:** Hindu / Sikh / Others (Muslim / Christian /Jain)
- **Religion:** General / SC / BC

Relationship with respondent	Education	Occupation	Monthly income (Rs.)
	1) No education 2) Up to matric 3) Above matric	1) Farming 2) Business 3) Service (Govt. or private) 4) Labour 5) Self-employed 6) Housewife 7) Any other/non-working	1) ≤ 5000 2) 5001-10000 3) 10001-20000 4) > 20000
Mother			
Father			

3. Physical Activity Participation

What physical activities do you participate in? (Tick all that apply)	Yes	No	In a typical week, on how many days do you do any kind of physical activity / exercise?		
			Days	Time	
				Hours	Minutes
a) School Sports					
b) LTPA • Out-of-School Sports • Walking / Jogging /Running • Household chores					
Please specify if any other					

4. Mode of transportation for school

- Active commuting: Walking/ Cycling
- Passive commuting: School bus / Car / Auto / Scooter / Rickshaw

5. Screen Time

How much time do you usually spend sitting or reclining on a typical day? (watching television, using a computer, playing video games)?

- Low: ≤ 2 hours
- High: > 2 hours

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/47550