

Assessment of the Role of Electronic Media in Affecting the Cardiopulmonary Fitness, Physical Fitness, Obesity, & Psychosocial Well Being in School Going Children-An Observational Study

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Abstract

Background: Available evidence suggests the role of electronic media watching time on endurance, physical & mental health of the children. Such sedentary activities can lead to pathway for cardiopulmonary & metabolic diseases. Thus, this observational study was undertaken to assess the role of electronic media in affecting the cardiopulmonary fitness, physical fitness, obesity, & psychosocial wellbeing in school going children.

Material & Method: This study recruited 532 healthy school going children (age range of 9 – 15 yrs) for a period of four months from September to December 2021. Children suffering from any respiratory conditions (asthma, tuberculosis, etc.), cardiac conditions (congenital heart diseases), neurological deficit (poliomyelitis, etc.), or musculoskeletal disorders (muscular pain, fractures, or any other related conditions) were excluded from the study. The parameters assessed were body mass index, waist to hip ratio, VO₂ max, electronic media watching time per day using a questionnaire.

Results: The average age was 12.03 yrs. Average BMI was 16.24 ± 4.35 kg/m²(males) and 17.56 ± 3.67 kg/m² (females); Average WHR was 66.43 ± 0.63 ; Average VO₂ max was 36.34 ml/kg/min; Average EMT was 120 min/day (range 60 – 200min). A positive linear relationship between EMT and BMI ($r = 0.68$) and between EMT & WHR ($r=0.34$) was observed. Thus, as EMT increases the BMI & WHR of students also increases. No statistically significant difference between EMT of boys and girls were observed ($p<0.05$). A negative linear relationship between EMT & cardiopulmonary fitness (VO₂ max) ($r= -0.79$) Thus as EMT increases cardiorespiratory fitness reduces. There is a statistically significant decrease in physical activity with increase in the EMT($p<0.05$).

Conclusion: The study concludes that there is a significant negative impact of increased electronic media watching time on school going children which increases the chances of obesity, reduces the level of cardiorespiratory fitness by reduction in the levels of physical activity & altered psychosocial wellbeing.

Keywords: Electronic media, Cardiopulmonary fitness, Physical activity, Obesity, Psychosocial wellbeing, Children

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Background

In the present times, electronic media (EM) has become a part & parcel of life due to the innovations in technology. Excessive use of electronic devices eg television, computer, video games, mobile phones leads to sedentary behavior. Not only adults but children also supposedly are becoming addicted to the electronic media which is negatively affecting their health [1]. Increased visceral fat is associated with an increased risk of several chronic diseases. Recent studies indicate an increased obesity in children in developed countries with a markedly hike in developing countries [2]. In India, prevalence of obesity ranges between 3.6% and 11.7% [3].

Rapid urbanization has led to change in lifestyle, diet, limited outdoor activity, crunch of open play spaces & increased use of EM by children are some of the various contributing factors that take a toll on the health of the children. This can add on the existing & future burden of debilitating diseases in the world [4].

Long sitting hours of children playing video games watching television play a significant role in developing obesity. Due to which children devote few hours per week in physical activity significantly lowering their cardiopulmonary fitness & physical fitness [5]. Roberts DF 2008 associated sedentary behavior & adiposity to increased energy intake, lower basal metabolic rate & less physical activity [4]. Ortega FB 2007 showed lower levels of physical activity to be associated to decreased cardiopulmonary fitness. Increased public health surveillance & improved cardiopulmonary fitness can mitigate the health effects of obesity on children.⁵ The American Academy of Pediatrics 2016 issued guidelines for limiting the electronic media time for 2-5yrs old to one hour per day of quality programmes [6]. The Canadian Paediatric Society also recommended similar guidelines in 2017 [7].

In a meta-analysis by Tremblay *et al* on 5-17yrs old kids, a positive association between EMT and obesity; EMT and higher cholesterol and blood pressure, haemoglobin A1c and insulin sensitivity were noted. Researchers found a inverse relation between EMT and confidence & self-esteem with more than 2 hours per day EMT associated with lower cardiopulmonary fitness [8].

Fewer studies have been undertaken till now assessing the association of electronic media with fitness of children. There is a growing trend towards lowered cardiopulmonary fitness, physical fitness, obesity & psychosocial wellbeing in the children. The ability of the children to intermingle in society is hampered, thus cognitive & behavior developmental modulations are affected. Altered psychosocial wellbeing can lead to mental illness & depression [9].

Thus, this observational study was undertaken to assess the role of electronic media in affecting the cardiopulmonary fitness, physical fitness, obesity, & psychosocial wellbeing in school going children.

Material & Methods

This study was conducted on 532 healthy school going children in Jaipur, Rajasthan (age range of 9 – 15 yrs) for a period of four months from September to December 2021.

Children suffering from any respiratory conditions (asthma, tuberculosis, etc.), cardiac conditions (congenital heart diseases), neurological deficit (poliomyelitis, etc.), or musculoskeletal disorders (muscular pain, fractures, or any other related conditions) were excluded from the study. After proper institutional ethical approval was undertaken. The procedure was explained to the children. A prior written consent was sought from parents. A questionnaire was handed out

which was either filled by parents or children.

Parameters Assessed

1. Body mass index – calculated as $\text{weight(kg)} / (\text{height(m)})^2$
2. Waist to hip ratio
3. VO₂ max – maximal oxygen uptake by an individual during intense exercise
4. Electronic media time (EMT) – time spent using electronic media (television, mobile phone, video games, computer /tablet) using a questionnaire
5. Psychosocial wellbeing – assessment done by health promoting behavior scale addressed in the Questionnaire [1].

To assess the cardiopulmonary fitness VO₂ max was calculated by undergoing a 20 m multistage fitness test (MSFT). It is also called as a beep test or PACER test [11]. Children were made to run 20 m & take the maximum number of laps as possible. The total number of laps taken by child were noted. VO₂ max was then calculated as (maximum speed attained in km/h × 6.55-35.8).

Measuring tape was used to measure waist

(at the midpoint between the iliac crest and the rib cage) and hip circumference. BMI & Waist to hip ratio were calculated.

The role of electronic media was assessed by the time spent on it every day using a questionnaire.

This Questionnaire consisted of four parts i.e demographic data, time duration of electronic media use (<2hrs/day, 2-3hrs/day,3-5hrs/day), time duration of physical activity (30 min,30-60min,60-90min,>90min), health promoting behavior scale (Life appreciation, health responsibility, social support, stress management, nutrition). The behaviours were recorded as never, rarely, sometimes, usually & always. Scoring was done from 1 to 5.

Statistical analysis

All the data was tabulated & put in excel sheet. The statistical analysis was done using SPSS software to generate tables. Coefficient of correlation was used to find the correlation between the variables.

Results

A total of 532 school going children (296 males and 236 females) were randomly recruited in the study.

Table 1

| Parameters | Mean Values |
|--|--|
| Average age | 12.03 yrs |
| Average BMI | 16.24 ± 4.35 kg/m ² (males) 17.56 ± 3.67 kg/m ² (females) |
| Average WHR | 66.43 ± 0.63 |
| Average VO ₂ max | 36.34 ml/kg/min. |
| Average EMT | 120 min/day (Range 60 – 200min) |
| Average duration of physical activity | 45 min |
| Average Scoring of psychosocial wellbeing (max -5) | 2.48 ± 1.35 |

A positive linear relationship between EMT and BMI ($r = 0.68$) and between EMT & WHR ($r=0.34$) was observed. Thus as EMT increases the BMI & WHR of students also increases.

No statistically significant difference between EMT of boys and girls were observed ($p<0.05$).

A negative linear relationship between EMT & cardiopulmonary fitness (VO₂ max) ($r = -0.79$) Thus as EMT increases cardiorespiratory fitness reduces.

There is a statistically significant decrease in physical activity with increase in the EMT($p < 0.05$). (Graph 1)

The study observed increased EMT was associated with decreased adaptation of positive behaviour in life appreciation health responsibility, social support, exercise and overall stress management which was statistically significant ($p < 0.05$).

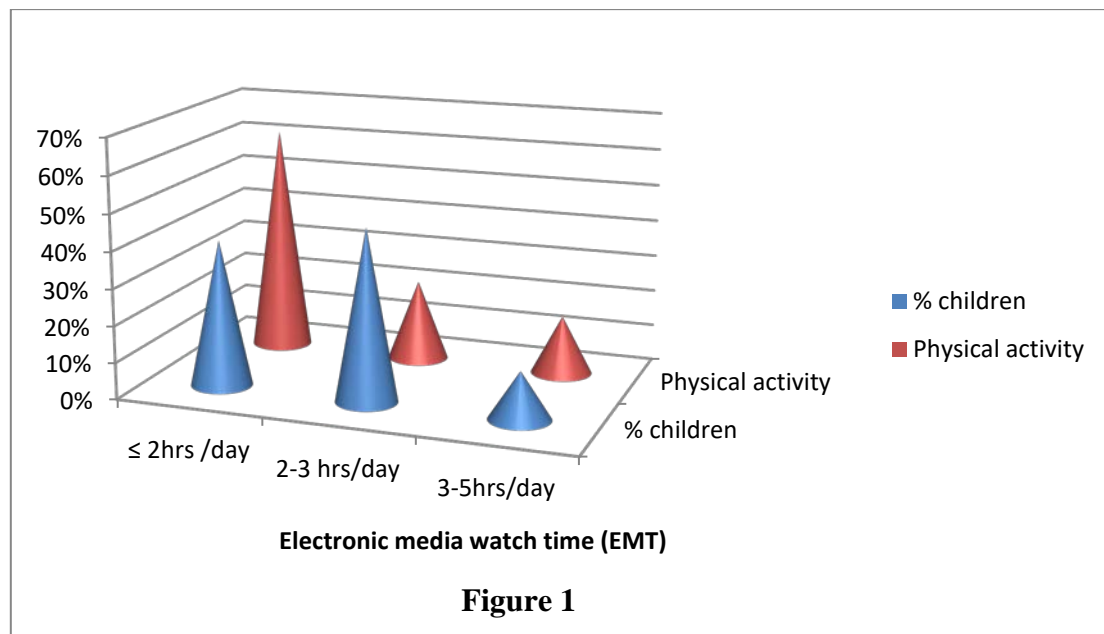


Figure 1

Discussion

The present observational study was conducted to correlate the time spent by school going children in using electronic media with cardiopulmonary fitness, physical fitness, obesity and psychosocial wellbeing. Children from both Government & private schools were included in the study in the age range 10-15 yrs.

In the present study the average BMI was 16.24 ± 4.35 kg/m² in males & 17.56 ± 3.67 kg/m² in females. A positive linear relationship between EMT and BMI ($r = 0.68$) and between EMT & WHR ($r = 0.34$) was observed. Thus as the EMT increases the BMI & WHR of students also increases. Kar SS 2015 has stated normal EMT for children to be 60 per day. The children with increased EMT were exposed to advertisements promoting ready to make fatty foods. This results in increased intake of foods rich in fats & hydrogenated oils by the children leading to high BMI & WHR [12]. This is in

accordance with the study done by Ray M 2010 [13]. Shields M 2008 stated increased television time is inversely proportion to fruits & vegetable intake combined with less physical activity leads to lowered metabolic rate & increased central obesity [14]. The fat content of commercially advertised products (candy, presweetened cereals) exceed the nutritional recommendations by Govt health bodies [15].

Sedentary habits combined with high EMT can lead to persistence of obesity in adolescents too. This can be explained as longer sitting hours cause intracellular pressure changes inside fat cells. The lipid droplets show an exaggerated growth, fat deposition increases under chronic pressure & loading. The cells become stiffer with time & expansion causes deformity in adjacent cells & forcing them for further expansion [16].

This is a possible explanation for increased waist circumference as fat accumulation is

enhanced around abdomen [17]. The increased screen time is also directly proportional to high cholesterol levels in kids. Also in contrast, it can encourage girls in teens to simulate slim & thin models & actresses which can lead to deficiency of iron, vitamins & other vital minerals [18].

In the present study, a negative linear relationship between EMT & cardiopulmonary fitness (VO_2 max) ($r = -0.79$) was observed. This shows that as EMT increases cardiopulmonary fitness reduces. Sedentary lifestyle, Increased use of motorized vehicles, decreased walking /taking lift instead of climbing stairs are some of contributing factors of decreased cardiopulmonary fitness. In the long run, development of hypertension, hyperlipidaemia, elevated blood glucose levels & cardiorespiratory illness may be found to be more common in obese children [19]. The finding is in accordance with study done by Sharayu Agre 2019 who conducted study on 568 school children screen time for students was ranging from 40 min to 190 min and average VO_2 max was 35.83 ml/kg/min. Similar negative linear relationship was observed with WHR and VO_2 max concluding as screen time increases, endurance & physical fitness along with risk for cardiopulmonary illness increases.

In a metaanalysis by van Ekris *et al* 11 on less than 18 years olds a positive correlation between EMT and adiposity noted, negative correlation noted for EMT and cardiopulmonary fitness / VO_2 max, and increased risk of metabolic illnesses [20].

Public health awareness should be created to spread knowledge about health benefits of games & exercises. Physical activity increases the metabolic rate by affecting metabolic processes in the body like oxidation of fat & elevation of levels of fat metabolizing enzymes, lower glycogen levels, improved glucose tolerance. Also, alveolar ventilation is enhanced with

improved uptake of oxygen & diffusion of carbon dioxide across alveolar capillaries [21]. Thus, increased periods of inactivity can make an individual susceptible to diabetes [22]. Lobelo noted statistically significant association between cardiopulmonary fitness quintiles and the mean cardiovascular risk score among obese males, then females [23]. Few studies have shown opposing & inconsistent results. Ekelund U 2012 noted long periods of inactivity to be unrelated to cardiometabolic risk factors where moderate to vigorous activity is taken into account [24].

The study observed increased EMT was associated with decreased adaptation of positive behavior in life appreciation health responsibility, social support, exercise and overall stress management which was statistically significant ($p < 0.05$). Increased screen time was observed as to be negatively associated with behaviours like feel interest in life, facing challenges, positive attitude, sharing feelings with others, discussions, smiling, laughing, sleeping 6-8 hrs /day, taking balanced diet etc. This is in accordance with other authors with similar findings.

Children watching television more than 120 min per day consider it to be a real world. Watching violent programmes have been observed as a violent behavior in children & may encourage for irresponsible social behavior. Studies have claimed aggressive behavior in boys owing to increased screen time [25]. Also, it hampers the learning ability & academic performance. Viewing television reduced the time for activities like reading, writing, talking with peers, spending time with family, storytelling & thus development of Vital activities like physical, mental and social skills is reduced [26]. Few video games might help in the development of fine motor skills & coordination, but negative impacts far outweigh their benefits.

Another grave problem associated is the school children exposed to more electronic media time do have attention deficit problems & failure to concentrate in studies. Christakis, 2004 conducted a study & found children who spent more than 3 hrs per day face more attention deficit problems at 7 yrs age [27].

Hoare *et al* associated anxiety with increased screen time and limited evidence for depressiveness. There was a strong relationship with depressive symptoms & screen time with reference to some longitudinal & cross-sectional studies. A positive association observed with depression in children in 3/3 studies [28].

Conclusion

Thus, the present study concludes that there is a significant effect of electronic media watching time on school going children which increases the chances of obesity, reduces the level of cardiorespiratory fitness by reduction in the levels of physical activity & altered psychosocial wellbeing. This is critical information as risk of debilitating diseases at this stage can be averted by changes in the lifestyle & focusing on the growing needs of children and adolescents taking into consideration the newer technological innovations. Mass education programmes should be implemented to educate the parents, adolescents & children in regard to negative physical & mental health hazards. Binge eating while watching television should be strictly prohibited as it may lead to overeating & consumption of nutrient less foods which may lead to adiposity. Aggressive video games should be avoided since they affect the mental behaviour of children & hamper the psychosocial wellbeing.

References

1. Snijder MB, Van Dam RM, Visser M *et al*. What aspects of body fat are particularly

hazardous and how do we measure them? *Int J Epidemiol* 2006; 35(1):83–92.

2. Monteiro CA, Conde WL, Lu B *et al*. Obesity and inequities in health in the developing world. *Int J Obes Relat Metab Disord* 2004; 28(9):1181–1186.
3. Gupta N, Goel K, Shah P, Mishra A. Childhood obesity in developing countries: Epidemiology, determinants & prevention. *Endocrine reviews*.2012;33(1):48-70.
4. Roberts DF, Foehr UG. Trends in media use. *Future Child* 2008; 18(1):11–37.
5. Ortega FB, Tresaco B, Ruiz JR *et al*. Cardiorespiratory fitness and sedentary activities are associated with adiposity in adolescents. *Obesity (Silver Spring)* 2007;15(6):1589–1599.
6. Reid Chassiakos YL, Radesky J, Christakis D, *et al*. Children and adolescents and digital media. *Pediatrics* 2016;138: e20162593.
7. Canadian Paediatric Society DHTFOO. Screen time and young children: Promoting health and development in a digital world. *Paediatr Child Health* 2017; 22:461.77.
8. Tremblay MS, LeBlanc AG, Kho ME, *et al*. Systematic review of sedentary behaviour and health indicators in school-aged children and youth. *Int J Behav Nutr Phys Act* 2011; 8:98.
9. Agre S, Agrawal R, Alirajpurwala A. Screen time evaluation, association with obesity, and cardiorespiratory fitness among children aged 10–12 years. *Indian J Child Health*. 2019; 6(7):361-364.
10. Chen, Mei-Yen, Liou, Yiing-Mei, Wu, Jen-Yee .The Relationship Between TV/Computer Time and Adolescents' Health-Promoting Behavior-A Secondary Data Analysis . *Journal of Nursing Research* 2008 ;16 (1): 75-85
11. Tim Takken, Bart C. Bongers, Marco van Brussel, Eero A. Haapala and Erik H. J. Hulzebos. Cardiopulmonary

- Exercise Testing in Pediatrics Ann Am Thorac Soc .2017; 14(1):123–128
12. Kar SS, Kar SS. Prevention of childhood obesity in India: Way forward. J Nat Sci Biol Med 2015; 6:12-7.
 13. Ray M, Jat KR. Effect of electronic media on children. Indian Pediatr 2010; 47:561-8.
 14. Shields M, Tremblay MS, Laviolette M, Craig CL, Janssen I, Connor Gorber S: Fitness of Canadian adults: results from the 2007-2009 Canadian Health Measures Survey. In Health Rep. Statistics Canada, Catalogue no.82-003-XPE; 2010;21(1).
 15. Holloway D, Green L, Livingstone S. Zero to Eight. Young Children and Internet Use. London: London School of Economics; 2013. p. 4-7.
 16. Huang TT, Johnson MS, Figueroa-Colon R, Dwyer JH, Goran MI. Growth of visceral fat, subcutaneous abdominal fat, and total body fat in children. Obes Res 2001; 9:283-9.
 17. WHO. Waist Circumference and Waist Hip Ratio. Geneva: WHO; 2008.
 18. Dietz WH Jr, Gortmaker SL. Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. Pediatrics 1985; 75:807-12.
 19. Kisner C, Colby L. Principles of Aerobic Exercise. Therapeutic Exercise. Philadelphia, PA. 5th ed. 2007. p. 241-3.
 20. van Ekris E, Altenburg TM, Singh AS, *et al.* An evidence-update on the prospective relationship between childhood sedentary behavior and biomedical health indicators: a systematic review and metaanalysis. Obes Rev 2016;17:833-49.
 21. Boynton-Jarrett R, Thomas TN, Peterson KE, Wiecha J, Sobol AM, Gortmaker SL, *et al.* Impact of television viewing patterns on fruit and vegetable consumption among adolescents. Pediatrics 2003; 112:1321-6.
 22. Reading K, Carr D. Obesity and Overweight in Oxford County Preschoolers. Woodstock, ON: Oxford County; 2011. p. 3-4, 8-11.
 23. Lobelo F, Pate RR, Dowda M *et al.* Cardiorespiratory fitness and clustered cardiovascular disease risk in U.S. adolescents. J Adolesc Health 2010; 47(4):352–359.
 24. Ekelund U, Luan J, Sherar LB *et al.* Moderate to vigorous physical activity and sedentary time and cardiometabolic risk factors in children and adolescents. JAMA 2012; 7(7):704–712.
 25. Huston AC, Donnerstein E, Fairchild H, *et al.* Big World, Small Screen: The Role of Television in American Society. Lincoln: University of Nebraska Press, 1992.
 26. Canadian Paediatric Society, Healthy Active Living for Children and Youth Advisory Committee. Healthy active living for children and youth. Paediatr Child Health 2002; 7:339-45.
 27. Christakis DA, Zimmerman FJ, Di Giuseppe DL, McCarthy CA. Early television exposure and subsequent attentional problems in children. Pediatrics 2004; 113: 708-713.
 28. Hoare E, Milton K, Foster C, *et al.* The associations between sedentary behaviour and mental health among adolescents: a systematic review. Int J Behav Nutr Phys Act 2016; 13:108.