Physical Activity in Children and Adolescents with Disabilities- a cross sectional study

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Abstract: Purpose: The emphasis on quantifying physical activity (PA) objectively in terms of step count with accelerometers or pedometers is established worldwide in normal as well as special populations. Limited studies have reported these data in Indian population and none have measured PA using objective measures in children with special needs. Thus, this study aims to describe PA in terms of steps count in children and adolescents with disabilities in our population. Participants: In this cross-sectional study, 40 children (mean age 11.66 years) with GMFCS levels I to III with physical and intellectual disability were recruited through convenient sampling. Uncooperative children or those with degenerative conditions or those who had undergone any surgeries which could limit locomotion were excluded. Method: The children were given ActivPAL (accelerometer) to be worn on the thigh for a period of 7 days. Data obtained from the ActivPAL was tallied with the parental record and valid data which included atleast 3 days of wear time consisting of 10 hours/day was included in the data analysis.29 valid data were considered for analysis Analysis: Wear time, valid days, step counts, percentage of recommended activity were summarized using descriptive statistics. The effect of gender, age and diagnostic category on step count were analyzed using nonparametric tests. Results: Based on an average wear time of 13 hours over 5 days, the Median value for step count was 5175 (weekday -5248, weekend - 5369) which is about 50% of the recommended step count for the age group. We did not find any significant influence of age, gender or diagnostic category on PA levels. Conclusion: Physical activity levels of children and adolescents with disabilities are significantly less than recommended levels inspite of their ability to ambulate with minimal or no assistance. Implications: Therapy for children and adolescents with special needs should target enhancement of physical activity for health promotion.

Index Terms: Physical activity, accelerometer, steps count, children, adolescents (Key Words)

INTRODUCTION

Physical activity promotion (PA) as well as minimizing sedentary behavior (SB) is being recognized worldwide for preventing lifestyle related diseases and for health promotion. Guidelines and recommendation for PA and SB have been well established for typically developing children, youth and adults. [1]

Assessment of PA in special populations have been studied and reported in recent times. [2,3] Though PA recommendations promote sixty minutes of moderate to high PA in children with disabilities, it might be very difficult or not feasible for many individuals with disabilities to achieve and sustain these exercise recommendations. This has been attributed to motor impairments, movement limitation, increased levels of fatigue and increased energy demands. [4] In the recent times, assessment of PA has gained much prominence in children with disabilities. Both subjective and objective measures have been used for the measurement of PA and ST in children with cerebral palsy, Autism and intellectual disabilities. [5,6,7] Evidence from studies, mostly from developed Nations, suggests that children with disabilities spend as much as 70% of their day in sedentary postures. [8]

In 2015, the United Nations launched Transforming Our World: The 2030 Agenda for Sustainable Development." Its vision of "no-one left behind," has put a focus on disability inclusion. Disability has been prioritized by the World Health Organization (WHO) to develop policies in PA and sports. The publication of WHO guidelines on physical activity and sedentary behavior for people living with disability reflects the WHO's commitment to inclusive actions, aligned with the 2030 Agenda and expressed in the Global Action Plan on Physical Activity 2018–2030. [9,10]

By creating opportunities for inclusive physical activity participation, better health outcomes can be facilitated among this population. In this context it is very crucial to have data on PA and SB and factors that influence them.

Though diminished PA and enhanced SB among children with disabilities have been reported from developed Nations, limited studies have addressed this concern in Indian population. As the environment and attitudes of parents and people in the Indian society are different from those seen in other countries, the influence of these factors could also influence the PA. [8]

With the body of evidence available on international platform and the lack of awareness and studies in Indian context, there is a strong need to assess PA in the Indian scenario. This information would be vital as a precursor to tackle sedentary behavior in children with disabilities and to take steps to create a healthy and active lifestyle for them. Thus, the aim of this study was to assess and describe PA among children and adolescents with disabilities in India.

METHODS

Ethical clearance was obtained for the study from the institutional ethical committee. Special schools in and around Bengaluru were approached for permission to conduct the study. Following permission from school, parents of children and adolescents with disabilities were approached for permission to participate in the study. Informed written consent was obtained from parents.

In this prospective cross-sectional study, children and adolescents between 5-17 years of age with developmental disabilities (motor/intellectual/social) were recruited through convenience sampling based on the inclusion criteria of ambulatory with or

without support (GMFCS level I to III) and with cognitive and behavior levels sufficient to comprehend and cooperate with measurements. Children with degenerative neurological or musculoskeletal disorders, those who had undergone any surgery in the last six months which could alter mobility and uncooperative or aggressive children were excluded.

The basic demographic details were recorded using a standard pro forma. ActivPAL Tri-axial accelerometer was worn by the children for a period of 7 days. The device was strapped to one thigh midway between the hip and knee. Parents were given an information sheet to address any queries. Parents were also required to note the non-wear time and sleep time and general activity during the day. The device was collected back and data analyzed using ActivPAL software.

ANALYSIS

Data obtained from the ActivPAL was tallied with the parental record and valid data with atleast 3 days of wear time consisting of 10 hours/day was included in the data analysis. [11] Data was entered in Ms excel and analyzed using SPSS version 21. 29 valid records were considered valid for analysis.

Wear time, valid days, step counts, percentage of recommended activity were summarized using descriptive statistics. The data obtained had a wide range of variability and therefore it had to be represented as median and interquartile ranges.

The effect of gender, age and diagnostic category on step count were analyzed using nonparametric tests.

RESULTS

Out of the 29 valid data analyzed, most participants were boys (69%). **Table 1** describes the characteristics of participating children and adolescents. According to diagnosis, participants were classified into three groups i.e. Cerebral Palsy (CP), Intellectual Disability (ID) and Down's Syndrome (DS). Almost an equal percentage of participants had a diagnosis of CP (41.4%) and ID (37.9%), while 20.7% had ID. There were a higher number of adolescents (58.6%) than children (41.4%).

Table 2 represents the average wear time, valid days and median step count for the study population. Median value for step count was 5175 (weekday -5248, weekend - 5369).

Table 3 represents the association of Physical Activity (Step Count) with age, gender and diagnosis. There was no significant difference in step counts between genders, age groups or diagnosis and therefore no significant influence of these variables was noted on PA. Weekdays data showed a greater variation than weekend data. Girls showed higher step count (7035 steps) during weekdays as compared to boys(5141steps). However, there was a reversal of this pattern during weekends and this led to a non-significant difference in the average step count. Children had a higher step count (7035 steps) as compared to adolescents (4902 steps) during weekdays but it dropped during weekend. There was no change noted in the PA for adolescents during weekdays and weekend. In relation to diagnostic criteria, children with DS had higher PA levels(6305 steps) than those with CP (4313 steps) and ID (5425 steps). However, during weekends, the PA levels dropped for participants with DS and CP but remained constant for those with ID.

Table 1 Demographic characteristics of the participants

Demographics	**Sub categories**	**Number of participants**	**Percentage %**
Gender	Boys	20	69
	Girls	9	31
Age	Children	12	41.4
	Adolescents	17	58.6
Diagnosis	Cerebral Palsy	12	41.4
	Intellectual Disability	11	37.9
	Down's Syndrome	6	20.7

Table 2 Average time of accelerometer use, valid days and PA levels in step counts

Accelerometer wear time, valid days and step counts	
Mean Wear Time (Hours)	13.3±2.9
Mean Valid Days	4.9±1.2
Median Steps/ Day (IQR)	5175 (3081, 6433)

Table3 Comparison of step counts based on gender, age and diagnosis (N=29)

		Median (IQ 25, 75) Step Counts			**Between Group Difference**
Variables	**Subcategory(N)**	**Weekday**	**Weekend**	**Total**	
Gender	Boys (20)	5141 (3525, 7163)	5447 (2525, 7168)	5017 (3294, 6104)	* Not significant
	Girls(9)	7035 (2646, 8594)	3732 (953, 6779)	6561 (2381, 8254)	
Age	Children(12)	7035 (2797, 7496)	5895 (2637, 7342)	6048 (3389, 7370)	* Not significant

	Adolescents(17)	4902 (3501, 6719)	5098 (2465, 6162)	4593 (3081, 6134)	
Diagnosis	Cerebral Palsy(12)	4313 (2613, 6958)	5670 (2021, 7473)	3992 (3992, 6774)	
	Intellectual Disability (11)	5425 (4409, 8045)	5895 (3903, 6951)	5175 (4542, 7496)	* *Not significant
	Down's Syndrome(6)	6305 (2721, 7353)	3425 (2151, 5455)	5993 (2557, 6369)	

*Mann-Whitney test; **Kruskal Wallis test (Level of significance set at $p < 0.05$)

DISCUSSION

This study was part of a larger study aimed at assessing sedentary time and its correlates in children and adolescents with disabilities. This is one of the first studies to objectively report PA levels in special pediatric populations from India.

There were many challenges faced during data collection. Many children did not cooperate with wearing the accelerometer for the planned 7 days of recording. Many parents did not keep a record of the wear time and sleep time. Due to these reasons, many records were invalid for analysis.

The primary objective of the study was to report PA levels among children and adolescents with disabilities. ActivPal accelerometer was used to obtain step count as a measure of PA. The data obtained had a wide range of variability and therefore it had to be represented as median and interquartile ranges. The median step count reported in this study was 5175 (weekday -5248, weekend -5369) which is about 50% of the recommended step count (12000 steps) for the age group. Though subgroups of variables showed difference in the weekend and weekday pattern of PA, the overall activity averaged to a mid-range. Previous studies in other Asian populations have reported as low as 70% of the recommended step count in children and adolescents with disabilities. [8,12] There was a higher level of PA noted during weekdays in the present study. As most of the children participating in the study were school going, the weekday activity could be attributed to the physical education and activities they were engaged in during school hours. This is in contrast to a study done by Sit et al who reported lower levels of PA during school hours especially during recess and lunch hours. [2] This indicates that PA activities in Indian schools could be better as compared to other countries. However, school activities were not quantified or recorded in this study and therefore this could not be analyzed. Similarly, weekend inactivity could be attributed to sedentary time at home but again this was not recorded separately. Activities in school and at home during weekdays and weekends require further investigation.

This study also aimed to analyze any variability in the PA in relation to Age, gender and type of disability. Studies in other populations reported variation in PA in relation to age, sex and type of disability. In the present study, girls, children and participants with DS showed better PA during weekdays, but the weekend activity was similar for all subgroups. This resulted in a nonsignificant change in the total PA.According to the International Classification of Function (ICF) an individual's functional ability is influenced by body impairments as well as by environmental and contextual factors. Thus, the activity of children with disabilities may be influenced by their body impairments socioeconomic background, accessibility, parents'/caregivers education, awareness and attitudes. This has been reported in studies with varying degrees. [13,14,15] Therefore future studies could address these variables and their influence on PA.

This study is a pioneer in reporting objective data regarding PA levels in children and adolescents with disabilities. It has also provided the variability that exists in Indian population as compared to that reported from other countries. This data will be valuable in paving the path for further analysis regarding correlates of PA and SB in these special populations.

CONCLUSION

This study is one of the first to report objective data of PA in children and adolescents from our country. PA levels are significantly less (50%) than recommended in children and adolescents with disabilities. Age, Gender and type of Disability were not associated with PA level in this study.

FUTURE IMPLICATIONS

Future studies should target analysis of factors influencing PA in special populations. Therapy for children and adolescents with special needs should target enhancement of physical activity for health promotion.

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CONFLICT OF INTEREST

The authors report no conflict of interest

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