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Original research article

Comparison of Paediatric Reach Test Values in Sedentary and Non Sedentary School Children

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Abstract

Background and objectives: Balance is the ability to maintain a state of equilibrium and is one of the critical underlying elements of movement that facilitates the performance of functional skills. The physical therapist must determine if the child possesses adequate functional balance to safely meet the demands of everyday life at home, in school, and within the community. There is a need to measure balance toquantify balance ability in adolescents. Sport is the leading cause of injury requiring medical attention among adolescents and with reduced balanced there is even more chances of occurance of injuries. Research has concluded that Pediatric Reach Test is a valid and reliable tool to measure balance and that sports training reduces incidence of injuries due to falls.

The objectives of this study are: To assess the effect of PRT values in sedentary school children. To assess the effect of PRT values in non sedentary school children. To compare the Paediatric Reach Test values in sedentary and athletic school children.

Methodology: For the purpose of this study 100 school children from local schools aged 7-12 years were selected and divided into 2 groups of 50 each. Group A consisted of sedentary children i.e. children who did not participate in sports activities for at least 5-6 hrs/week and Group B consisted of non sedentary children who were actively involved in sports for more than 5-6hrs/week. The balance of both groups were tested using Pediatric Reach Test in both sitting and standingpositions leaning forward, right and left on both sides.

Results: After statistical analysis of the balance values achieved there was a highly significant differencein the mean values for sedentary children which was 33.11 and non sedentary children which was 58.15 showing that there was increased balance seen in the non sedentary population.

Conclusion: In this study it has been clearly proved that more activity is needed in all school going children soas to increase their balance to reduce fall rates causing injuries.

Keywords: Balance, Paediatric Reach Test, Functional Reach test.

Introduction

Balance is a complex process involving the reception and integration of sensory inputs and the planning and execution of movement to achieve a goal requiring upright posture. It's the ability to control the centre of gravity (COG) over base of support (BOS) in a given sensory environment.[1] It involves controlling the body's position in space for the purposes of stability limits and orientation and controlling thebody's position without change in base of support.[3] In 1851 AD, Romberg used different balance tests to assess static standing skills. Many tools have

since been developed in an attempt to describe and measure balance.[4] To maintain the postural stability, the integration of visual, vestibular and proprioceptive neural input to the central nervous systems is required.[1] It provides the sensory information necessary for balance.

The visual system detects information of self in regard to stationary environment, to the objects, and to moving objects or people. If the visual system does not distinguish between self motions, there may be misinterpretation with resultant inaccurate motor output.[2] Somatosensory (proprioception, kinaesthesia) input provides information regarding the body with reference to the supporting surface. Slopes and uneven ground are best detected by somatosensory input. Proprioception is a distinct component of balance. Itis the cumulative neural input from the mechanoreceptors in the joint capsules, ligaments, muscle tendons and skin to the CNS and when these structures are subjected to mechanical deformation, action potentials are conducted to the CNS and contribute to the body's ability to maintain postural control.[1] Identification of any vestibular impairments contributions to imbalance is important. Gaze stabilization during head movements is a major function of vestibular system.[2] Righting reactions and the equilibrium reactions which emerge with the maturation of brainstem and the cortex respectively also plays an important role in the maintenance of balance.[2] The research has established the fact that the children use visual information to control balance in a manner different from the adults, and that it is not until after the age of seven years that adult like balance control strategies begin to appear.[5] The interaction between the individual and his environment plays a significant role in the development of balance. Hence the functional balance has been defined as the element that allows a child to safely perform everyday tasks. As the child approaches adolescence and young adulthood, increased proficiency in basic and instrumental activities of daily living is anticipated. Hence the physical therapist must determine if the child possesses adequate functional balance to safely meet the demands of everyday life at home, in school and within the community.[6] PRT (Paediatric Reach test) has a total 6 items in standing and sitting, the validity andreliability of PRT was examined and compared with the laboratory computerized force plate. The result or the values obtained from both PRT and Gold standard laboratory measurement were significantly associated with each other.[7] Hence the study provides evidence that PRT is simple, valid and reliable measure that can be used with children.

Objectives

To assess the effect of PRT values in sedentary school children.
To assess the effect of PRT values in non sedentary school children.
To compare the Paediatric Reach Test values in sedentary and athletic schoolchildren.

Material and Method

The study performed was a descriptive study. For the purpose of this study 100 school children from local schools aged 7-12 years were selected and divided into 2 groups of 50 each. Department of Paediatrics at Government medical college Bettiah, Bihar. Study duration of Eighteen months. Group A consisted of sedentary children i.e. children who did not participate in sports activities for at least 5-6 hrs/week and Group B consisted of non sedentary children who were actively involved in sports for more than 5-6hrs/week. The balance of both groups were tested using Pediatric Reach Test in both sitting and standingpositions leaning forward, right and left on both sides.

Inclusion criteria

Group 1-Sedentary children

Both boys and girls. Children in the age group of 7-12years. Children who are not much into physically exerting activities although children pursuing interests in non-athletic activities like drama, elocution, writing and othersimilar activities were included in this group.
Children having normal BMI between 17.9 to 24.9.

Group 2-Non sedentary children

Both boys and girls, Children in age group of 7-12 years., Children who were actively participating in physically demanding activitiessuch as sports, dancing, swimming, yoga etc.
Children having normal BMI between 17.9 to 24.9.

Exclusion criteria

Group 1-Sedentary children

Children under the age group of 7 years and above the age of 12years., Children who were not totally sedentary and are into physical activities rangingfrom 5-6 hrs per week8., Children whose health was affected by any kind of neurological, orthopedic, cardiologic or any other condition which might make them vulnerable to scorelower test values.

Group 2-Non sedentary

Children who suffered from exercise induced problems such as asthma etc., Children less than 7years of age or more than 12 years of age. Children having orthopedic problems like joint instability, recent fractures etc.

Figure 1: Performing Paediatric Reach Test in sitting forward- starting position

The need for motivational prompts will vary among children, andis related to age and attention span, among other things. It might be useful to know a child's interests and/or favourite toys or activities when administering this measure to young children (for example, finger puppets might be motivating for young children). Recent research with the Functional Reach Test in standing used on children suggests statistical controlling for the base of support (through measures of foot length and distance between the feet in stance) and height of the child if making either intersubject or intrasubject inferences; therefore, these variables were added to the score sheet to provide this option. A total score is obtained by summing the interval data (score in centimetres).

Results

This study compares the Pediatric Reach Test values in sedentary and non sedentaryschool children. A sample size of 100 children in the age group of 7 to 12 years was selected from local schools in and around Bettiah keeping in mind the inclusion and exclusion criteria. They were divided into 2 groups i.e. Group 1 and Group 2 consisting of 50 children each. Group 1

included sedentary children and Group 2 consisted of non sedentary children.

Table 1:

Age	Group				Total
	Non Sedentary Female	Sedentary Female	Non Sedentary Male	Sedentary Male	
7-8	8	12	6	14	40
	30.2%	48.0%	24.0%	56.0%	40.0%
9-10	12	7	9	9	37
	48.0%	28.0%	36.0%	36.0%	37.0%
11-12	5	6	10	2	23
	20.0%	24.0%	40.0%	8.0%	23.0%
Total	25	25	25	25	100
	100.0%	100.0%	100.0%	100.0%	100.0%

Within the age group of 7-8yrs, 30.2% are non sedentary females, 48% of sedentary females, 24% non sedentary males and 40% of sedentary males were taken which were a total of 40%. Within the age of 9-10 yrs, 48 % non sedentary females, 28% sedentary females, 36% non sedentary males and 36% sedentary males were taken which made a total of 37%. Among the age group of 11-12 yrs, 20% of non sedentary females, 24% of sedentary females, 40% of non sedentary males and 8 % of sedentarymales were taken who were 23% in total. The totals distribution between all 4 groups were 100% each making a total of 100% subjects. In non sedentary females, the mean BMI is 16.476 ± 2.8167, in sedentary females, themean BMI is 16.232 ± 1.9504, in non sedentary males, the mean BMI is 17.900 ± 2.9408 and in sedentary males, the mean BMI is 14.856 ± 1.9275. The p-value is .001 which shows that there is a highly significant difference in BMI among sedentary and non sedentary males and females. Both gender shows a greater mean and standard deviation in non sedentary domain (Males-17.900, Females-16.476) and lesser mean and standard deviation in the sedentary domain (Males-16.366, Females-16.232). In non sedentary females the mean balance when standing forward is 9.76 ± 2.693, when standing right is 9.580 ± 3.5785, when standing left is 9.30 ± 3.654, when sitting forward is 9.72 ± 2.376, when sitting right is 11.300 ± 3.7305 and when sittingleft is 10.66 ± 3.171. There is no significant difference in the activities of non sedentary females seen.

In sedentary females the mean balance when standing forward is 6.30 ± 3.007, when standing right is 4.680 ± 2.1500, when standing left is 4.22 ± 2.269, when sitting forward is 7.68 ± 3.372, when sitting right is 5.700 ± 1.8484 and when sitting left is 5.52 ± 1.923. There is a highly significant difference in the activities of sedentary females seen. Mean standing total in non sedentary female is 28.98 ± 8.571, in sedentary female is 14.80 ± 6.537, in non sedentary male is 24.50 ± 7.775 and sedentary male is 14.26±3.257 with a p-value of .000 which has a highly significant difference. Mean sitting total in non sedentary female 31.66 ± 7.626, in sedentary female is 19.14 ± 6.368, non sedentary male is 31.22 ± 7.019 and sedentary male is 17.86 ± 3.676 witha p-value .000 which has a highly significant difference. compares the non sedentary and sedentary population in standing andsitting, forward, right and left and reveals a high significant statistical difference among sedentary and non sedentary in each domain. graphical representation of the comparison of standing andsitting activities in non sedentary and sedentary population.

Discussion

The present study was done to evaluate the balance in different physical activities in healthy

school children between 7-12 years of age using the Paediatric Reach Test (PRT). Different variables like age, height, weight, BMI (Body Mass Index) and gender was also included for comparison[8]. The present study is a comparative study. Normal children without any detected developmental disabilities were selected from various primary schools. A total of 100 healthy children aged 7-12 years old were selected for this study. The results were analysed using t-test and ANOVA. The analysis of the result showeda positive result as regarding the correlation between the sedentary and non sedentary children's balance. The results revealed the alternate hypothesis to be true. The correlation between the sedentary and non sedentary children's balance was highly significant. The primary objective of this study was to find out the changes in balance in sedentary and non sedentary group using PRT. The BMI was seen to be higher in non sedentary children. This study has taken only those subjects who came into the healthy BMI category. Thus the children who come in the upper BMI were found to be more active as compared to the ones who came in the lower BMI categories. The sedentary subjects had a lower BMI which might be a probable cause for weakness or easy tiredness depending upon how low the BMI was found to be and thus also affecting their balance. It was also seen that in the age group of 7 to 8 years both the males and females show equal sedentary behaviour. But when it comes to the 9 to 10 years age group, girls were found to be more active as compared to the boys. In the age group of 11 to 12 years the boys were found to be more out going and non sedentary as compared to girls. This might be because girls get mature sooner as compared to boys and they might be discouraged from participating in too many activities depending upon the broad mindedness of the family as girls begin to get involved with their typically characteristic duties such as taking care of the house, cooking etc from an early age which might be around 11 to 13 years. Also this is the age where girls start with their menses which might also play a role in making them more conscious about their body changes thus making them less out going.

The non sedentary subjects who were taken into this study were the ones who participated in physical activity of more than 5-6 hours per week. These subjects exhibited better balance in both sitting and standing as compared to the sedentary subjects. The cause for this can be strongly suggested as the activity level of these subjects. The more the physical activity, more will be the proprioceptive as well as thevestibular awareness as these long hours of activities work as a training session for theproprioceptive and vestibular systems. The musculoskeletal system activation along with the kinaesthetic awareness which is a part of these activities will help the subject to have a better control over his movements thus improving the balance to a large extent. This supports the theory that while girls may have progressed to an adult like integrated open and closed loop strategy of controlling balance as shown in a study by Riach and Strakes (1994) [9] and Krishernbaum and colleagues (2001)[10], boys tend to lag behind somewhat and do not develop this adult like strategy until a few years later. They also suggested that 9-10 year old boys when standing with eyes closed exhibit different vestibular function as compared to girls.

Thus at this age, aspects of vestibular system in boys may be still developing which needs further research to reach a clearer conclusion. Non sedentary samples have better balance than sedentary and this is seen to be common in both genders. The reason for this might be that the non sedentary subjects train their various body systems through their activities which help them achieve better balance as compared to the sedentary ones. Subjects taken for the study were allpre pubertal, so any balance changes associated with the beginning of puberty is absent. For the purpose of further research balance attainment in children after reaching puberty can also be studied.

Conclusion

Studies were done previously on the use of Paediatric Reach Test on its reliability, validity and to check balance in children with cerebral palsy .But no studies were done to evaluate the balance in different physical activities in healthy school children between 7-12 years of age. Thus a need for the present study arose.

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