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Technologies regulating protein expression and their application to drug development

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ABSTRACT— Balance and motor skills are essential prerequisites for physical development of a child. The aims of this study were to measure anthropometrics, postural balance and motor skills; and examine their correlation among healthy preschool children. Forty-nine healthy preschool children aged between 3 to 4 years old participated from PERMATA preschool organization. Pediatric Balance Scale and Peabody Development Motor Scale-2nd Edition (PDMS-2) were administered to measure balance skills for both fine and gross motor skills respectively. Mann-Whitney U test demonstrated that there was no significant difference in balance (p=0.72) and motor skill (p=0.33) between boys and girls. Spearman correlation coefficient demonstrated that there was significant correlation between balance skills with height (r=0.45, p=0.001) and body mass index (r=0.47, p=0.001). No significant correlation was found between balance skills and motor skills (r=0.11, p=0.44). The present study suggests that balance skills in healthy preschool children aged 3-4 years old are correlated with their physical growth such as height and weight but not motor skills.

KEYWORDS: Balance skills, Motor skills, Preschool children, Physical development

1. INTRODUCTION

Motor and balance skills are part of the prerequisites for physical function and sports performance [1], [2]. Most motor skills are acquired by children during the period of preschool [2], [3]. Both motor and balance skills are also fundamentals of physical developmental milestone in children. These skills are further polished for more complicated movements such as running, hopping and sports activities. Any impairment in motor and balance skills may increase the risk of falls and injuries even in healthy children during sports activity participation [1], [4]. “Motor” is defined as motion or relating to the movements of muscle [5]. Motor skills can be categories into two major groups which are gross motor skills and fine motor skills. “Gross motor skills” refers to large physical movements of the whole body [6]. On the other hand, “Fine motor skills” means smaller movements, mainly movements in hands and fingers. Fine motor movements are more challenging for the preschool children compared to gross motor movements [7]. Balance of an individual is gained when the centre of mass is kept within base of support [8]. One has to maintain their body in postural balance in order to prevent from falling. Specifically, balance is divided into static balance and dynamic balance. Static balance is gained when static posture is kept while resting [9]. Dynamic balance is obtained when stability of the body is maintained during movement performance [10]. Both motor and balance competency in children is dependent on multiple factors. For example motor ability has been demonstrated to be higher in children who were more physically active, had smaller body mass index (BMI) and were less sedentary [11]. Similarly, boys with better motor performance recorded faster time and further distance in running and jumping respectively [12]. Difference in the onset of puberty was advocated to have resulted in inconsistent motor performance levels among children aged 13 years old [13]. As for balance, age (rs=0.689), height (rs=0.650), and weight (rs=0.642), have been reported to be moderately correlated with the Pediatric Balance Scale (PBS) score.8 However, BMI was weakly correlated with the PBS score (rs=0.182). In younger children, a higher variability of the PBS score was found. Previous study

reported that the balance test was mastered by girls, (t (391) =-2.07, p=0.039) while boys scored better in figure-8 dribbling test (t (350) = -5.02, p<0.001) [14]. Even though it is understood that older children perform better in balance test, there is still limited understanding on the relationship between anthropometric data and the balance skills of preschool children [8].

2. MATERIALS AND METHODS

This cross sectional study was carried out at Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia. The participants were healthy preschool children aged between 3-4 years old, recruited from PERMATA preschools at Putrajaya and Dengkil. The children were excluded if they were younger than 3 years old and older than 4 years old, unable to follow commands in Bahasa Malaysia, English or Mandarin, and diagnosed with any disability or illness by a pediatrician. Demographic data of the children and parents were taken and recorded. Gross and fine motor skills were assessed using 7 tests from Peabody Developmental Motor Scale 2nd edition (PDMS-2),16 that included standing on tip toes, running speed and agility, buttoning, unbuttoning, touching fingers, building tower and stringing beads. The PDMS-2 tests were performed once based on its purchased protocol. These tests are suitable to determine motor skills level of children from 0-83 months and are reported to help in detecting small changes in their motor development [17]. PDMS-2 is reported to have excellent test–retest [ICC=0.923], inter-rater [ICC=0.972], and intrarater [ICC=0.896-0.998] reliability [17]. During the test, the children were requested to perform certain movements or tasks with the same trained final year physiotherapy undergraduates rating the same tasks according to the score criteria for all children. Children who were able to complete the motor tasks were given a score of 2, a score of 1 if they partially completed the tasks and a score of 0 if they were unable to perform the tasks. Balance skills was assessed using the Pediatric Balance Scale (PBS) that consisted of 14 subtests which included sitting to standing, standing to sitting, transfer, standing unsupported, sitting unsupported, standing with eyes close, standing with feet together, standing with one foot in front, standing with one foot, turning 360 degrees, turning to look behind, retrieving object from floor, placing alternative foot on stool and reaching forward with outstretched arm.18 Score from 0-4 on the children' performance was rated as in the PBS sheet18 by the same physiotherapy assistants for all children. The best performance of three trials was taken as the score. PBS has been reported to have a good internal consistency, [Cronbach α=.89–.97], test-retest [ICC=0.82-0.93] and inter-rater reliability [0.96-0.99] when used with school-age children with mild to moderate motor impairments [18]. Prior to the tests, participants' parents were given verbal and written information on the study procedures and consent was obtained. Ethical approval was obtained from the Secretariat for Research and Ethics of Universiti Kebangsaan Malaysia.

3. RESULTS

A total number of 49 children (30 boys, 19 girls) aged between 3 to 4 years old were involved in this study. Table 1 shows the descriptive data of the participants. Table 2 shows the correlation between anthropometric data with motor skills (PDMS-2) and balance (PBS) scores. Spearman correlation test was used to analyse the data as the data were not normally distributed. The subjects' height was positively correlated to their weight (r=0.39, p=0.05), which means shorter children had lesser body weight. The height was significantly correlated with the total score of PBS (r=0.45, p=0.01). Taller children had better performance in the PBS. Besides, the children with heavier body weight had larger BMI (r=0.77, p<0.01). There was a negative correlation between BMI and the total score for PBS (r=-0.47, p<0.01). Children with lower BMI, scored better in the balance test. There was no significant correlation between time spent on physical activities, with motor skills and balance skills. Mann-Whitney U test showed that there was no significant difference between the boys and girls in terms of the motor skills (p=0.33) and balance skills (p=0.72). Hence, the data is depicted by combining the data of both boys and girls.

4. DISCUSSION

This study provided information regarding balance and motor skills among preschool children aged 3 to 4 years old. The results demonstrated that there were no significant correlation between balance and motor skills among preschool children aged 3 to 4 years old (Table 2). Height was found to be positively correlated with balance. BMI was negatively correlated with balance. In present study, mean total score of the PBS was 49.35 ± 3.961, where the minimum score achieved was 33 and the maximum score was 56. Earlier study reported that the mean PBS total score was 46.0±6.55 with total PBS score range of 28 to 53 for children aged 3 years to 3 years 5 months old.8 As for the children aged 3 years 6 month old to 3 years 11 months old, mean PBS total score was 48.5±5.02, total score ranged from 30 to 54.8 The mean PBS total score in present study was slightly higher than the previous study.8 One of the possible reasons may be due to the fact that children in present study had lower mean BMI compared to the previous study [8]. Positive correlation between height and total score of PBS is consistent with the results of other studies [8], [9]. Balance performance using PBS was reported to have a moderate correlation (r=0.650) with height in children aged 2 years 4 months to 13 years 7 months [8]. Height was also found to be significantly correlated to Functional Reach Test which is a dynamic balance test, Timed Up and Go, and the Bruininks Oseretsky Test of Motor Proficiency Running Speed and Agility performed in children aged 5 to 13 years old [9].

5. CONCLUSION

In conclusion, this study suggests that balance skills in healthy preschool children aged 3-4 years old are correlated with their physical growth such as height and weight. However, no significant correlation was demonstrated between balance and motor skills in these children. The data of this study may be beneficial as reference for health care professionals in Malaysia when assessing the Malaysian children for developmental delay. Clinically, similar balance training can be utilized in children aged 3-4 without considering gender differences.

6. REFERENCES

[1] Mickle KJ, Munro BJ, Steele JR. Gender and age affect balance performance in primary school-aged children. J Sci Med Sport 2011:14(3):243-8.

[2] Venetsanou F, Kamba A. The effects of age and gender on balance skills in preschool children. Physical Education and Sport 2011: 9(1): 81 – 90.

[3] Gallahue D, Donnely F. Developmental physical education for all children. Human Kinetics, Champaign 2003.

[4] Willems TM, Witvrouw E, Delbaere K, Philippaerts R, De Bourdeaudhuij I, De Clercq D. Intrinsic risk factors for inversion ankle sprains in females--a prospective study. Scand J Med Sci Sport 2005:15 (5):336-45.

[5] The American Heritage® Medical Dictionary. Houghton Mifflin Company, 2007, 2004. Retrieved from: http:// medical-dictionary.thefreedictionary.com/motor

[6] Oswalt A. Early Childhood Physical Development: Gross and Fine Motor Development 2008. Retrieved from: http://www.mentalhelp.net/poc/view_doc.php?type=doc&id=12755&cn=462

[7] Benelli C, Yongue B. 1995. “Supporting young children’s motor development’’. Childhood

Education 1995: Summer 71 (4): 217.

[8] Franjoine MR, Darr N, Held SL, Kott K, Young BL. The performance of children developing typically on the pediatric balance scale. Pediatr Phys Ther 2010: 22 (4):350-9.

[9] Habib Z, Westcott S. Assessment of anthropometric factors on balance tests in children. Pediatr Phys Ther 1998: 10:101-109.

[10] Bressel E, Yonker JC, Kras J, Heath EM. Comparison of static and dynamic balance in female collegiate soccer, basketball, and gymnastics athletes. J Athl Train 2007: 42 (1):42-6.

[11] Wrotniak BH, Epstein LH, Dorn JM, Jones KE, Kondilis VA. The relationship between motor proficiency and physical activity in children. Pediatrics 2006:118 (6): e1758-65.

[12] Milanese C, Bortolami O, Bertucco M, Verlato G, Zancanaro C. Anthropometry and motor fitness in children aged 6-12 years. J. Hum. Sport Exerc 2010: 5(2).

[13] Ozmun JC, Gallahue DL. Motor Development In Adapted Physical Educa¬tion and Sport, ed. J.P. Winnick, 343-357. Champaign, IL: Human Kinetics, 2005.