

## **‘Leaving No Child Behind’: Investigation on Gross Motor Skill Among Autistic Children**

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## **Abstract**

Autism is defined as a developmental disability that affects the ability of a person to communicate, understand language, play, and interact with others (Dunlap & Bunton-Pierce, 1999). Children who suffer from autism usually show uneven gross and fine motor skills and lack of cooperativeness in group play. Opportunities should be given among autistic children to interact successfully with peers. An investigation was conducted to investigate the performance of gross motor skill among autistic children. Seven autistic children performed 20 items of Texas Revision of Fitt's Basic Motor Skills: Basic Movement Performance Profile (Faith, 1978). Results indicated that the autistic children scored lower than their normal peers. The mean score of gross motor activities indicated that autistic boys perform better than autistic girls. The autistic children showed difficulties in performing non-locomotor movements as compared to locomotor movements. Suitable physical activity program should be developed to widen the opportunity and increase physical ability of autistic children to interact and play with their peers.

**Keywords:** Gross Motor Skill, Autism, Autistic Child

## **1. Introduction**

Everybody should have an opportunity to participate in the excitement of social, emotional or physical type of activities. Involvement in these healthy activities contributes into the enlargement on the importance of quality and healthy life-style. In general, people are allowed to participate freely in these activities but there is a certain group of people who can't make this choice due to developmental delay or disability. Special or adapted activities and strategies should be designed to meet the needs of the developmental disability group such as adolescents with autism.

Autism is defined as a developmental disability that affects a person's ability to communicate, understand language, play, and interact with others (Dunlap & Bunton-Pierce, 1999). Autistic children usually show impairment in communication, in social interaction and express repetitive and stereotyped patterns of behavior (American Psychiatric Association, 1994; Dunlap & Bunton-Pierce, 1999; Powers, 2000; Winnick, 2005). In physical aspect, children with autism may also exhibit physical over-activity and uneven of gross and fine motor performance (Autism Society of America, 2006), lack of cooperative in group play as well as motor planning and coordination disorder (National Education Association, 2006).

Autism is a *spectrum disorder* which means the symptoms can vary in severity (Autism Society of America, 2006; Powers, 2000; Shore, 2001), See Figure 1.1. Some autistic children may be very passive and compliant, can be violent, may be withdrawn and anti-social though some may feel comfortable in social situations (Shore, 2001). According to

Dunlap and Bunton- Pierce (1999), children with autism can cognitively range from having mental retardation to having significantly high intelligence levels, or even being label gifted. This wide range of severity is an indication that there is a vast opportunity for autistic children to involve in social, emotional, physical and cognitive activities into their daily living.

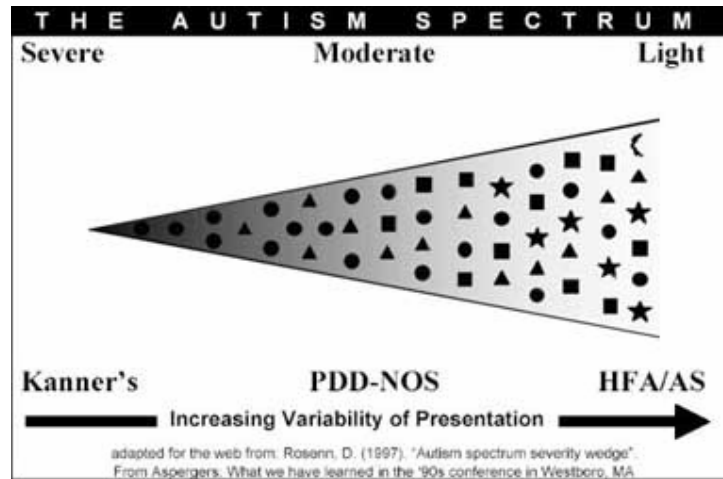


Figure 1.1: The Autism Spectrum ((Rosenn, 1997)

Several research have been conducted among autism (Barry & Burlew, 2004; Charlop-Christy & Daneshvar, 2003; Glaeser, Pierson & Fritschmann, 2003; Kamps et al., 2002; Odom et al., 2003; Steigleman, 2004; United States Government Accountability Office, 2005). However, all the research above focuses mainly on the communication and social perspective through several strategy and method were implemented such as using video modeling, play and story telling with peers. Research is needed to further understand the undisclosed knowledge related to autism children from the perspective of the physical and motor skill. Assessment on gross motor skill has been conducted to evaluate their severity as the incidence of motor planning and coordination disorder occur among autistic children.

Gross motor skills are the actions that involve the movement of large muscles in the body (eNotes.comLLC., 2006). According to Magill (1997) gross motor skills control the large muscles of the body to walk, run, sit, crawl, and other fundamental motor skill and activities that need less precision of movement. On the other hand, fine motor skills requires greater control of small muscles in the body especially involvement of hand-eye coordination action and high degree of precision of hand and finger movement (Magill, 1997). Gross motor skills usually develop together with fine motor skills since many activities depend on the synchronization of both skills and development during childhood. Through experiencing activities of gross and fine motor skills, it encourages children to interact with peers but require a safe and open play space.

Previous research suggested that children and adolescents with autism spectrum and high functioning autism have delays or disorders in overall motor development, including locomotor and object control (Berkeley, Zittel, Pitney & Nichols, 2001), manual dexterity, ball skills, and balance (Manjiviona & Prior, 1995). Falk-Ross, Iverson and Gilbert (2004)

recommend games as a technique for developing gross and fine motor skills. In addition, the entire process of a game involves various communication and interaction skills through facial expressions, tones of voice and body language. Above situation maintain that games activity is suitable for autistic children to improve their social skills as well as motor skills. However due to variability symptom and severity among autism, applying specific motor skill instruments (such as McCarron Assessment Neuromuscular Development test (McCarron, 1982), Movement Assessment Battery for Children (Henderson & Sugden, 1992), Bayley Scales of Infant Development (BSID) II Motor Scale (Bayley, 1993) and the Peabody Developmental Motor Scales (Folio M. R. & Fewell, 2000) – naming a few) among this group in Malaysia is challenging since expertise in this area is rare especially in movement skill perspective. Therefore, this study is conducted to investigate the gross motor skill among autistic children by using daily tasks such as walking, jumping, climbing, pushing, pulling and running activities as will be described latter. This type of instrument had been chosen based on rational that games activities conducted among autistic children to improve their social skills involved daily tasks.

## **2. Method**

### *2.1 Research participants*

Seven participants (aged = 12.8 63.3 years) from one Special School in Johor Bahru, Malaysia involved in this study. Only one school is involved in this study because this investigation was served as a pilot and pioneer data for this group. In addition, this school has the suitable facilities and indoor room to conduct the assessment. Accessible to the facilities is essential to fulfill the need of the participants to interact with their recognizable environment.

Participants were identified as autistic child based on medical examination and school report. Only autistic children that returned the Parents Informed Consents are allowed to perform the tasks. Seven other normal participants were assessed using the same instrument. The normal participants were served as control group and data used as the base performance score on the task given.

### *2.2 Instrument*

Participants gross motor skill were assessed using the Texas Revision of Faith's Basic Motor Skills Test: Basic Movement Performance Profile (Faith, 1978). The motor skill test was developed to measures the basic motor skills most needed by children to function efficiently in everyday life (Faith, 1978).

The instrument consists of twenty tasks: Walking, Pushing wheelchair, Ascending stairs, Descending stairs, Climbing step ladder, Carrying chair, Pulling wheelchair, Running, Catching bean bag, Creeping, Jump down, Throwing, Hitting, Forward Roll, Kicking, Dynamic balance, Hanging, Dodging, Static balance and Jumping. A five scale of task score (0 to 4) to perform each task was establish where scale 0 is indicating the lowest score and

scale 4 is indicating as the highest score. The maximum score (total score) for the instrument is 80 point. The task and score description is described in Appendix A. According to Fait (1978), reliability coefficient of this test is .94. Investigation using this instrument on groups of severely and profound retarded subjects resulted that the mean score for most is between 35 and 45, with a scorer of 2 representing an 'average' in the majority of items.

### *2.3 Procedure*

Assessment on gross motor skill among autistic children using Texas Revision of Fait's Basic Motor Skills Test: Basic Movement Performance Profile (Faith, 1978) have been conducted at the school's indoor room. There was no time limit given for each participant as the test on each task was depending on participants' willingness to perform the tasks. Tester examined each participant until all task was done before conducting a new test to the other participants. Responsible teacher that supervise the participants are always with the participants and assisting tester in giving instruction and motivation to the participants to perform the tasks.

## **3. Results**

### *3.1 Individual performance*

Seven normal children can perform well that mean scored 4 for all tasks except for the forward roll activity, hanging on the bar, static balance and kicking. All normal children scored above 70 point of the total score. Analysis on total score on Texas Revision of Fait's Basic Motor Skills Test indicating that two of autistic children perform well in gross motor activity (score more than 70 point of the total score). Two participants scored moderate level (49 and 52 point of the total score) while three participants scored below average (38 and 21 point of the total score), see Figure 3.1.

Though result does not significantly differ, the boys' participants scored higher than the girls participants (Boys = 2.68, girls = 2.23). In addition, the younger children age between 7 to 12 years old scored better (mean score 2.49) than the older group age between 13 to 17 years old (mean score 2.33).

### *3.2 Tasks performance*

The task performance analysis indicating that participants mean score was high on pulling and pushing a wheelchair (3.7 point for each of task). Participants perform at average level on twelve tasks (score above 2 point of each task). On the other hand, participants perform below average (scored below 2 point) on six tasks, climbing (1.9 point), forward roll (1.4 point), hanging (1.6 point), dodging (1.6 point), static balance (1.7 point) and jumping (0.9 point). Figure 3.2 illustrate the mean score of each task.

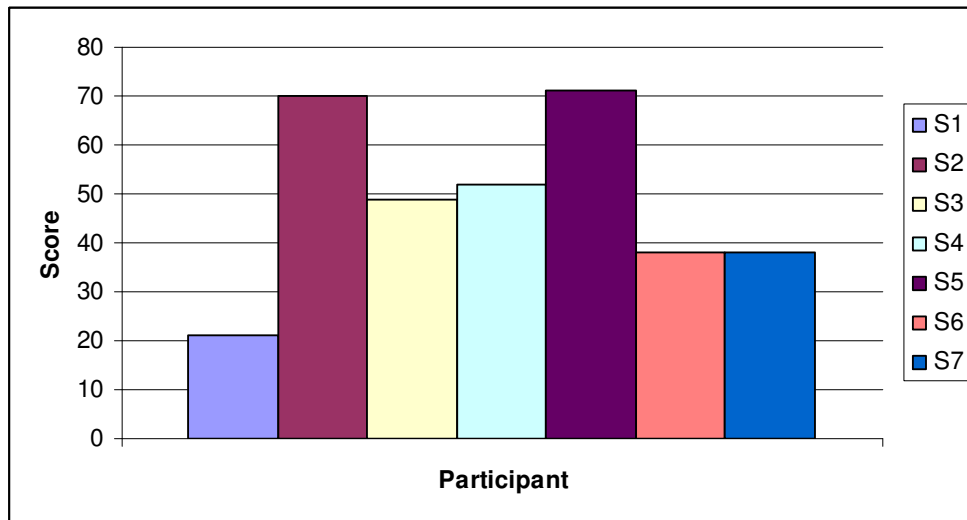


Figure 3.1: Total Score of Texas Revision of Fait's Basic Motor Skills Test of Participants

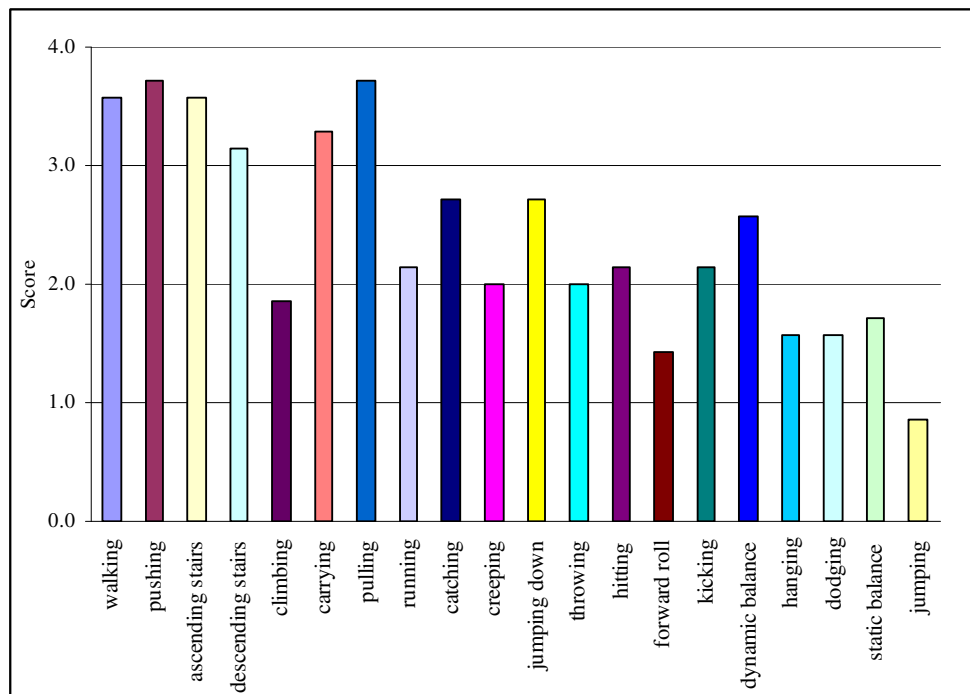


Figure 3.2: Mean Score of Texas Revision of Fait's Basic Motor Skills Test of each task

Based on task performance analysis, the tasks of the Texas Revision of Fait's Basic Motor Skills Test were classified into three different level of difficulty among autistic children. A classification into different level of difficulty was form based on the mean score

of each task performed by participants. Tasks were classified into hard, moderate and easy task (See Table 3.1).

**Table 3.1:** Test Item Classified Based on Different Level of Difficulty

<b>Score Below 2 point (hard task)</b>	<b>Score 2 to 2.99 point (moderate task)</b>	<b>Score above 3 point (easy task)</b>
<ul style="list-style-type: none"> <li>• Jumping</li> <li>• Forward Roll</li> <li>• Dodging</li> <li>• Hanging</li> <li>• Static balance</li> <li>• Climbing</li> </ul>	<ul style="list-style-type: none"> <li>• Creeping</li> <li>• Throwing</li> <li>• Running</li> <li>• Hitting</li> <li>• Kicking</li> <li>• Dynamic balance</li> <li>• Jump down</li> <li>• Catching bean bag</li> </ul>	<ul style="list-style-type: none"> <li>• Descending stairs</li> <li>• Carrying chair</li> <li>• Ascending stairs</li> <li>• Walking</li> <li>• Pushing wheelchair</li> <li>• Pulling wheelchair</li> </ul>

#### **4. Discussion and Conclusions**

The wide range of score among participants of this study from 21 to 71 point of total score demonstrated the agreement towards a phrase that ‘autism is a spectrum disorder’. Even though the tasks given are related to their living skills, different severities of symptoms influence participants’ performance in the test. Though intelligence quotient or IQ test was not conducted, despite the fact that three of participants scored below average and this result is in parallel with study conducted by Fait (1978) among severely and profound retarded subjects and Provost, Lopez, and Heimerl (2006) among autism children. A further investigation should be conducted to examine the relationship of intelligence quotient level with gross motor performance among autistic children.

Though no significant differences were shown between boys’ and girls’ participants as well as between younger and older children, this result indicates that any physical activity or sport program should consider this finding. The development of physical activity and sport program should follow the need of each autism child. This important as the current view agree to the point that the autistic individuals have the potential to grow and improve and is treatable (Adams, Edelson, Grandin & Rimland, 2004). An appropriate physical activity, services, treatments, and education for autistic children may improve their motor function and daily physical skills.

Results also indicate that the autistic children demonstrated difficulty in performing six given tasks. The nature of the task, level of complexity and the stability of the environment might influence their ability to perform the tasks. Based on Berkeley et al., (2001) and Provost et al., (2006) findings, we agree that some tasks also require higher degrees of motor planning and imitation. In addition, it is possible that the success of some of

the interactions of autistic children with their peers may have a relationship to how well they are able to perform the given gross motor tasks.

With the increasing awareness towards fulfilling the needs of autism children, investigation related to movement skill for this group is continuing to emerge. Cooperation between researcher, teacher, parents and individual interested with this group able to transform findings of research into approaches that can support each and every child to acquire their fundamental movement skill used for daily living, physical activity, sports, health and well being.

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Texas Revision of Fait's Basic Motor Skills Test  
Basic Movement Performance Profile

1. Walking

- 0 – makes no attempt at walking
- 1 – walks while being pulled
- 2 – walks with toe-heel placement
- 3 – walks with shuffle
- 4 – walks with heel-toe placement and opposite arm-foot swing

2. Pushing (wheelchair)

- 0 – makes no attempt to push wheelchair
- 1 – makes some attempt to push wheelchair
- 2 – pushes wheelchair once with arms only
- 3 – pushes wheelchair once with continuous motion for 10 ft
- 4 – pushes wheelchair carrying adult occupant continuously for 10 ft.

3. Ascending Stairs (up 4 stair steps)

- 0 – makes no attempt to walk up stairs
- 1 – steps up one step with assistance
- 2 – walks up 4 steps with assistance
- 3 – walks up 4 steps, two feet on each step
- 4 – walks up 4 steps, alternating one foot on each step

4. Descending Stairs (down 4 stair steps)

- 0 – makes no attempt to walk down stairs
- 1 – steps down one step with assistance
- 2 – walks down 4 steps with assistance
- 3 – walks down 4 steps, two feet on each step
- 4 – walks down 4 steps, alternating one foot on each step

5. Climbing (4 rungs; step ladder)

- 0 – makes no attempt to climb ladder
- 1 – climbs at least one rung with assistance
- 2 – climb 4 rung with assistance
- 3 – climb 4 rung, two feet on each rung
- 4 – climb 4 rung, alternating one foot on each rung

11. Jumping Down (two foot take-off and landing from 18 in. folding chair)

- 0 – makes no attempt
- 1 – steps down from chair with assistance
- 2 – steps down from chair
- 3 – jumps off chair with two foot take-off and landing with assistance
- 4 – jumps off chair with two foot take-off and landing while maintaining balance

12. Throwing (overhand softball, 3 attempts)

- 0 – makes no attempt to throw
- 1 – grasps ball and release in attempt to throw
- 2 – throws or tosses ball a few feet in any direction
- 3 – throws ball at least 15 ft. in air in intended direction
- 4 – throws ball at least 30 ft. in the air in intended direction

13. Hitting (volleyball with plastic bat)

- 0 – makes no attempt to hit ball
- 1 – hits stationary ball fewer than 3 of 5 attempts
- 2 – hits stationary ball at least 3 of 5 attempts
- 3 – hits ball rolled from 15 ft. away fewer than 3 of 5 attempts
- 4 – hits ball rolled from 15 ft. away at least 3 of 5 attempts

14. Forward Roll

- 0 – makes no attempt to do forward roll
- 1 – puts hands and head on mat
- 2 – puts hands and head on mat and pushes with feet and/or knees in attempt to do roll
- 3 – perform roll but tucks shoulder and rolls to side
- 4 – perform forward roll

15. Kicking (soccer ball)

- 0 – makes no attempt to kick stationary ball
- 1 – pushes stationary ball with foot in attempt to kick it
- 2 – kicks stationary ball several feet in any direction
- 3 – kicks stationary ball several feet in intended direction
- 4 – kicks ball rolled from 15 ft. away in direction of roller

6. Carrying (folded folding chair)

- 0 – makes no attempt to lift chair from floor
- 1 – attempts but not able to lift chair from floor
- 2 – lifts chair from floor
- 3 – carries chair by dragging on the floor
- 4 – carries chair 10 ft.

7. Pulling (wheelchair)

- 0 – makes no attempt to pull wheelchair
- 1 – makes some attempt to pull wheelchair
- 2 – pulls wheelchair once with arms only
- 3 – pulls wheelchair once with continuous motion for 10 ft
- 4 – pulls wheelchair carrying adult occupant continuously for 10 ft.

8. Running

- 0 – makes no attempt to run
- 1 – takes long walking steps while being pulled
- 2 – takes running steps while being pulled
- 3 – jogs (using toe or flat foot)
- 4 – runs for 25 yds with both feet off the ground when body weight shifts from the rear to front foot

9. Catching (bean bag tossed from 5 ft. away)

- 0 – makes no attempt to catch bean bag
- 1 – holds both arms out to catch bean bag
- 2 – catches bean bag fewer than 5 of 10 attempts
- 3 – catches bean bag at least 5 of 10 attempts
- 4 – catches bean bag at least 8 of 10 attempts

10. Creeping

- 0 – makes no attempt to creep
- 1 – will assume hands and knees position
- 2 – creeps with a shuffle
- 3 – creeps alternating hands and knees
- 4 – creeps in a crosslateral pattern with head up

16. Dynamic balance (4in beam with shoes on)

- 0 – makes no attempt to stand on beam
- 1 – stands on beam with assistance
- 2 – walks at least 5 steps with assistance
- 3 – walks at least 5 ft. without stepping off beam
- 4 – walks at least 10 ft. without stepping off beam

17. Hanging (2 hands on horizontal bar)

- 0 – makes no attempt to grasp bar
- 1 – makes some attempt to hang from bar
- 2 – hangs from bar with assistance
- 3 – hangs from bar for at least 5 seconds
- 4 – hangs from bar for at least 10 seconds

18. Dodging (a large cage ball rolled from 15 ft. away)

- 0 – makes no attempt to dodge ball
- 1 – holds up hands or foot to stop ball
- 2 – turns body to avoid ball
- 3 – dodges ball at least 5 of 10 attempts
- 4 – dodges ball at least 8 of 10 attempts

19. Static Balance (standing on one foot with shoes on)

- 0 – makes no attempt to stand on one foot
- 1 – makes some attempt to stand on one foot
- 2 – stands on one foot with assistance
- 3 – stands on one foot for at least 5 seconds
- 4 – stands on one foot for at least 5 seconds with 5lbs weight in the same hands as elevated foot

20. Jumping (standing long jump, 3 attempts)

- 0 – makes no attempt to jump
- 1 – jumps with a one-foot stepping motion
- 2 – jumps from crouch with two foot take-off and landing at least 1 feet
- 3 – jumps from crouch with two foot take-off and landing at least 2 feet
- 4 – jumps from crouch with two foot take-off and landing at least 3 feet