Comparison effectiveness between ABA therapy with brain gym in gross motor skills among autism children aged six years to twelve years old

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Abstract. Autism is a growth disorder in children which symptom included gross motor disorders. Autistic children had low gross motor skills lead to child development task especially school age, coordination movement in learning did not follow the chronological age. The study aims to determine the comparison of effectiveness between Applied Behaviour Analysis (ABA) therapy with brain gym toward gross motor abilities in autism children aged between 6 years and 12 years. The study was used quasi experimental with pre-test and post-test design method. The samples were 20 respondents which met the inclusion criteria such as autism children who have gross motor abilities disorder in SLB Risantya Bandung with crude motor ability parameter that is Test Gross Motor Development (TGMD) II. The result showed ABA therapy group had significant influenced toward gross motor abilities (p=0.00<0.05), while brain gym was not significant influenced toward gross motor abilities (p= 0.083<0.05) in school-age autism children.

1. Introduction
Eugen Bleuler was defined “autism” as impairment in the social interaction [1]. Autism disorder was heterogenous neuro-development disorder with impairment in social and communication skills, behavioural and motor sensory difficulties [2-6]. The autism characteristics such as hyperactive, self-injury, unstable of mood, eating and obsession [7, 8]. In 2010, the autism prevalence estimated 1 in 68 (14.7 per 1000) school-aged children is diagnosed with autism [1]. Meanwhile, approximately 3.5% of children up to 5 years was diagnosed autism in Japan [9].

The previous studies found autism children had higher motor skill impairment rate such as deficiency on gross and fine motor activities, balance skills, joint flexibility and movement speed [2]. Gross motor skills are basic skills needed for movement competence for more complex motor skill development [10]. Currently, there are many therapies created for autism children such as speech therapy, occupational therapy, biomedical therapy, physiotherapy among autism patients such as Applied Behaviour Analysis (ABA) and brain gym therapy. The study aims to determine the comparison of effectiveness between Applied Behaviour Analysis (ABA) therapy with brain gym toward gross motor abilities in autism children aged between 6 years and 12 years.
2. Methodology
This study was used quasi experimental with two group pre-test-post-test design method. The study was conducted in SLB (Extraordinary School) Risnatya, Bandung. The study population was autism patients at SLB Risnatya, Bandung with total of 29 students. The samples were 20 students who met the inclusion criteria. The samples were divided into 2 groups included 10 students under ABA group and 10 students in brain gym group.

The data was collected was used Test Gross Motor Development (TGMD) II tools to measure the gross motor skills level before and after 12 times of ABA therapies in the ABA group as well as before and after 12 times of brain gym therapies in the brain gym group. The data was analysed with Wilcoxon test by using SPSS program to determine the intensity changes.

3. Result and Discussion

3.1. Result
In Table 1, there were 7 male respondents (70%) and 3 female respondents (30%) in ABA treatment group. Meanwhile, 6 male respondents (60%) and 4 respondents (40%) in brain gym treatment group. In ABA treatment group, 2 respondents (25%) were aged 6 years and 2 respondents (25%) were aged 10 years old. In additions, there were 2 respondents (25%) were aged 8 years old and 2 respondents were aged 6 years old.

| Treatment group | Characteristic | Frequency | Percentage (%) |
|-----------------|----------------|-----------|----------------|
| Gender          | Male           | 7         | 70             |
|                 | Female         | 3         | 30             |
| Total           |                | 10        | 100            |
| ABA Age         | 6 years old    | 2         | 25             |
|                 | 7 years old    | 2         | 25             |
|                 | 8 years old    | 2         | 25             |
|                 | 9 years old    | 2         | 25             |
|                 | 10 years old   | 2         | 25             |
| Total           |                | 10        | 100            |
| Gender          | Male           | 6         | 60             |
|                 | Female         | 4         | 40             |
| Total           |                | 10        | 100            |
| Brain gym Age   | 6 years old    | 2         | 25             |
|                 | 7 years old    | 2         | 25             |
|                 | 8 years old    | 2         | 25             |
|                 | 9 years old    | 2         | 25             |
|                 | 10 years old   | 2         | 25             |
| Total           |                | 10        | 100            |

For ABA treatment group, 1 respondent (10%) had scored gross motor abilities ranged 0 to 25% and 9 respondents (90%) were scored gross motor abilities level between 25% and 50% during pre-test. Meanwhile, 4 respondents (40%) had scored gross motor abilities level between 50% and 75% and 4 respondents (40%) had scored between 75% and 100% during post-test.
In additions, 2 respondents (20%) had scored between 0% and 25% and 8 respondents (80%) during pre-test in brain gym treatment group. Besides, 5 respondents (50%) had scored gross motor abilities level between 25% and 50% and 3 respondents (30%) had scored gross motor abilities level between 50% and 75% during post-test.

Table 2. Respondent distribution of respondent frequency based on gross motor abilities of ABA and brain gym therapy.

| ABA level | Gross motor abilities range | Frequency | Percentage (%) | Post-test | Percentage |
|-----------|-----------------------------|-----------|----------------|-----------|------------|
| 1         | 0-25%                       | 1         | 10             | 0         | 0          |
| 2         | 25-50%                      | 9         | 90             | 2         | 20         |
| 3         | 50-75%                      | 0         | 0              | 4         | 40         |
| 4         | 75-100%                     | 0         | 0              | 4         | 40         |
| Total     |                             | 4         | 10             | 10        | 100        |

| Brain gym level | Gross motor abilities range | Frequency | Percentage (%) | Post-test | Percentage |
|-----------------|-----------------------------|-----------|----------------|-----------|------------|
| 1               | 0-25%                       | 2         | 20             | 2         | 20         |
| 2               | 25-50%                      | 8         | 80             | 5         | 50         |
| 3               | 50-75%                      | 0         | 0              | 3         | 30         |
| 4               | 75-100%                     | 0         | 0              | 0         | 0          |
| Total           |                             | 4         | 10             | 10        | 100        |

Table 3 shows that the normality test was obtained p-value= 0.000<0.05 which can be interpreted as normal distributed pre-test distribution. Meanwhile, post-test normality test was obtained p-value= 0.025<0.05 that can be interpreted normal distribution of non-normal distribution. The minimum and maximum of ABA treatment group in pre-test were 25 and 50 with median of 50. The post-test of ABA treatment group had minimum and maximum of 50 and 100 with median of 75. Besides, brain gym treatment group had minimum and maximum of 25 and 50 with median 50 in pre-test. In post-test, minimum and maximum were 50 and 100 with median of 75.

Table 3. Distribution of minimum, maximum and mean values on gross motor abilities before and after ABA and brain gym interventions.

| Gross motor abilities | N  | Median | Minimum | Maximum | Normality (P) |
|-----------------------|----|--------|---------|---------|---------------|
| ABA                   |    |        |         |         |               |
| Pre-test              | 10 | 50     | 25      | 50      | 0.000         |
| Post-test             | 10 | 75     | 50      | 100     | 0.025         |
| Brain gym             |    |        |         |         |               |
| Pre-test              | 10 | 50     | 25      | 50      | 0.000         |
| Post-test             | 10 | 75     | 50      | 100     | 0.025         |

ABA treatment group had mean of 14.3 and brain gym treatment group had mean of 6.7. The statistical test showed p-value=0.001<0.05 which meant there was difference between ABA and brain gym toward gross motor skills in autism children aged 6 years and 12 years.
Table 4. Influence of ABA and brain gym toward gross motor abilities in autism children school-aged.

| Gross motor abilities | N  | Mean | Asymp Sig. (**P) |
|-----------------------|----|------|------------------|
| ABA group             | 10 | 14.3 | 0.001            |
| Brain gym             | 10 | 6.7  |                  |
| Total                 | 20 |      |                  |

3.2. Discussion

The result showed there was difference between ABA and brain gym therapist with gross motor skill level in autism children school aged. ABA method had controlled the autism children’s gross motor ability due to improvement of the limbic system that regulated the appreciation and stored as long term memory.

The secondary hypothesis on the brain gym therapy is denied which meant the distraction of many environmental factors and ability of receptive language and ability to imitate various children movement are not well enough that there is better children ability doing more movement in support rather than being able to follow the instructions independently.

Meanwhile, brain gym had less focused leads lack of self-expression and learning activity. The problem occurs in this dimension such as underfocused, lack of attention, lack of understanding, lack in communication and lack in gross motor abilities.

In additions, ABA therapy was more effective than brain gym therapy in improving the abilities of an acute motoric among autism children school due to stimulation was given in movement form and turned into habituation and stored as long term memory. The autism children learned about the movement and children would learn positive reinforcement and become long term memory in form of movement ability.

Hence, ABA therapy is more effective than brain gym in handling autism children because ABA therapy is performed in trial and repeated with direct intervention directly on gross motor abilities. Besides, the autism children should train to perform basic first-hand abilities to increase the gross motor abilities.

4. Conclusion

In conclusion, ABA therapy is more effective than brain gym toward gross motor abilities skills in autism children aged between 6 years and 12 years. The 12 times of ABA therapy showed significant influence toward gross motor abilities skills. Furthermore, more ABA related study with more samples or brain gym with other techniques is needed.

References

[1] Bharatharaj, J., Huang, L., Krägeloh, C., Elara, M. R., & Al-Jumaily, A. (2018). Social engagement of children with autism spectrum disorder in interaction with a parrot-inspired therapeutic robot. *International Conference on Robotic and Smart Manufacturing, 133*(2018), 368-376.

[2] Najaafari, M. G., Sheikh, M., Hemayatatalab, R., Memari, A.H., Aderyani, M.R., & Hafizi, S. (2018). The effect of SPARK on social and motor skills of children with autism. *Pediatrics and Neonatology, 2018,* 1-7.

[3] Loukusa, S., Mäkinen, L., Kuusikko-Guffin, S., Ebeling, H., & Leinonen, E. (2018). Assessing social-pragmatic inferencing skills in children with autism spectrum disorder. *Journal of Communication Disorder, 73*(2018), 91-105.

[4] Martins, R., Bonito, L., Andrade, A., Albuquerque, C., & Chaves, C. (2015). The impact of the diagnosis of autism in parents of children. *Procedia- Social and Behavioral Sciences, 171* (2015), 121-15.

[5] Khantrejitriranon, A. (2018). Using a social story intervention to decrease inappropriate
behaviour of preschool children with autism. *Kasetsart Journal of Social Sciences*, 39(2018), 90-97.

[6] Runcharoen, S. (2014). The development of social interaction of children with autism in inclusive classroom. *Procedia-Social and Behavioral Sciences*, 116(2014), 4108-4113.

[7] Sitimin, S. A., Fikry, A., Ismail, Z., & Hussein, N. (2016). Work-family conflict among working parents of children with autism in Malaysia. *Procedia Computer Science*, 105 (2017), 345-352.

[8] Miyajima, A., Tateyama, K., Fuji, S., Nakaoka, K., Hirao, K., & Higaki, K. (2017). Development of an intervention programme for selective eating in children with autism spectrum disorder. *Hong Kong Journal of Occupational Therapy*, 30, 22-32.

[9] Ospina, M. B. et al. (2008). Behavioural and developmental interventions for autism spectrum disorder: a clinical systematic review. *PLoS ONE*, 3(1). doi: 10.1371/journal.pone.0003755

[10] Liu, T., Hamilton, M., Davis, L. and El Garhy, S. (2014). Gross motor performance by children with autism spectrum disorder and typically developing children on TGMD-2. *Child and Adolescent Behavior*, 2(1). doi: 10.4172/2375-4494.1000123