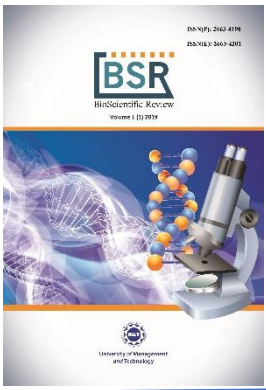

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The Effect of Rebound Therapy on Gross Motor Functions in a Child with Spastic Cerebral Palsy: A Case Study

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Abstract

Delayed development of the gross motor function abilities is the main manifestation of cerebral palsy (CP) in all children affected by it. Rebound therapy was introduced to help children with different disabilities such as CP. The aim of this case study was to assess the effect of the rebound therapy on the gross motor function abilities in a child with spastic CP. An eight year old girl with spastic CP of Level I on the gross motor function classification system (GMFSC) and graded 1 on the Modified Ashworth Scale (MAS) was selected to undergo the rebound therapy program using mini trampoline. Gross motor abilities were assessed pre- and post- rebound therapy program. The program was conducted for three successive months - three times / week for half an hour / session. The comparison of pre- and post- treatment results showed that rebound therapy improved the total gross motor function abilities by 3.8%, the sitting function by 5%, the kneeling and crawling functions by 3%, the standing function by 2.7% and the walking, running and jumping functions by 8% in a child with spastic CP. Rebound therapy was effective in improving gross motor function abilities in a child with spastic CP. However, further randomized control trials are recommended.

Keywords: Cerebral Palsy (CP), children, gross motor functions, rebound therapy, spasticity

List of Abbreviations: CP: Cerebral Palsy, GMFCS: Gross Motor Function Classification System**,** GMFM: Gross Motor Function Measure

1. Introduction

Cerebral palsy (CP) is an umbrella term [1] that refers to a permanent disorder of the infant brain caused by a non-progressive lesion. It impacts negatively the affected child's movements and posture leading to activity limitations [2].

The most common symptoms of CP include an impaired muscular tone, impaired motor functions, delayed gross motor functions, delayed fine motor skills and limitations in daily activities [3,4].

Rebound therapy is a therapeutic tool that uses trampoline to facilitate movements, improves balance and also improves motor performance in children with different disabilities, such as CP [5,6].

As a concept, rebound therapy is based on the physical principles of bouncing such as kinetic energy, Hooke's law,

Newton's third law and potential energy [7,8,9,10,11]. These properties lead to several biomechanical, physiological and therapeutic effects [11].

It is well established that rebound therapy enhances cardiovascular and pulmonary functions, modulates of muscle tone, improves kinesthetic awareness and also improves postural control [11]. Moreover, it helps the children with CP to improve their postural balance and enhances their muscular tone [12], resultantly improving their motor performance.

As far as we know, there is no available literature which discusses the effect of rebound therapy on the gross motor function abilities in children with spastic CP of Level 1 on Gross Motor Function Classification System (GMFCS).

The aim of the current case study was to reveal the effect of rebound therapy on the gross motor function abilities in a child with spastic CP. It was hypothesized that there was no effect of rebound therapy on the gross motor function abilities in a child with spastic CP.

2. Patient Profile

An 8 year old girl with spastic CP was selected for the rebound therapy intervention. The child fits in Level I on the GMFCS, which means she could walk independently [13] but there were some balance and coordination disturbances [14]. She was also graded 1 according to the Modified Ashworth Scale (MAS) for spasticity.

3. Management

Rebound therapy program using mini trampoline was designed to manage the child. The program was performed for 3 successive months - 3 sessions / week for half an hour / session. The child performed the entire program on the surface of the mini trampoline with bare feet.

3.1. Evaluation

Gross Motor Function Measure-88 (GMFM-88) assessment scale was used to assess the gross motor function abilities of the child, pre- and post-rebound therapy program. GMFM-88 is a very well used assessment scale that evaluates the gross motor functions. It is not limited by age and it consists of eighty-eight items categorized into the following five dimensions: (A) lying and rolling (B) sitting (C) crawling and kneeling (D) standing and (E) walking, running, and jumping. Each item is scored on a 4-point scale (0-1-2-3) [15]. The score reflecting the total gross motor function abilities including the scores of all the above mentioned functions was also calculated.

3.2. Treatment Program

In each session, the rebound therapy program given below was conducted. The program was divided into four parts. Firstly, positioning exercises were performed in the kneeling position, in the standing position with an erect posture with both feet on the mini trampoline surface and in single limb standing position. Secondly, the program included the squatting exercises, that is, the standard squatting exercise in addition to the single limb squatting exercise. Thirdly, the program included coordination exercises, such as catching and throwing ball from different positions including kneeling, standing, single limb standing and kicking the ball with feet, alternatively. Finally, jumping exercises and jumping while throwing a ball were conducted.

4. Results

The gross motor functions were assessed by GMFM-88 pre- and post-rebound therapy program.

4.1. Pretreatment Results

In Dimension (A), which assessed lying and rolling, the child scored 100%. In Dimension (B), which assessed the sitting function, she scored 93.3%. In Dimension(C), which assessed the crawling and kneeling abilities, she scored 97%. In Dimension (D), which assessed the standing function, she scored 87% and lastly, in Dimension (E), which assessed the walking, running and jumping functions, she scored 73.6%. The total unaided score was 90.18%. Unaided score means that the child was assessed without any assistive aids or orthosis.

4.2. Post Treatment Results

After three months of the rebound therapy program, the child was assessed again using the same assessment tool, that is, GMFM-88.

The percentage score of Dimension A was 100%. Dimension (B) was improved by achieving 98.3% score. Dimension (C) was also improved by achieving 100% score. Dimension (D) was improved by achieving 89.7% score and finally, Dimension E was improved by achieving 81.9% score. The total unaided score was 94% (Table 1).

4.3. Comparing the Pre- and Post-treatment Results

The post treatment results showed improvement by 3.8% in the total gross motor function abilities with 5% in the sitting function, 3% in the kneeling and crawling functions, 2.7% in the standing function, and 8% improvement in the walking, running and jumping functions in a child with spastic CP after the rebound therapy program.

5. Discussion

The current case study rejects the hypothesis and proves that the rebound therapy has a positive effect on the gross motor function abilities in a child with spastic CP. The results showed improvement in the total gross motor function score, as well as in the scores for the sitting function, kneeling and crawling functions, standing function and walking, running and jumping functions after three months of the rebound therapy program.

This case study selected the child using GMFCS as it is previously known to be a valid and reliable tool in classifying CP [16]. It is more likely to be used by the researchers rather than any other CP classification tool [17] as it is related directly to the gross motor abilities and limitations [18].

Table 1. The Pre- and Post- rebound Therapy Gross Motor Function Scores using GMFM-88

Variable	Dimension (A)	Dimension (B)	Dimension (C)	Dimension (D)	Dimension (E)	Total Score
Pretreatment	100%	93.3%	97%	87%	73.6%	90.18%
Post Treatment	100%	98.3%	100%	89.7%	81.9%	93.98%
% of Improvement (Post treatment-pretreatment %)	0%	5%	3%	2.7%	8%	3.8%

This case study selected GMFM-88 as the method of assessment of gross motor functions due to its validity [19] and reliability [20], previously confirmed by a research performed on eighty-four children with CP. GMFM was found to have an excellent reliability (0.952-1.000), acceptable smallest real difference (1.60) and acceptable standardized response mean (3.14) [19].

The results of the current study were confirmed by Mohamed et al. [21]. They performed a randomized control trail using the rebound therapy via a Swiss ball. They revealed that there was improvement in the GMFM scores for items 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 33, 34, 35, 36, 37 in the sitting domain and a significant difference as compared to the control group.

The current case study agrees with the findings of a single subject study which revealed that the rebound therapy using bungee trampolining improved the scores of items 34 and 53 in GMFM in the subject. It also showed improvement in motor performance [12].

The gross motor function abilities are proven to be highly related to balance [22]. So, if the balance improves in a child with CP, it will lead to improvement in the gross motor functions.

Mansouri,Qasemi, and Sadeqi conducted a randomized control trial to evaluate the efficiency of the rebound therapy on balance in children with spastic CP. The results proved that there was a significant improvement in balance in children with CP in the rebound therapy group as compared to the other control group [23].

In another randomized control trial assessing the impact of the rebound therapy on balance in children with CP, Abd-Elmonem et al. [24] mentioned that there was a significant improvement in the rebound therapy subjects as compared to the control group subjects.

This results of this case study contradict a pilot study that showed no changes in the GMFM despite showing a significant improvement in motor performance [25].

6. Conclusion and Recommendations

Rebound therapy improved the gross motor functions in a child with spastic CP, specially the sitting, kneeling and crawling, standing, walking, running and jumping functions. Further randomized control trials are recommended to assess the effect of the rebound therapy on the gross motor functions in children with CP as a single case study is not enough for drawing certain conclusions. Also, we recommend further randomized control trials to assess the effect of the rebound therapy on other aspects such as balance, playfulness and gait.

References

[1] Blair E, Cans C. The Definition of Cerebral Palsy. In: Panteliadis CP, ed. *Cerebral Palsy A Multidisciplinary Approach*. Cham: Springer International Publishing; 2018:13-17.

[2] Chen A, Dyck Holzinger S, Oskoui M, et al. Losing a diagnosis of cerebral palsy: a comparison of variables at 2 and 5 years. *Dev Med Child Neurol*. 2020;62(1):83-88. https://doi.org/10.1111/dmcn.14309

[3] Park EY. Gross motor function and activities of daily living in children and adolescents with cerebral palsy: a longitudinal study. *J Dev Phys Disabil*. 2018;30(2):189-203. doi:10.1007/s10882-017-9579-4

[4] Thapa R. Symptom recognition and diagnosis of cerebral palsy in Nepal. *J Autism Dev Disord*. 2017;47(6):1739-1748. doi:10.1007/s10803-017-3090-8

[5] Rebound Therapy South Africa. What Is Rebound Therapy? Rebound Therapy.org.http://rebound-therapy.co.za/.Published 2020. Accessed March 19, 2020.

[6] The Chartered society of Physiotherapists. Safe practice in Rebound Therapy. *Chart Soc Physiother*. 2016:1-14.

[7] Physics for Trampoline. Physics for Trampoline.https://sites.google.com/site/physicsfortrampoline/newtonsthreelaws/other. Published 2020. Accessed March 19, 2020.

[8] Pendrill AM, Eager D. Free fall and harmonic oscillations: analyzing trampoline jumps. *Phys Educ*. 2014;50(1):64-70.

[9] Gornyi I, Kachorovskii V, Mirlin A. Anomalous Hooke's law in disordered graphene. *2D Mater*. 2017;4(1):1-6. https://doi.org/10.1088/20531583/4/1/011003

[10] Shakir S, Naran S, Lowe KM, Bartlett SP. Balancing distraction forces in the mandible. *Plast Reconstr Surg-Glob Open*. 2018;6(9):e1856.

[11] Kaye P, Anderson E. *What is Rebound Therapy*. 2020:1-60.

[12] Germain AM, Blackmore AM, Gibson N, et al. Effects of adaptive bungee trampolining for children with cerebral palsy a single-subject study. *Pediatr Phys Ther*. 2019;31(2):165-174. doi:10.1097/PEP.0000000000000584

[13] Martakis K, Stark C, Rehberg M, et al. One-minute walk test in children with cerebral palsy GMFCS level 1 and 2: reference values to identify therapeutic effects after rehabilitation. *Dev Neurorehabil*. 2020;23(4):201-209. https://doi.org/10.1080/17518423.2019.1625981

[14] Fiss AL, McCoy SW, Bartlett D, et al. Developmental trajectories for the early clinical assessment of balance by gross motor function classification system level for children with cerebral palsy. *Phys Ther*. 2019;99(2):217-228. https://doi.org/10.1093/ptj/pzy132

[15] Ko J. Sensitivity to functional improvements of GMFM-88, GMFM-66, and pedi mobility scores in young children with cerebral palsy. *Percept Mot Skills*. 2014;119(1):305-319. https://doi.org/10.2466/03.25.PMS.119c14z1

[16] Kora A, Abdelazeim F. Immediate effect of vertibrace dynamic on gross motor function in a child with spastic cerebral palsy: A case study. *Biosci Rev*. 2019;1(1):54-59. https://doi.org/10.32350/BSR.0101.07

[17] Kora A, Abdelazeim F, Olama K, et al. Effect of different kinesio taping applications on ankle range in children with spastic cerebral

palsy: a comparative study. *Asian J Adv Res Reports*. 2018;1(3):1-8. https://doi.org/10.9734/ajarr/2018/v1i313059

[18] Can Child. Gross Motor Function Classification System - Expanded & Revised. Can Child. https://canchild.ca/en/resources/42-gross-motor-function-classification-system-expanded-revised-gmfcs-e-r. Published 2020. Accessed June 20, 2020.

[19] Shin HI, Sung KH, Chung CY, et al. Relationships between isometric muscle strength, gait parameters, and gross motor function measure in patients with cerebral palsy. *Yonsei Med J*. 2016;57(1):217-224.

[20] Bowden A. Primitive Reflex Integration in Intensive Physical Therapy and Gross Motor Function in Children with Cerebral Palsy : A Case Report. 2019. https://ir.uiowa.edu/pt_casereports/75.

[21] Mohamed KA, Kamal HM, Abd El-Nabi W, et al. The effect of rebound therapy on sitting in children with cerebral palsy. *Med J Cairo Univ*. 2018;86(12):3963-3969.

[22] Liao HF, Hwang AW. Relations of balance function and gross motor ability for children with cerebral palsy. *Percept Mot Skills*. 2003;96(3):1173-1184. https://doi.org/10.2466/pms.2003.96.3c.1173

[23] Mansouri S, Qasemi Q, Sadeqi M. Effect of 8 weeks rebound therapy on balance, flexibility and muscle strength of the knee in children with spastic cerebral palsy. In: *8th Internartional Congress on Physical Education and Sport Sciences*. Tehran: Sport Sciences Research Institude of Iran; 2015.

[24] Abd-Elmonem AM, Elhady HS. Effect of rebound exercises on balance in children with spastic diplegia. *Int J Ther Rehabil*. 2018;25(9):467-474. https://doi.org/10.12968/ijtr.2018.25.9.467

[25] Duff C, Sinani C, Marshall P, et al. Can rebound therapy improve gross motor skills and participation in children with cerebral palsy? *Assoc Paediatr Chart Physiother J*. 2016;7(1):4-13.