

THE INFLUENCE OF PHYSICAL THERAPIST APPROACH IN THE PARENT'S COMPLIANCE OF INFANTILE CEREBRAL PALSY DIAGNOSED CHILDREN. A RANDOMIZED CONTROLLED TRIAL

Alexandru Mădălin DINA^{1*}, Victorița PAVEL²

*Received 2023 May 24; Revised 2023 June 19; Accepted 2023 June 20;
Available online 2023 July 30; Available print 2023 August 30.*

©2023 Studia UBB Educatio Artis Gymnasticae. Published by Babeş-Bolyai University.



This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License

ABSTRACT. Many methods of approaching the parents or guardians of neuromuscular diagnosed 0-4 years old children have been investigated, and the most efficient on the long period of time, as the diagnose needs a long-term medical program, has been found to be the clearly, detailed and constructive information. The lack of discernment and reason of a 0-4 year old child make his family role essential after the medical diagnose, especially the parents or guardians (P/G). The study's objective is to demonstrate that the physical therapist relationship with P/G determines his treatment compliance. The research is based on the data collected from 2 groups, representative sample and a control group. Both groups followed the instructions of the medical rehabilitation program *DinaCord* which had a 4 months duration, being designed the same but having other approach from the physical therapist side, depending on which group the subjects belonged. The specialist's participation must be active in both ways of transmitter and receiver. Thereby, the transmitted information is received then processed by the parent or guardian depending on the reception and empathize of the physical therapist by the paraverbal, nonverbal and verbal parent or guardian feedback. As results, the rehabilitation program has better output when the physical therapist's P/G approach is optimized, compared to a passive information transmitter physical therapist. The conclusions underline the parent or guardian (P/G) compliance potential in the physical therapy program

¹ *National University of Physical Education and Sports, Faculty of Physiotherapy, U.N.E.F.S., Bucharest, Romania*

² *Recumed Medical Center, Bucharest, Romania.*

* *Corresponding author: dina_alex76@yahoo.com*

as he is let know about all the information consisting of the diagnosis, the approach (the therapy, the consequences, the result projection in an estimated period of time) and the influence of an active participation from his part.

Keywords: *active participation, parent or guardian compliance, cerebral palsy, rehabilitation, physical therapist approach.*

REZUMAT. Influența abordării fizioterapeutului asupra complianței părintelui copilului diagnosticat cu paralizie cerebrală infantilă. Studiu clinic randomizat.

Există numeroase studii care au investigat metodele de abordare a părinților sau tutorilor copiilor cu vârsta 0-4 ani diagnosticați cu sindrom neuromuscular de către fizioterapeuți. Iar cele mai eficiente pe o perioadă lungă de timp, deoarece diagnosticul necesită un program medical de recuperare de lungă durată, s-au dovedit a fi cele în care sunt prezentate informații clare, detaliate și constructive. Lipsa de discernământ și rațiune a unui copil de 0-4 ani fac ca rolul familiei sale să fie esențial după diagnosticare, în special a părintelui sau tutorelui (P/T). Obiectivul acestui studiu este să demonstreze că relația fizioterapeutului cu P/T influențează complianța acestuia la tratament. Cercetarea se bazează pe colectarea datelor de la 2 grupe, un grup ce reprezintă un eșantion reprezentativ al populației și un grup de control. Ambele grupe au urmat instrucțiunile programului de reabilitare medicală DinaCord, care a avut o durată de 4 luni, însă abordarea fizioterapeutului a fost diferită. Participarea specialistului trebuie să fie activă în ambele roluri, de emițător și receptor. Astfel, informațiile sunt transmise către P/T și apoi procesate de către acesta, în funcție de recepționarea lor și empatizarea de către fizioterapeut a răspunsului paraverbal, nonverbal și verbal al P/T. Ca rezultat, programul de recuperare medicală are rezultate mai bune atunci când abordarea P/T de către fizioterapeut este optimizată, în comparație cu o abordare pasivă a transmiterii informațiilor de către fizioterapeut. Concluziile acestui studiu subliniază potențialul complianței la tratament a părintelui sau tutorelui în cadrul programului de recuperare medicală, prin transmiterea acestuia a datelor cu privire la diagnostic, abordare (terapia aplicată, consecințe, proiecția rezultatelor pe o perioadă estimată), cât și influența unei participări active din partea sa.

Cuvinte cheie: *participare activă, complianța părintelui sau tutorelui, paralizie cerebrală, recuperare medicală, abordarea fizioterapeutului.*

INTRODUCTION

The upper motor neuron lesion is represented by any injury of the motor neurons located above the nuclei of the cranial nerves or the spinal cord's anterior horns (Emos & Agarwal, 2021). The totality of the symptoms which define the central motor neuron lesion is called the upper motor neuron syndrome (UNMS).

The main characteristics is the alteration of the motor coordination, fine motor skills, muscle fatigue and accentuation of spasticity, dystonia, synkinesis, clonus, osteotendinous reflexes (Murvanidze, 2017).

The most common type of the central motor neuron injury is the cerebral palsy, as it is the most common cause of disability at the child age (Morgan et al., 2021).

In the recent studies made by CDC (Centers for Disease Control and Prevention of U.S.), it is observed the incidence of cerebral palsy around the world with 1.5 – 4 cases per 1000 children (Durkin et al., 2016). In Europe, there are 80 cases per 1000 births for 28-35 weeks of gestation and 1 to 1.7 cases per 1000 births for at least 37 weeks of gestation (Pakula et al., 2009).

The study entitled *Medical expenditures attributable to cerebral palsy and intellectual disability among Medicaid-enrolled children*, published by Vijaya Kancherla et al. in 2012, showed how much it costs the yearly medical aid for a child with cerebral palsy, in comparison with a child who has not a known diagnosis. The study was made on the children registered in 2005 on the *Medicaid* medical platform. The total medical costs for the entire year for a child without a known diagnosis were \$1674, for a child with cerebral palsy were \$16721 (almost 1000% out of \$1674) and for a child with cerebral palsy and mental retardation were \$43338 (about 2600% of \$167).

The study made in 2012 by Koshy & Brabin on the population of Liverpool shows us the reducing tendency of the parent's compliance.

According to Menahem & Halasz (2000), the number of non-compliance parents is growing and related to the anxiety state. There is a direct relation between anxious people and unwell or unable to comply the specialist's recommendations. Also, Baias & Sandor (2023) describe that parents who have a better understanding of adaptive sport actively promote the participation of children with disabilities into physical education activities.

The study realized in 2019 by Hielkema & Boxum, demonstrates the importance of an active role of parents in the physical therapy program, with a minimal difference between a physical therapy program applied by parent (82) versus physical therapist (81). The evaluation scale used were *Gross Motor Function Measure - GMFM* – (Alotaibi, et al., 2013) and a video measurement system called *Infant Motor Profile* (Heineman et al., 2011).

OBJECTIVE

Our objective is to demonstrate that an optimized physical therapist relationship with P/G determines a good treatment compliance for his cerebral palsy diagnosed child.

MATERIALS AND METHODS

Subjects

Between September 2017 and June 2021, it was elected a group of 25 subjects with the formal and informal consent of the P/G. This study was a randomized controlled trial and was made in the clinic's pediatric department of Recumed Medical Center Bucharest and Regina Maria Bucharest. All the subjects were diagnosed with UNMS, evaluated and treated by the physical therapy program. The subjects selection was made by following the myofascial and functional evaluation to know clearly the motor capacity and the impairment level of each subject.

The inclusion criteria of the subjects was:

- the upper motor neuron syndrome diagnosis (consisting in cerebral palsy);
- 0-2 years motor age;
- 0-4 years chronological age;
- P/G minimal compliance;
- similar clinical picture.

The exclusion criteria of the subjects was

- any other diagnosis than the upper motor neuron syndrome;
- >2 years motor age;
- >4 years chronological years age;
- no P/G treatment compliance.

The subjects were divided into two groups, as below:

- *group 1* - 15 subjects;
- *group 2* - 10 subjects;
- each accepted subject received a number, in the order of acceptance, as follow:
 - for the group 1, a number from 1 to 15;
 - for the group 2, a number from 1 to 10;
- the acronym 'G1' for the group 1 subjects and the acronym 'G2' for the group 2 subjects.

Instruments

The subjects from both groups, group 1 and group 2, were evaluated from the neuromotor, somatic and osteopathic point of view with the complex evaluation scale *DinaCord*.

DinaCord's evaluation scale is divided as follows:

- *the motor evaluation:*
 - the assessment score obtained on each motor development intermediate stage;
 - the total score of all motor tests which quantify the subject's motor development;
 - the percentage represents the subject's neuromotor development level compared with a 2 year old subject with an unaltered neuromotor development level, which is the maximum percentage. The maximum score (100%) is 240 points and the minimum optimal score (80%) is 192 points;
 - the neuromotor age is reported to the minimum optimal score value (80%) per motor age compared to the maximum score per motor age;
- *the somatic evaluation;*
- *the osteopathic evaluation.*

By considering the 2 years old motor age as the final stage of the neuromotor rehabilitation process, the *DinaCord* evaluation system (Table 1) has expressed the obtained score of each subject in percentage by reporting it to the maximum possible score (240 points). On this way, we appreciated the rehabilitation pace and we were able to predict the neuromotor evolution of the subject.

Table 1. The neuromotor development appreciation in the DinaCord system

Motor age	Maximum score per motor age/ Percentage of maximum total score	Minimum optimal score per motor age/ Percentage of maximum total score
1 month	6 / 2.5%	4.8 / 2%
2 months	12 / 5%	10 / 4.16%
3 months	20 / 8.33%	16 / 6.67%
4 months	57 / 23.75%	45.6 / 19%
5 months	75 / 31.25%	60 / 25%
6 months	115 / 47.29%	92 / 38.33%
7 months	123 / 51.25%	98.4 / 41%
8 months	153 / 63.75%	122.4 / 51%
9 months	175 / 72.92%	140 / 58.33%
10 months	190 / 79.17%	152 / 63.33%
11 months	210 / 87.5%	168 / 70%
12 months	220 / 91.67%	176 / 73.33%
15 months	225 / 93.75%	180 / 75%
18 months	230 / 95.83%	184 / 76.67%
24 months	240 / 100%	192 / 80%

A considered full recovered subject means he has both ages correlated, the chronological and the motor one.

Methods

As Forsyth et al. (2022) conclude in his study, both groups followed the instructions of the medical rehabilitation program *DinaCord* which had a 4 months duration, being designed the same but having other approach from the physiotherapist side, depending on which group the subjects belonged. In other words, the P/G of the 15 subjects from the group 1 received a high amount and explicit information of what does it mean the diagnosis, the physiotherapy program's approach, the consequences involved in such a diagnose, the result projection for a 4 months therapy and for a long term therapy, similar cases as examples and the influence of an active participation from their part.

The P/G of the 10 subjects from the group 2 received very few information about the diagnosis, the physiotherapy program's approach, the consequences involved in such a diagnose, the result projection for a 4 months therapy and for a long term therapy, similar cases as examples and the influence of an active participation from their part.

The *DinaCord* rehabilitation program represents a set of myofascial and bone manipulations followed by active and pasivo-active physical exercises, all in a specific order. Depending on the part of the body involved, the proposed rehabilitation program is structured as follows:

- segmental - applied techniques on the neck and trunk level;
 - applied techniques on the upper limbs level;
 - applied techniques on the lower limbs level.
- global - globally functional techniques.

We used the Mann-Whitney U test to compare the differences between our two independent groups, the experimental and the control one. Instead of choosing t-test, because the assumptions are not met, we chose the Mann-Whitney U, which means that sample distributions are not normally distributed and the sample sizes is small. The probability value's level of significance used is >0.05 , representing the standard of probability that the alternative hypothesis is true.

For statistical processing the data, it had been used Microsoft Office Excel version 16.66. The use of this tool is due to his multitude of statistical procedures, the table processing program and graphical integration of data.

RESULTS

All the subjects included in this study had the same diagnose, infantile cerebral palsy, each one of them met the inclusion criteria and didn't meet the exclusion criteria.

The percentage value is the percentage of the total score of the subject which is compared with the maximum possible score (240); it's the parameter that shows the evolution pace of the subject.

The motor age represents the neuromotor development level of the subject and is related to the chronological age.

The total score represents the sum of all points obtained in by a subject in each motor race.

The processed data shows significant differences between the two evaluations, initial and final on both groups (Table 2 and Table 4).

Table 2. Group 1- motor evaluation results

Registered number	Total score			Percentage (%)			Motor age		
	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference
1	78	161	83	32	67	35	5 1/2 months	10 1/2 months	5 months
2	116	166	50	48	69	21	7 1/2 months	11 months	3 1/2 months
3	34	73	39	14	30	16	3 1/2 months	5 1/2 months	2 months
4	10	140	130	4	58	54	2 months	9 months	7 months
5	10	31	21	4	12	8	2 months	3 1/2 months	1 1/2 months
6	59	80	21	24	33	9	5 months	5 1/2 months	1/2 months
7	155	194	39	64	80	16	10 months	2 years	1 year and 2 months
8	9	25	16	3	10	7	1 1/2 months	3 1/2 months	2 months

Registered number	Total score			Percentage (%)			Motor age		
	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference
9	146	218	72	60	90	30	9 1/2 months	2 years	1 year and 2 1/2 months
10	83	173	90	34	72	38	5 1/2 months	1 year	6 1/2 months
11	89	112	23	37	46	9	6 months	7 1/2 months	1 1/2 months
12	125	176	51	52	73	21	8 months	1 year	4 months
13	100	143	43	41	59	18	7 months	9 months	2 months
14	120	177	57	50	73	23	8 months	1 year	4 months
15	162	223	61	67	92	25	10 1/2 months	2 years	1 year and 1 1/2 months
Average	86.4	139.4	53	35.6	57.6	22	6.1 months	11.5 months	5.4 months

The Mann-Whitney U test was applied to the experimental group and the results demonstrated that there is a significant difference between the initial and final evaluation (Table 3). The U-value is 56, comparing with critical U-value which is 64; the Z-score is -2.32277. The p-value is 0.02034, while the effect size index $r = 0.599$ meaning that the results are conclusive.

The Mann-Whitney U test was applied to the experimental group and the results demonstrated that there is a significant difference between the initial and final evaluation (Table 5). The U-value is 31, comparing with critical U-value which is 23; the Z-score is -1.39847. The p-value is 0.16152, while the effect size index $r = 0.44$ meaning that the results are conclusive.

THE INFLUENCE OF PHYSICAL THERAPIST APPROACH IN THE PARENT'S COMPLIANCE
OF INFANTILE CEREBRAL PALSY DIAGNOSED CHILDREN

Table 3. Mann-Whitney U test for initial and final evaluation of group 1

	Values
U-value	56
Critical U-value	64
Z-score	-2.32277
p-value	0.02034
r	0.599

Table 4. Group 2 - motor evaluation results

Registered number	Total score			Percentage (%)			Motor age		
	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference
1	45	69	24	18	28	10	4 months	5 1/2 months	1 1/2 months
2	117	141	24	48	58	10	7 1/2 months	9 months	1 1/2 months
3	94	104	10	39	43	4	6 1/2 months	7 1/2 months	1 month
4	109	119	10	45	49	4	7 1/2 months	8 months	1/2 months
5	92	107	15	38	44	16	6 months	7 1/2 months	1 1/2 months
6	35	38	3	14	15	1	3 1/2 months	3 1/2 months	0
7	104	126	22	43	52	9	7 1/2 months	8 months	1/2 months
8	71	92	21	29	38	9	5 1/2 months	6 months	1/2 months
9	98	106	8	40	44	4	7 months	7 1/2 months	1/2 months
10	105	131	26	43	54	11	7 1/2 months	8 1/2 months	1 month
Average	87	103	16	35	42	8	6.2 months	7.1 months	0.9 months

Table 5. Mann-Whitney U test for initial and final evaluation of group 1

	Values
U-value	31
Critical U-value	23
Z-score	-1.39847
p-value	0.16152
r	0.44

The difference between initial evaluation and final evaluation (Table 6) of the average group 1 total score (53) is superior in term of value, in comparison with the average group 2 total score (16).

The difference between initial evaluation and final evaluation of the average group 1 motor age (5.4 months) is superior in comparison with the average group 2 motor age (0.9 months).

Table 6. The difference between the 2 groups on initial and final evaluation

Registered number	Total score -average-			Motor age (months) -average-		
	Initial evaluation	Final evaluation	Difference	Initial evaluation	Final evaluation	Difference
G1	86.4	139.4	53	6.1	11.5	5.4
G2	87	103	16	6.2	7.1	0.9
Difference G1 - G2	-0.6	36.4	37	-0.1	4.4	4.5

The Mann-Whitney U test was applied on the initial evaluation score and the results demonstrated that there is not a significant difference between the experimental and control groups (Table 7). The U-value is 74, comparing with critical U-value which is 39; the Z-score is 0.02774. The p-value is 0.97606, as there are no significant difference between the two groups.

THE INFLUENCE OF PHYSICAL THERAPIST APPROACH IN THE PARENT'S COMPLIANCE
OF INFANTILE CEREBRAL PALSY DIAGNOSED CHILDREN

Table 7. Result of intergroup Mann-Whitney U test - initial score

	Values
U-value	74
Critical U-value	39
Z-score	0.02774
p-value	0.97606

The Mann-Whitney U test was applied on the final evaluation score and the results demonstrated that there is a significant difference between the experimental and control groups (Table 8). The U-value is 41, comparing with critical U-value which is 39; the Z-score is 1.85825. The p-value is 0.6288, meaning that the results are conclusive.

Table 8. Result of intergroup Mann-Whitney U test - final score

	Values
U-value	41
Critical U-value	39
Z-score	1.85825
p-value	0.6288

DISCUSSION

The results show that the rehabilitation specialist has a very important role in the therapy. Not only to apply the learned methods, but also to lead the entire relationship between the child, P/G and himself. Spending time on making the P/G understand all the information and consequences, it's a game changer for the entire therapy and furthermore for the child's life. According to Morgan et al. (2021) there is a recommendation for parents psychological support, as they are experiencing anxiety, stress or depression. Menahem & Halasz (2000) also said that 56% of the children from foster home have mental instability diagnosed parents.

The results demonstrate that the physical therapy's compliance of the P/G leads to a better evolution of the upper motor neuron syndrome. According to Whittingham, Sanders, McKinlay & Boyd (2016) the empathic and evidence-based communication is necessary for the parents, as new concerns and issues are raised.

Further research can make a better understanding of how to work on the most efficient physical therapist's approach in relation with the P/G.

CONCLUSIONS

Our research has clarified the issue of applying the typology of treatment applied to patients diagnosed with upper motor neuron lesion with motor age 0-2 years and chronological age 0-4 years. The optimized physical therapist's approach is a game changer for the P/G compliance.

The results after the 4 months physiotherapy method *DinaCord* sessions proposed, including functionally active physical exercises with myofascial stress relief and the amelioration of the bone relations, were very conclusive, as the P/G compliance was high for all the cases for the subjects from group 1 but low for all the cases for the subjects from group 2.

The processed data analysis of difference between the percentage score of initial evaluation and the final evaluation shows that the compliance of P/G is essential for an efficient rehabilitation. Otherwise, the communication role between physical therapist and P/G is directly related to the P/G compliance level.

The group 1 obtained a higher value of functional level (53) compared to group 2 (16). The *DinaCord* evaluation scale was the quantification tool through which the values had been calculated as the average difference between the initial evaluation and final evaluation.

After comparing the average total score values obtained by the two groups, we conclude that an objective, proactive and detailed communication can make the difference between an efficient or not physical therapy session.

ACKNOWLEDGMENT

We declare that this original study was not published elsewhere and wasn't funded by any other organization. There is no conflict of interest. The patient's parents were informed about the study. All the authors had an equal contribution.

REFERENCES

- Alotaibi, M., Long, T., Kennedy, E., & Bavishi, S. (2013). The efficacy of GMFM-88 and GMFM-66 to detect changes in gross motor function in children with cerebral palsy (CP): a literature review. *Disability and Rehabilitation*, 36:8, 617-627. Doi:10.3109/09638288.2013.805820;
- Baias, S., Sandor, I. (2022). Sports practice as therapeutic method in physical rehabilitation programs for children with special education needs. *Studia UBB Educatio Artis Gymnasticae*, 67(4),17-28. Doi:10.24193/subbeag.67(4).30;
- Durkin, M., et al., (2010). Prevalence of Cerebral Palsy among 8-Year-Old Children in 2010 and Preliminary Evidence of Trends in Its Relationship to Low Birthweight. *Paediatric and perinatal Epidemiology*, 30(5), 496-510. Doi: <https://doi.org/10.1111/ppe.12299>;
- Emos, M., C., & Agarwal, S. (2021). Neuroanatomy, upper motor neuron lesion. *PubMed*, <https://pubmed.ncbi.nlm.nih.gov/30725990/>;
- Forsyth, R., J., Roberts, L., Henderson, R., & Wales, L. (2022). Rehabilitation after paediatric acquired brain injury: longitudinal change in content and effect on recovery. *Developmental medicine & child neurology*,64(9), 1168-1175. Doi: <https://doi.org/10.1111/dmcn.15199>;
- Heineman, K., Bos, A., & Hadders-Algra, M. (2011). Infant Motor Profile and cerebral palsy: promising associations. *Developmental medicine & child neurology*, 53(4), 40-45. Doi: <https://doi.org/10.1111/j.1469-8749.2011.04063.x>;
- Kancherla, V., Amendah, D., D., Grosse, S., D., Yeargin-Allsopp, M., & Braun, K., N. (2012). Medical expenditures attributable to cerebral palsy and intellectual disability among Medicaid-enrolled children. *Research in Developmental Disabilities: A Multidisciplinary Journal*, 33(3), 832-840. Doi: <https://doi.org/10.1016/j.ridd.2011.12.001>;
- Koshy, G., & Brabin, B. J., (2012). Parental compliance – an emerging problem in Liverpool community child health surveys 1991-2006. *BMC Medical Research Methodology*, 12(53). Doi: <https://doi.org/10.1186/1471-2288-12-53>;
- Menahem, S., & Halasz, G. (2000). Parental non-compliance – a paediatric dilemma. A medical and psychodynamic perspective. *Child Care Health and Development*, 26(1), 61-72. Doi: 10.1046/j.1365-2214.2000.00115.x;
- Morgan, C., et al., (2016). Effectiveness of motor interventions in infants with cerebral palsy: a systematic review. *Developmental medicine & child neurology*, 58(9), 900-909. Doi: <https://doi.org/10.1111/dmcn.13105>;
- Morgan, C., et al., (2021). Early Intervention for Children Aged 0 to 2 Years With or at High Risk of Cerebral Palsy: International Clinical Practice Guideline Based on Systematic Reviews. *JAMA Pediatrics*, 175(8), 846-858. Doi: <https://doi.org/10.1001/jamapediatrics.2021.0878>;

- Murvandize, E., (2017). Effects of early regular physical therapy treatment on gross motor function of children with cerebral palsy. *Journal of Physical Education and Sport*, 17(1), 284-287. Doi: 10.7752/jpes.2017.01042;
- Pakula, A., T., Braun, K., N., & Yeargin-Allsopp, M. (2009). Cerebral palsy: classification and epidemiology. *Physical medicine and rehabilitation clinics of North America*, 20(3), 425-52. Doi: <https://doi.org/10.1016/j.pmr.2009.06.001>;
- Sellier, E., Platt, M., J., Andersen, G., L., Krägeloh-Mann, I., De La Cruz, J., & Cans, C. (2015). Decreasing prevalence in cerebral palsy: a multi-site European population-based study, 1980 to 2003. *Developmental medicine & child neurology*, 58(1), 85-92. Doi: <https://doi.org/10.1111/dmcn.12865>;
- Whittingham, K., Sanders, M., McKinlay, L. & Boyd, R. (2016). Parenting Intervention Combined with Acceptance and Commitment Therapy: A Trial with Families of Children with Cerebral Palsy. *Journal of Pediatric Psychology*, 41(5), 531-542. Doi: <https://doi.org/10.1093/jpepsy/jsv118>.