

Intervening to Enhance The Occupational Performance of Children With Obstetrical Brachial Plexus Palsy: A Randomized Controlled Trial

Songül Atasavun Uysal Assoc. Prof¹ , Eda Tonga Assoc. Prof ²

¹Department of Physical Therapy and Rehabilitation, Faculty of Health Sciences, Hacettepe University, Ankara, Turkey

² Department of Physical Therapy and Rehabilitation,, Faculty of Health Sciences, Marmara University, Istanbul, Turkey

Corresponding author:

Songül Atasavun Uysal, Department of Physical Therapy and Rehabilitation, Faculty of Health Sciences, Hacettepe University, 06100 Samanpazarı ANKARA / TURKEY

Email: songula@hacettepe.edu.tr

Abstract

Purpose: To investigate the benefits of intervening to enhance the occupational performance of children with obstetrical brachial plexus palsy (OBPP).

Methods: Twenty- nine children with OBPP, 4-7 years aged, participated in this study. Intervention group composed of six girls and 12 boys. They participated in 40 minutes to 36 sessions of intervention. Both intervention and control group children' occupational performance issues were determined by the COPM. The Pediatric Evaluation of Disability Inventory (PEDI) used for evaluating the function in children and level functional independence of a child in activities of daily living was evaluated with The Functional Independence Measure for Children (WeeFIM).

Results: COPM, PEDI, WeeFIM scores demonstrated statistically significant improvement ($p<0.01$) in occupational performance in the intervention group. Significant correlations were found between COPM performance and PEDI ($p<0.01$) in change scores.

Conclusions: The present study is the first study about occupational performance intervention with COPM application in the children with OBPP. The present study suggests intervening to enhance the occupational performance and COPM as useful for the children with OBPP.

Keywords: activities of daily living, brachial plexus neuropathies, randomized controlled trial

Obstetrik Brakiyal Pleksus Palsili Çocukların Occupational Performansının Geliştirilmesine Yönelik Müdahale: Randomize Kontrollü Bir Deneme

ÖZ

Amaç: Obstetrik brakiyal pleksus paralizili (OBPP) çocukların *occupational* (anlamli ve amaçli aktivite) performanslarını arttırmak için yapılan müdahalenin yararlarını arařtırmaktır.

Yöntem: Bu çalıřmaya OBPP tanısı olan, 4-7 yařları arasında yirmi dokuz çocuk katıldı. Müdahale grubu altı kız ve 12 erkekten oluřmaktadır. 36 seans müdahaleye 40 dakika katıldılar. Hem müdahale hem de kontrol grubu çocuklarının *occupational* performans sorunları COPM tarafından belirlendi. Engelli Envanterinin Pediatrik Deęerlendirmesinde kullanılan (PEDI) ve çocuęun günlük yařam aktivitelerindeki fonksiyonel baęımsızlık düzeyinin deęerlendirilmesinde Çocuklar için İşlevsel Baęımsızlık Ölçeęi (WeeFIM) ile deęerlendirilmiřtir.

Sonuçlar: COPM, PEDI, WeeFIM skorları, müdahale grubunda *occupational* performansta istatistiksel olarak anlamli artış ($p < 0.01$) görüldü. COPM performansı ile PEDI arasında skorların deęiřtięi anlamli korelasyon bulundu ($p < 0.01$).

Tartıřma: Bu çalıřma, OBPP'li çocuklarda COPM uygulaması ile *occupational* performans müdahalesine iliřkin ilk çalıřmadır. Bu çalıřma, *occupational* performansı ve COPM'yi , OBPP'li çocuklar için yararlı bulunarak müdahale etmeyi önermektedir.

Anahtar kelimeler: günlük yařam aktiviteleri, brakial pleksus, randomize kontrollü

INTRODUCTION

An obstetric brachial plexus lesion (OBPL) is caused by traction of the brachial nerves during birth (1). Despite nerve reconstruction, this injury leads to activity limitations and participation restrict (2). When these children grow older some occupations and limitations will increase with age (3). These limitations become more obvious at the age of 4-6 years, when children perform an increasing number of occupations that require the involvement of both arms and hands as bimanual (2).

Occupational performance is the ability to choose, organize, and satisfactorily execute meaningful occupations that are culturally defined and age-appropriate for self-care, enjoying life, and contributing to the social and economic fabric of a community (4). Occupational performance is also the result of the dynamic relationship between the person, the occupation, and the environment. Participating in daily life functions is a vital part of human development and living experience. Through participation, children can acquire skills and competencies, connect with others, and find purpose and meaning in life (4, 5). Intervention for children should focus on enabling participation in everyday occupations that are meaningful to them or their families, providing fulfillment, and engaging them in everyday life with others (6). The purpose of intervention is to assist the child in coping as independently as possible with age-appropriate functions. The therapist assesses the child's use of the arms and hands, as well as possible injury-related limitations to play, daily actions and pastimes. Based on this assessment, the therapist works with the child and the family to find ways to support the child's coping ability (4, 5, 7). The therapist may provide tips for daily activities such as eating, dressing and appropriate toy choices. In the same time, focused on the children's roles, their occupations and optimal participation is important (8). Canadian Occupational Performance Measure (COPM) provides an opportunity to establish goals and evaluate the

success of those goals. The COPM identifies issues that are encountered in the performance of daily activities. These issues are referred to as occupational performance issues (9, 10).

Some studies searched activities of daily living but not detailed analysis of the occupation, participation and satisfaction and how intervention to enhance them in children with OBPP (3, 11-13). The specific purpose of this study was to investigate the benefits of intervening to enhance the occupational performance of children with obstetrical brachial plexus palsy.

MATERIAL AND METHOD

All data collected in the Hacettepe University Faculty of Health Sciences Department of Physical Therapy and Rehabilitation.

The Hacettepe University Research Ethics Review Committee approved the study. Informed consent was obtained from participants and their families, and the study protocol was conducted in strict accordance with the Declaration of Helsinki.

Participants

Twenty- nine children with OBPP took part in the study. Intervention group comprised 12 (66.7%) boys and 6 (33.3%) girls. The children's mean age was 4.69 (SD = 1.84) years. Control group included 11 children, eight girl and three boys, with OBPP, mean age was 5.53 years (SD= .99). All children had upper brachial plexus injuries. The inclusion criteria were agreement from the children and families to participate in the study and sign the informed consent form, being under 7 ages, and diagnosis of OBPP. The present study was planned to randomized controlled trial. A statistician randomized to one of two groups using a random number allocation table. Of 35 participants, eighteen reached the intervention group and 11 to

the control group as showed in flow-chart (Fig 1). All children had no other impairments and spoke same language (Turkish), and similar socio-cultural conditions.

(Insert Figure 1 into here)

Instruments

Caregivers of participating children and children completed the COPM. The researcher analyzed WeeFIM and parents filled PEDI.

The COPM was used to evaluate the occupation performance of the children. This measure consists of three main parts, including self-care, productivity and leisure. Each main part consists of three occupations, which are composed of three examples issues. The participant scores the occupations between 1 and 10, and then, she/he determines five activities that are most important for him between these issues. 1 is defined, as the 'lowest score' and 10 is the 'highest score'. Adding the satisfaction/performance scores then dividing by the number of issues generates a total satisfaction/performance score. These scores will range from 1 to 10 (9). It has validity and reliability (14, 15).

The Pediatric Evaluation of Disability Inventory (PEDI) is an instrument for evaluating function in children between the ages of 6 months and 7.5 years with disabilities. The PEDI measures both functional performance and capability in three domains: self-care (73 items), mobility (59 items), and social functions (65 items). The PEDI is an effective tool for determining a child's ability to perform self-care occupations in relation to the performance expected of their developmental age group (16). Its construct validity and reliability have been established in several populations of children with physical disabilities (17, 18).

The Functional Independence Measure for Children (WeeFIM) is an 18-item tool used to evaluate the level of functional independence of a child in 6 domains related to the activities of daily living. The subsets include self-care (6 items), sphincter control (2 items), transfers (3 items), locomotion (3 items), communication (2 items), and social cognition (3 items). Scoring for each item ranges between 1 (total dependence) to 7 (total independence). The minimum score that can be obtained is 18 and the maximum score is 126. In the present study, the Turkish version of the WeeFIM was used (19). WeeFIM has also validity and reliability ($r=0,81-0,99$) (20).

The COPM, PEDI, and WeeFIM were administered in the first week, when the children began to participate intervention, and in the last week, when the intervention was ending. The process of recruiting participants occurred 3 times over 3 months. The researchers organized the data collection, selected clients who met the inclusion criteria, and compiled the data.

Intervention

The intervention was built around the children and their families' needs and expectations, with particular attention paid to the children's social roles like as child, student. The session was approximately 40 minutes in length.

Yearly developmental milestones were considered while the intervention was applied to the children's occupations. These daily occupations were coached with verbal, gestural, or physical cues, or with a combination of all of these. Verbal cues and tips were given based on how easily the children performed their occupations.

Leisure occupations were undertaken in the exercise room. The intervention was aimed toward practice and repetition, which are important in the development of habits. All occupations were trained as play, to make the intervention more child-appropriate. If the

children wanted to play basketball and have a need to improve in self-care occupations, they would get the opportunity to do both during the sessions.

The therapy intervention room was included all material like bed, toilet, kitchen, mirror, toys, etc.

Data Analysis

Purpose of the statistical analyses in the present study was to search the effect of interventions on occupational performance of children with OBPP and compare three instruments.

All statistical analyses were performed with Statistical Package for the Social Sciences software, version 10.0 (SPSS Inc., Chicago, Illinois, USA). To examine whether a change occurred after intervention, pretest and posttest scores were compared with the Wilcoxon signed-rank test. Spearman's rank correlation coefficients were used to determine the relationships among the changes of scores for the COPM, WeeFIM, and PEDI. A p-value of less than 0.05 was considered significant.

RESULTS

The mean scores of evaluated parameters before and after intervention are shown in Table 1.

(Insert Table 1 into here)

The PEDI scores for self-care, mobility, and sociality domains were all statistically improved in the intervention group ($p < 0.05$). Except self-care domain, all PEDI domains were increased in the control group, too. The changes in scores for the COPM indicated clinically significant changes in both performance and satisfaction in the intervention group (p

< 0.05). The WeeFIM scores for self-care, sphincter control, and total parameters were all statically improved ($p < 0.05$). Table 2 shows the changes of scores for the PEDI, WeeFIM, and COPM assessments. When compared differences of evaluated before and after treatment between intervention and control group, COPM' score of intervention group were found statistically significance ($p < 0.01$).

(Insert Table 2 into here)

Significant correlations were found between COPM performance and the PEDI ($p < 0.01$). Correlations between the COPM and PEDI and between the COPM and WeeFIM are shown in Table 3.

(Insert Table 3 into here)

The participants' parents also stated self-care occupations were the most challenging occupations in COPM. However, the children with OBPP stated that they hardly completed their productivity and leisure occupations. Those activities were putting an arm into a jacket or cardigan, zipping, buttoning, putting on or taking off clothes, combing their hair, and washing their hands or face as self-care occupations; playing basketball or volleyball as leisure occupations; and playing games as productivity occupations.

DISCUSSION

Occupation performances of individuals represent their participation in life, and the COPM is an important method for evaluating the efficacy of interventions. As such, the occupation performances and satisfaction rates of children with OBPP were investigated here. Because of the children's young ages, their parents were asked about the children's difficulties in occupations and participation (21). Some researchers (3, 11, 12) found that parents, had children with OBPP, described their children as facing difficulties in daily living

activities such as zipping up a jacket, buttoning clothing, and putting an arm into a sleeve. In the present study, parents emphasized that their children were especially challenged by self-care occupations. The results of this study are thus parallel to the conclusions of other researchers (3, 11, 12). These occupations require that both shoulder movements and bimanual hands. These are also affected in the OBPP children. Children have compensated occupations, which is needed affected sides for doing non-affected upper extremities. However, bimanual occupations require both hands work together. Krumlinde- Sundholm et al. (3) searched activities of daily living in the 5 years old with OBPP, Strömbeck et al. (11) searched these activities ages 7-20 with OBPP and Spaargaren et al.(12) searched these activities in the ages 7-8 with OBPP. In the current study, differently other studies (3, 11, 12), detail analysis of the occupations, participation and satisfaction to ask and/or less than 7 ages children. In addition, the present study examined that intervening to enhance the occupational performance. We advised early intervention program for occupational performance in children with OBPP.

The intervention consisted of purposeful occupations for the children and caregivers, with a focus on keeping the occupations playful for the children, who were always active participants in the intervention. These factors are assumed to be the source of the improvement illustrated by the children's COPM scores. Wressle et al. (22) stated that COPM was facilitating intervention. This intervention study demonstrated that the COPM could measure change over time and can be recommended for this target group of children and their parents.

The PEDI was used earlier for children with OBPP (13). Ho et al. (13) used the PEDI in their study, and found that self-care occupations were more challenging than other occupations in children with OBPP. The results of the present study also support their results. Furthermore, they stated mobility and social functioning domain were not impaired in

children with OBPP. Therefore, those domains were not used in their study. In contrast, in the present study, the PEDI mobility and social sections were used. There were no data found in the literature about how these domains are affected in children with OBPP. The results of the present study show that both mobility and social domain points were increased after intervention. This increase was considered to be a result of the children's increased motor development due to the intervention application. As a result of this, their mobility improved. These improvements, in turn, likewise improved the social life of the children. In addition, children were regular attending of intervention sessions. Regular attendance allowed them to be in an environment different from their home environments, which might have led to an increase in their level of socialization.

According to the WeeFIM results, self-care, sphincter care, and especially total points increased in the present study. Both the study of Ho et al. (13) and the present study found that self-care occupations were the most important occupations for children with OBPP, and the present study participants' parents also stated that same occupations. The present intervention included self-care occupations, and each child worked to meet their own needs and expectations for self-care occupations. WeeFIM sphincter control increased was thought to be a result of continuing the children's developmental period when the intervention application. May be the intervention had an affect also on general development more than expected. It should be noted that children and parents both actively participated in the study and results were found to be positive.

Some tests domains, except COPM, were increased in two groups of children with OBPP as mentioned above. COPM domains differences were statistically significances only intervention group. We thought that intervention of occupational performance was positive effect of children' performance and satisfaction.

Looking at the correlation results, only COPM-Performance and PEDI were correlated. Kang et al. (23) applied client-centered therapy to children with developmental disorders and found significant correlations between COPM scores and assessment of motor and process skills. However; both the COPM and the PEDI are based on performance. This may increase performance and effect their relations.

The present study has limitation to be taken into account. It is looking at the relatively low number of participants; it is impossible to generalize from the results. However, looking at the present study, as the first study about intervention and COPM application in children with OBPP, is, nevertheless, quite valuable. The present study suggests intervention and COPM as useful for the children with OBPP to rehabilitation therapists.

In the same time, the present study was stated that when measured occupations by COPM, observed that young children had hardly or not to express their occupations. Some of the studies, which used to COPM, they stated same issues for the children with disabilities (24). Therefore, the present study has suggested that parent-proxy in the children with OBPP reported COPM less than 6 ages. When children with OBPP ages were 6 or up, easily expressed and rated their occupations by using COPM. The present study has offered that both physical therapist/occupational therapists preferred to used COPM both family and children with OBPP, taken into children' age.

Based on the results of this study, the use of COPM may generate an improvement in function and occupational performance in children with OBPP, ages under 7. In order to maximize the usefulness of the COPM and intervention for children with OBPP, both physiotherapists and occupational therapists should educate caregivers about the rationale underlying therapy.

REFERENCES

1. Basheer H, Zelic V, Rabia F. Functional scoring system for obstetric brachial plexus palsy. *J Hand Surg Br.* 2000 Feb;25(1):41-5. PubMed PMID: 10763722. Epub 2000/04/14. eng.
2. Boeschoten KH, Folmer, K.B., van der Lee, J. H.& Nollet, F Development of a set of activities to evaluate the arm and hand function in children with obstetric brachial plexus lesion *Clin Rehabil.* 2007;21:163.
3. Sundholm LK, Eliasson AC, Forssberg H. Obstetric brachial plexus injuries: assessment protocol and functional outcome at age 5 years. *Dev Med Child Neurol.* 1998 Jan;40(1):4-11. PubMed PMID: 9459211. Epub 1998/02/12. eng.
4. Law M PH, Baptiste S, Townsend E. . Core concepts of occupational therapy. In: E T, editor. *Enabling Occupation: An Occupational Therapy Perspective.* Ottawa, Canada: Canadian Association of Occupational Therapists; 1997. p. 29-56.
5. Law M. Participation in the occupations of everyday life. *Am J Occup Ther.* 2002 Nov-Dec;56(6):640-9. PubMed PMID: 12458856. Epub 2002/12/03. eng.
6. Law M. Enhancing participation. *Phys Occup Ther Pediatr.* 2002;22(1):1-3. PubMed PMID: 12174502. Epub 2002/08/15. eng.
7. Exner C. Development of Hand Skills. In: Case-Smith J, editor. *Occupational Therapy for Children.* 5 ed. St. Louis, Missouri: Elsevier Mosby; 2005. p. 304- 55.
8. Rodger S. *Occupation-centred practice with children, practical guide for occupational therapist.* Rodger S, editor. Oxford, UK: Wiley- Blackwell; 2010.
9. Law M, Baptiste, S., Carswel, A., McColl, M.A., Polatajko,H.,Pollock,N. *Canadian Occupational Performance Measure.* CAOT Publications ACE; 2005.
10. Therapists CAoO. *Enabling occupation: an occupational therapy perspective.* Ottawa, CA: CAOT Publications ACE; 1997.
11. Strombeck C, Krumlinde-Sundholm L, Remahl S, Sejersen T. Long-term follow-up of children with obstetric brachial plexus palsy I: functional aspects. *Dev Med Child Neurol.* 2007 Mar;49(3):198-203. PubMed PMID: 17355476. Epub 2007/03/16. eng.
12. Spaargaren E, Ahmed J, van Ouwkerk WJ, de Groot V, Beckerman H. Aspects of activities and participation of 7-8 year-old children with an obstetric brachial plexus injury. *European journal of paediatric neurology : EJPN : official journal of the European Paediatric Neurology Society.* 2011 Jul;15(4):345-52. PubMed PMID: 21511503.
13. Ho ES, Curtis CG, Clarke HM. Pediatric Evaluation of Disability Inventory: its application to children with obstetric brachial plexus palsy. *The Journal of hand surgery.* 2006 Feb;31(2):197-202. PubMed PMID: 16473678. Epub 2006/02/14. eng.
14. Cup EH, Scholte op Reimer WJ, Thijssen MC, van Kuyk-Minis MA. Reliability and validity of the Canadian Occupational Performance Measure in stroke patients. *Clinical rehabilitation.* 2003 Jul;17(4):402-9. PubMed PMID: 12785249.
15. Pan AW, Chung L, Hsin-Hwei G. Reliability and validity of the Canadian Occupational Performance Measure for clients with psychiatric disorders in Taiwan. *Occupational therapy international.* 2003;10(4):269-77. PubMed PMID: 14647540.
16. Haley SM CW, Ludlow LH, Haltiwanger JT, Andrellos, PA. *Pediatric Evaluation of Disability Inventory: development, standardization and administration manual.* In: of T, Univ. B, editors. Boston: 1992.
17. Feldman AB, Haley SM, Coryell J. Concurrent and construct validity of the Pediatric Evaluation of Disability Inventory. *Physical therapy.* 1990 Oct;70(10):602-10. PubMed PMID: 2217539. Epub 1990/10/01. eng.
18. Berg M, Jahnsen R, Frosli KF, Hussain A. Reliability of the Pediatric Evaluation of Disability Inventory (PEDI). *Physical & occupational therapy in pediatrics.* 2004;24(3):61-77. PubMed PMID: 15257969. Epub 2004/07/20. eng.

19. Erkin G, Aybay C, Kurt M, Keles I, Cakci A, Ozel S. The assessment of functional status in Turkish children with cerebral palsy (a preliminary study). *Child: care, health and development*. 2005 Nov;31(6):719-25. PubMed PMID: 16207230. Epub 2005/10/07. eng.
20. Aybay C, Erkin G, Elhan AH, Sirzai H, Ozel S. ADL assessment of nondisabled Turkish children with the WeeFIM instrument. *Am J Phys Med Rehabil*. 2007 Mar;86(3):176-82. PubMed PMID: 17167346. Epub 2006/12/15. eng.
21. Verkerk GJ, Wolf MJ, Louwers AM, Meester-Delver A, Nollet F. The reproducibility and validity of the Canadian Occupational Performance Measure in parents of children with disabilities. *Clin Rehabil*. 2006 Nov;20(11):980-8. PubMed PMID: 17065541. Epub 2006/10/27. eng.
22. Wressle E, Lindstrand J, Neher M, Marcusson J, Henriksson C. The Canadian Occupational Performance Measure as an outcome measure and team tool in a day treatment programme. *Disabil Rehabil*. 2003 May 20;25(10):497-506. PubMed PMID: 12745961. Epub 2003/05/15. eng.
23. Kang DH, Yoo EY, Chung BI, Jung MY, Chang KY, Jeon HS. The application of client-centred occupational therapy for Korean children with developmental disabilities. *Occupational therapy international*. 2008;15(4):253-68. PubMed PMID: 18819165. Epub 2008/09/27. eng.
24. Atasavun Uysal S, Duger T. Visual perception training on social skills and activity performance in low-vision children. *Scandinavian journal of occupational therapy*. 2012 Jan;19(1):33-41. PubMed PMID: 21696247. Epub 2011/06/24. eng.

Table 1. Mean scores of Wee FIM, PEDI and COPM

TESTS (points)	INTERVENTION GROUP				CONTROL GROUP			
	Before intervention		After intervention		Before intervention		After intervention	
	M	SD	M	SD	M	SD	M	SD
Wee FIM (18- 126 points)	95.55	22.80	95.55	22.80	106.63	12.86	110.54	10.76
PEDI (0- 197 points)	140.16	43.09	148.5	40.41	178.45	13.50	181.72	12.74
COPM performance (0-10)	3.90	1.21	6.91	1.00	5.40	2.55	5.67	2.51
COPM satisfaction (0-10)	2.91	1.35	6.88	0.90	3.74	2.61	3.5	2.55

Table 2. Differences of evaluated parameters before and after intervention

TESTS		INTERVENTION GROUP		CONTROL GROUP		INTERVENTION GROUP-CONTROL GROUP	
		Z	p	Z	p	Z	p
Wee FIM	Self-care	-3.647	0.000**	-2.539	0.01*	-1.266	0.20
	Sphincter control	-2.07	0.038*	-1.00	0.31	-1.114	0.26
	Mobilization	-1.857	0.063	-2.070	0.03*	-1.323	0.18
	Locomotion	-1.342	0.180	-1.732	0.08	-0.993	0.32
	Communication	0.000	1.000	-1.414	0.15	-1,842	0.06
	Social communication	-1.841	0.066	-1.00	0.31	-0.990	0.32
	total	-3.633	0.000**	-2.677	0.007*	-0.454	0.65
PEDI	Self care	-3.680	0.000*	-1.614	0.10	-2.290	0.02
	Mobility	-1.972	0.049*	-2.701	0.007*	-1.568	0.11
	Socialition	-3.097	0.002*	-1.841	0.006*	-1.522	0.12
	total	-3.736	0.000**	-1.898	0.005*	-1.691	0.09
COPM	Performance	-2.680	0.007*	-1.298	0.19	-4.144	0.000**
	Satisfaction	-3.738	0.000**	-1.134	0.25	-4.496	0.000**

*p<0.05
**p<0.001

Table 3. Spearman rank correlation on change scores among COPM, Wee FIM, PEDI in the intervention group

	Δ Wee FIM	Δ PEDI
Δ COPM-performance	r:-0.32 p: 0.18	r:0,95 p:0.00*
Δ COPM-satisfaction	r:-0.02 p: 0.91	r:0,68 p:0.68
<p>*P<0.01 ΔCOPM-performance: Change scores in COPM performance ΔCOPM-satisfaction: Change scores in COPM satisfaction ΔWee FIM: Change scores in Wee FIM ΔPEDI: Change scores in PEDI</p>		