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Influence of age on outcomes of Bobath-based neurorehabilitation of adults – pilot study

Wpływ wieku na wyniki neurorehabilitacji pacjentów dorosłych opartej na Koncepcji Bobatów – badanie pilotażowe

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ABSTRACT

INTRODUCTION: Functional activity in post-stroke survivors is often impaired and has a significant negative impact on the patient, his/her family, community and society.

MATERIAL AND METHODS: Pilot study – a two-group, before-and-after preliminary study was carried out to investigate the feasibility of conducting a larger randomized controlled trial investigation of the efficacy of Bobath-based poststroke neurorehabilitation. Patients were admitted to the neurological rehabilitation unit after ischemic stroke. Both groups (group I aged 40–55 years and group II aged 67–82 years received ten half-an-hour physiotherapy sessions over a two-week period. Measurements of the the Barthel Index, gait velocity, cadence and stride length were conducted twice: on admission, and after the last session of rehabilitation.

RESULTS AND DISCUSSION: Statistically significant and favourable changes in the selected activities of daily living, gait velocity and stride length were observed in both age groups.

CONCLUSIONS: This pilot study indicates a short-term benefit for using interventions based on the Bobath Concept. The findings presented suggest that Bobath-based rehabilitation may be considered an effective form of post-stroke rehabilitation in various age groups.

KEY WORDS
neurorehabilitation, physiotherapy, activities of daily living, gait disorder

STRESZCZENIE

WSTĘP: Czynności funkcjonalne u osób po udarze są często obciążone deficytem, a przez to wpływają negatywnie na pacjenta, jego rodzinę, społeczność lokalną i całe społeczeństwo.

MATERIAŁ I METODY: Badanie pilotażowe – ocena pacjentów przed i po terapii. Pacjenci po udarze niedokrwiennym mózgu zostali przyjęci na oddział rehabilitacji neurologicznej. Obie grupy (grupa I: 42–55 lat oraz grupa II: 67––82 lata) otrzymały 10 półgodzinnych sesji terapeutycznych w ciągu dwóch tygodni. Pomiar wskaźnika Barthel, prędkości chodu, tempa chodu oraz cyklu chodu został przeprowadzony dwukrotnie: przy przyjęciu oraz po zakończeniu rehabilitacji.

WYNIKI: W obu grupach zostały zaobserwowane statystycznie znaczące pozytywne zmiany wybranych czynności codziennego życia, prędkości chodu oraz długości dwukroku.

WNIOSKI: Badanie pilotażowe wskazuje krótkoterminowe korzyści wynikające z wykorzystania terapii opartej na koncepcji Bobath. Wyniki sugerują, że terapia taka może być wykorzystana jako efektywny sposób rehabilitacji poudarowej w różnych grupach wiekowych.

SŁOWA KLUCZOWE
rehabilitacja neurologiczna, fizjoterapia, czynności codziennego życia, zaburzenia chodu

INTRODUCTION

Stroke is among the leading causes of death and disability [1,2]. Functional activity in post-stroke survivors is often impaired and has a significant negative impact on the patient, his/her family, community and society. There is lack of one predominant approach in stroke rehabilitation. The mainstream approaches are Bobath, proprioceptive neuromuscular facilitation (PNF), Brunnstrom, constraint-induced movement therapy (CIMT), biofeedback, functional electrical stimulation, robotic-mediated approach, etc. [3]. Evidence concerning available rehabilitation programs for stroke patients is still limited. There is still need for effective long-term rehabilitation programs restoring patients to their highest possible functioning (restoring to full health is not always possible). Researchers and clinicians still look for effective rehabilitation approaches in post-stroke therapy. The Bobath–based approach is considered one of the most common in contemporary post-stroke rehabilitation, but there are only a few studies in the area of its outcomes in stroke survivors [4,5,6,7,8,9,10,11]. It can be perceived as a key problem in neurorehabilitation based on the Evidence-Based Medicine (EBM) paradigm.

The current investigation is regarded as a pilot study. The design presented is a two group before-and-after preliminary study. Its key aim is to fill a gap in the available evidences by comparing the short-term results of the Bobath-based physiotherapy approach for improving activities of daily living (ADLs) and walk in patients following stroke. The secondary aim is to investigate the feasibility of conducting a larger randomized controlled trial (RCT) study of the efficacy of Bobath-based therapy within the population of post-stroke patients.

MATERIAL AND METHODS

The participants were two comparison groups (named "group I" and "group II") of post-stroke patients, respectively adults aged 40–55 years and elderly aged 67–82 years. The patient profiles are presented in Table I.

The patients were admitted to the neurological rehabilitation unit and assessed according to the criteria described below: inclusion criteria: age, time after cerebrovascular accident (CVA): 1 month to 3 years, and clinical status of first ischemic stroke, exclusion criteria: serious complicating medical illness making rehabilitation not possible.

Table I. Patients' overall profiles
Tabela I. Charakterystyka pacjentów

Parameter	Group I Number and percentage (n = 20)	Group II Number and percentage (n = 20)
Stroke type:	ischemic (100%)	ischemic (100%)
Side of paresis:		
left	11 (55%)	9 (45%)
right	9 (45%)	11 (55%)
Sex:		
females	10 (50%)	12 (60%)
males	10 (50%)	8 (40%)
Age [years]:		
min	40	67
max	55	82
SD	3.67	4.3
mean	47.95	73.6

Both groups received ten half-an-hour physiotherapy sessions over a two-week period (ten working days). Each of the patients received the same Bobath-based intervention, respective to their clinical staus and functional possibilities. The consistency of intervention was maintained, and fidelity to the Bobath Concept was ensured given that all the patients were treated by the same experienced therapist (> 10 years experience in post-stroke neurorehabilitation) with international certificates: both International Bobath Instructors Training Association (IBITA) and European Bobath Tutors Association (EBTA) recognized [9,10]. There were no additional treatment methods, techniques or tools used in addition to the Bobath-based ones. The measurements were assessed before and after the intervention period by the same therapist. Assessment was based on changes in the following parameters: the Barthel Index to assess selected activities of daily living (assessed as "valid" [12,13,14]), gait velocity, cadence, and stride length (including normalized values based on gait analysis method published in [15]).

The results of measurements, where available, were given as mean, median, maximal value, minimal value and standard deviation (SD). Wilcoxon's signed rank test was used to establish significance to determine if there was a significant change from the first to the second measurement. The data were analyzed with Statistica 9 software. The level of statistical significance was set at $p < 0.05$.

The study was accepted by the appropriate bioethical committee. All the subjects gave written informed consent before entering the study in accordance with the recommendations of the bioethical committee acting on the rules of Good Clinical Practice and the Helsinki Declaration.

RESULTS

The results are presented in Tables II–III.

In the first part of the study – assessment of selected activities of daily living using part of the Barthel Index – respectively 50% and 55% recovery was observed. The median change was higher in group I (younger): 10 points versus 5 points in group II (older).

Table II. Assessment of selected ADLs using Barthel Index
Tabela II. Ocena wybranych czynności codziennego życia za pomocą wskaźników Barthel

Parameter	Group I Number and percentage (n = 20)	Group II Number and percentage (n = 20)
Recovery, No. of patients (%)	10 (50%)	11 (55%)
No change, No. of patients (%)	10 (50%)	9 (45%)
Min change	0	0
Max change	15	25
Median change	10	5
BI score before and after therapy (median, 1st/3rd quartile)	before therapy: 40 (30/40) after therapy: 40 (40/40)	before therapy: 30 (20/40) after therapy: 37.5 (30/40)
Wilcoxon's test results	p = 0.000	p = 0.003

Table III. Results of gait velocity and stride length
Tabela III. Wyniki prędkości chodu i długości dwukroku (cykl chodu)

Parameter	Group I Number and percentage (n = 20)	Group II Number and percentage (n = 20)
1	2	3
Velocity:		
recovery	15 (75%)	14 (70%)
no change	5 (25%)	6 (30%)
min change	0	0
max change	0.8	0.5
median change	0.2	0.2
Velocity score before and after therapy (median, 1st/3rd quartile)	before therapy: 0.6 (0.5/0.8) after therapy: 0.65 (0.4/1.05)	before therapy: 0.4 (0.3/0.6) after therapy: 0.7 (0.5/0.8)

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1	2	3
Wilcoxon's test results	p = 0.03	p = 0.016
Normalized velocity:		
recovery	15 (75%)	19 (95%)
no change	5 (25%)	1 (5%)
min change	0	0
max change	0.25	0.18
median change	0.07	0.05
Normalized velocity score before and after therapy (median, 1st/3rd quartile)	before therapy: 0.21 (0.14/0.27) after therapy: 0.25 (0.13/0.38)	before therapy: 0.145 (0.1/0.185) after therapy: 0.205 (0.1/0.255)
Wilcoxon's test results	p = 0.009	p = 0.023
Stride length:		
recovery	17 (85%)	18 (90%)
no change	3 (15%)	2 (10%)
min change	0	0
max change	1.28	0.82
median change	0.275	0.26
Stride length score before and after therapy (median, 1st/3rd quartile)	before therapy: 1.54 (1.25/2) after therapy: 1.33 (1.82/2.5)	before therapy: 1.37 (1.18/1.67) after therapy: 1.605 (1.38/1.91)
Wilcoxon's test results	p = 0.001	p = 0.008
Normalized stride length:		
recovery	18 (90%)	18 (90%)
no change	2 (10%)	2 (10%)
min change	0	0
max change	0.57	1.19
median change	0.29	0.26
Normalized stride length score before and after therapy (median, 1st/3rd quartile)	before therapy: 1.87 (1.42/2.38) after therapy: 2.24 (1.52/2.72)	before therapy: 1.615 (1/2.03) after therapy: 1.82 (1.28/2.3)
Wilcoxon's test results	p = 0.000	p = 0.005

In the second part of the study – assessment of the spatio-temporal gait parameters, high and very high percentages of recovery were achieved:
– in gait velocity: 75% in group I and 70% in group II,
– in normalized gait velocity: 75% in group I and 95% in group II,
– in stride length: 85% in group I and 90% in group II,
– in normalized stride length: 90% in group I and 90% in group II.
Changes in cadence were not statistically significant.

DISCUSSION

Despite the growing body of knowledge about evidence-based stroke rehabilitation, the answer to many questions, such as "Which patients benefit most from specific intervention?" still remains open [16]. The median change in ADL and gait scores (especially gait velocity) are important predictive factors of improve ment in post-stroke patients [17]. This study has focused on determining the changes in ADL and gait scores (gait velocity, stride length, and their normalized values) observed in both age groups.

Following intervention, there was a significant difference in improvement between the two groups for selected activities of daily living using part of the Barthel Index and gait parameters. The significantly greater increases in group II (older) showed a higher percentage of recovery. Although group II showed significantly greater increases in walking velocity, the respective results for normalized values are different. Generally, both age groups (I and II) showed efficacy in improving functional ability in ADLs, gait velocity and stride length. The analyses confirm that the age of patients has a significant influence on ADLs and gait parameters in the Bobath-based rehabilitation of patients after stroke.

A major limitation of this study constitutes the lack of a reference group. Limitations of this study also constitute the small study sample and heterogeneity

in the sample, normal for the Polish population. Another limitation may constitute the limited time of a single therapeutic session. Rehabilitation based on the rules of the Bobath Concept offers a continual 24hour-aday, 7-day-a-week (24/7, twenty-four-seven) patient-oriented method of recovery with an increase in the patient's quality of life. There is a lack of similar studies in relation to this topic.

The next part of the research will be both studies on larger sample groups, with a reference group, and comparative studies between the Bobath-based approach and a Bobath-based, combined (eclectic, mixed) approach used to treat patients after stroke [18]. The results of Klimkiewicz et al. showed that the Bobath-based approach combined with classical kinesiosiotherapy gives better outcomes of the rehabilitation of upper limb functioning than kinesiotherapy alone [19]. There is a need to continue research, update and summarize the evidence . Strategies putting scientific knowlegde into clinical practice should be further explored. The level of preserved cognitive functions and the ability of patients to cooperate with therapist(s), including patients with disorders of consciousness may constitute important factors. The author takes part in such research as a member of International-Interdisciplinary Research for Disorders of Consciousness in Toruń (InteRDoCTor).

CONCLUSIONS

This pilot study indicates a short-term benefit of using interventions based on the Bobath Concept. The presented findings confirm that Bobath-based rehabilitation may be considered an effective form of post-stroke rehabilitation in various age groups.

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