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Effect of an intervention program based on motor relearning on disability and health-related quality of life in adults with hemiparesis

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Abstract:
Background: *Disability and quality of life are considered key aspects in the understanding of health and well-being under a biopsychosocial model. Both are important indicators for rehabilitative processes applied to different health conditions.*
Purpose: *To establish the effect(s) of an intervention program based on motor relearning on disability and Health-Related Quality of Life (HRQoL) in adults with hemiparesis.*
Methods: *A quasi-experimental clinical trial was conducted, involving both a non-randomized control group and an experimental group with simple masking. Both groups participated in a six-week physiotherapy program, three times a week. A non-probabilistic sampling of people with hemiparesis covering the following parameters was performed: representative of both sexes, between the ages of 18 and 60 years old: 34 belonging to the control group and 35 to the experimental group. Disability was assessed utilizing WHO-DAS 2.0 and HRQoL with WHOQOL-BREF.*
Results: *In most areas of WHO-DAS 2.0 and in global disability, the decrease in perception of disability was greater in the experimental than in the control group, however differences in the measurements of change were not statistically significant (p> 0.05). No significant differences were found in measurements of change in global HRQoL or in any of its dimensions (p> 0.05). In an analysis of related samples, significant differences were found in global disability for both groups, except for the global HRQoL.*
Conclusions: *There is a significant improvement in the disability level of people with hemiparesis who received both interventions based on motor relearning and conventional treatment. There were no significant improvements in the perception of HRQoL.*
Key Word: *Disability evaluation, Hemiplegia, Neurological rehabilitation, Physical therapy specialty, Quality of life.*

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I. Introduction

One of the main challenges for health professionals, particularly physical therapists working in the neuro-rehabilitation area, arises in the treatment of hemiparesis as a consequence of brain lesions. The sensorimotor and postural control of deficiencies associated with this condition interfere with the performance of both fine and gross motor skill patterns, and as a consequence, hinder the execution of daily life activities. These deficiencies have been classified both as important predictors of long-term functional independence and as generators of disability and alterations in people's quality of life [1]. From a neuro-epidemiological perspective, stroke is considered the main cause of hemiparesis, and one of the entities with the most serious consequences on a subject's functional level. This condition is a public health problem taking into consideration the number of people affected by it, the duration of its consequences and the impact it has s on people's lives and their families [2]. According to the Global Disease Burden Study, hemiparesis was ranked as the third most common cause of early death and disability for the general population in 2017, with a higher prevalence in low- and middle-income countries [3]. On the other hand, head trauma in humans aged 15 to 45 is the leading cause of death and disability associated with motor, behavioral, emotional and cognitive disorders that can interfere with the reintegration of people into the social and work environments, as well as with their quality of life. According to the World Health Organization (WHO) between 20 and 50 million people worldwide suffer from non-fatal craniocerebral trauma [4].

Researchers agree that treatment for people with deficiencies associated with different neurological conditions of the Central Nervous System (CNS) should include, in addition to biological aspects, those related to their consequences at functional and relational levels - dealing with the subject comprehensively as proposed by the WHO biopsychosocial model to health-related quality of life (HRQoL) [5-8]. In fact, these authors, in their respective work with population with stroke, reported not only hemiparesis, but also difficulties in gait, balance, mobility and limitations in the performance of daily life activities. These impairments and activity limitations result in restrictions on social participation that are associated with a low perception of a subject's quality of life. Consistent with these findings, Murtezani *et al*. suggest that factors associated with impairments at a physical level were causing the greatest impact on social reintegration of subjects with post-stroke hemiplegia [9].

In step with this conceptual approach and from the point of view of existing intervention modalities, new trends in neurorehabilitation seek to achieve the greatest possible functionality in subjects and thus, positively impact disability, maintaining, as far as possible, the well-being and quality of life of people. In this regard, studies such as the one conducted by Hamzat *et al*., reported on how restrictions on social participation are reduced while community reintegration is enhanced owing to therapeutic processes, and that said processes have a positive impact in the functional capacity of subjects with post-stroke hemiplegia [10]. In this regard, Murtezani *et al*. conclude that the therapeutic processes in post-stroke patients not only positively impacts their physical state, but also increases their quality of life and reintegration into society [9]. Accordingly, *Motor Relearning Programme* is considered a therapeutic approach that responds to current trends in neurorehabilitation through which motor control, motor learning and biomechanics theories [11-12], promote the re-education and recovery of functions through motor training tasks in specific contexts associated with daily life activities. Concurrently, Arowoiya *et al*. speaking about the achievement of independent ambulation, underline that it becomes a key rehabilitation objective since it is assumed that, if subjects do not have an adequate ambulatory level then their ability to participate in the community is directly affected [8]. Previous findings support the use of interventions that comprehensively address restoration in ability to perform different tasks related to daily life, such as those raised under the model of motor relearning.

Different studies have aimed at assessing the effectiveness of interventions based on motor relearning on physical deficiencies and specific aspects of functionality. They have included outcome measures such as the Motor Assessment Scale (MAS), the Barthel Index and the Lawton scale for the assessment of basic and instrumental activities of daily life, the Functional Independence Measure (FIM), the Berg Balance Scale (BBS), the Timed Up and Go test, and the Community Integration Questionnaire (CIQ) [13-18]. However, the available evidence regarding the effect of this intervention approach, in terms of human functioning and quality of life, is still insufficient. Therefore, this study focused on establishing the comparative effect between a motor relearning program and a conventional physiotherapeutic treatment, on disability and HRQoL on hemiparesis patients assessed through WHO-DAS 2.0 and WHOQOL-BREF, respectively. The different theoretical constructs that underlie this study are based on WHO statements accepted worldwide: disability and HRQoL. Both constructs are assumed as interaction possibilities for individuals with their environment: The former is tied to human functioning in different health conditions while the latter is tied to the reflection on the individual's health state. This therapeutic proposal, focused on motor relearning as the key in this study, coincides with these theoretical perspectives that recognize the multidimensional nature of human beings, guiding their actions to improve their activities as independent individuals and their participation in society.

II. Material and Methods

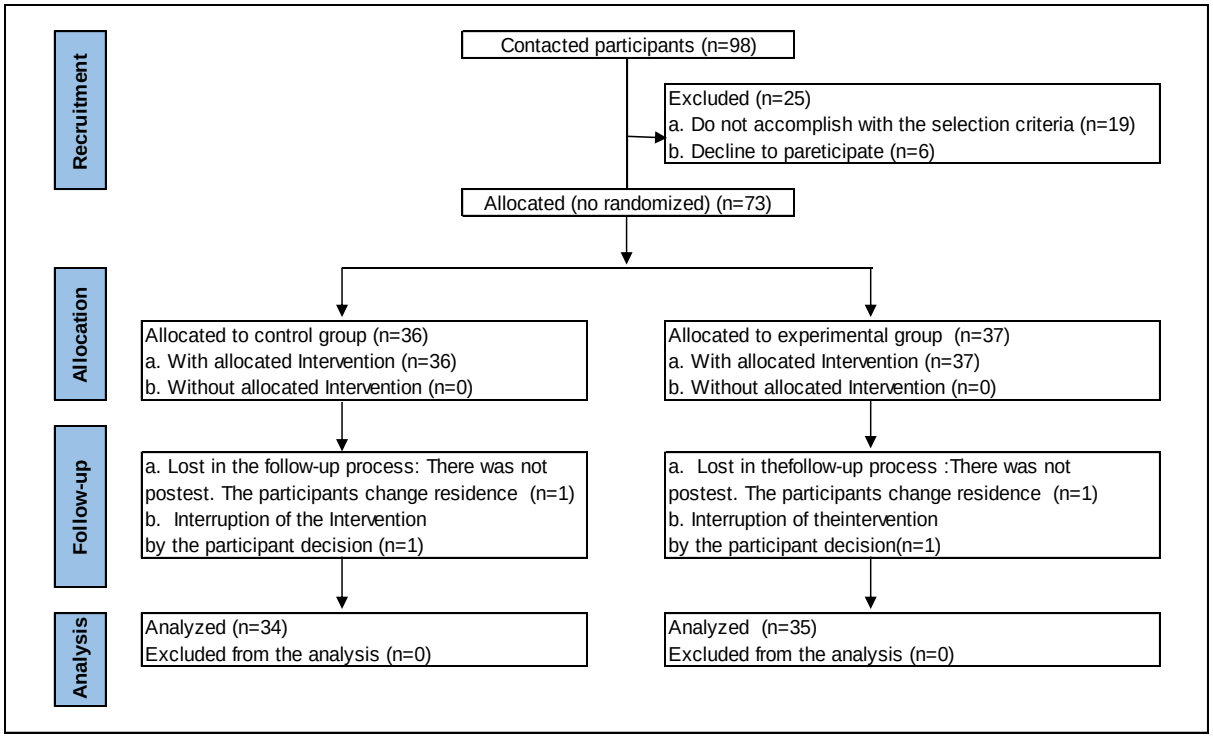
Study Design: A quasi-experimental clinical trial research, with both non-randomized control and experimental groups, and simple masking was conducted. Research was carried as part of a multi-centered project that also incorporated the evaluation of aspects related to postural control [19]. The guidelines of Resolution 8430 of 1993 of the Colombian Ministry of Health that establishes scientific, technical and administrative standards for health research were followed. Moreover, this study complies with the principles set forth in the Helsinki Declaration of the World Medical Association and was approved by the Bioethics Committee from the host University (Minutes 66, 2017)

Sample Size: A non-probabilistic sampling was carried out in nine Colombian cities targeting subjects with hemiparesis of both sexes between 18 and 60 years old, who signed the informed consent and met the inclusion criteria, namely: exhibiting compromised condition in any hemi-body, residency or origin and with more than three months of evolution; outpatient, clinically stable, with physiotherapy authorized by a treating physician and affiliated with the Colombian social security health system. People with marked contractures, who had difficulty understanding simple orders and those with associated health or co-morbidity conditions making it difficult to perform functional tests were excluded.

For the calculation of the sample size, the means comparison formula was used at a confidence level of 95% and a statistical power of 80%. The deviation estimators and the differences between groups were taken from the background for the degree of disability variables [20] and HRQoL [21].

Participants: After completing the recruitment phase, allocation and pertinent follow up phases, 69 adults with hemiparesis, 35 in the experimental group and 34 in the control group were analyzed (see figure 1: flowchart of sampling). Most participants were from the city of Manizales (Colombia), men, single, of low and medium socio-economic level, unemployed due to their health condition, and mostly affiliated within the subsidized social security health system. The same proportions for right and left hemiparesis, mostly caused by cerebrovascular disease and mainly causing moderate disability were recorded. Study subjects underwent between 15 and 18 physical therapy sessions. Specific information for both groups is included in tables 1 and 2. These tables show that none of the socio-demographic, clinical, disability and HRQoL variables have meaningful differences between the two groups in the pre-test ($p>0,05$). This guaranteed the sample's homogeneity before the intervention.

Figure 1. Sample and participant's flowchart



Interventions: Both groups, experimental and control, had interventions for six weeks, three times a week. Those assigned to the control group received conventional treatment administered by a physiotherapist outside the research group. The conventional treatment was based on motor control and learning under a hierarchical and reflex paradigm and basically oriented to neuromuscular facilitation, sensory-motor stimulation, muscle tone modulation, postural alignment, improvement of global movement patterns such as walking and weight support, among others.

Following the principles of Carr and Shepherd [11-12], participants in the experimental group received an intervention programme based on a motor relearning approach focused on the execution of tasks. It consisted of task-oriented treatments in specific contexts based on functionally useful movements and activities of daily life, practice and experience, constant repetition, and adaptation of technological devices. Strategies for increasing strength, endurance and speed of muscle contraction, standing balance, use of affected limb, maintenance of joint mobility arcs, improvement of aerobic capacity and work on connective tissue were used. A standardized protocol was not applied since each patient was treated according to their individual condition, using a progressive degree plan for difficulty and number of repetitions.

Outcome Measurements

a) Degree of disability: Assessed with the 36- item WHO-DAS 2.0 version. All of its components and the level of global disability are scored on a scale of 0 to 100 points, where 0 is none and 100 extreme (tables 1 and 2).
b) Health-related quality of life: assessed with the 26-item WHOQOL-BREF. It assesses the general perception of quality of life and health and four particular dimensions. (tables 1 and 2). All dimensions and global scoring are assessed on a scale of 0 to 100 points, where 0 is the lowest and 100 the highest (tables 1 and 2).

Bias Control: Bias control of sample selection was alleviated by a rigorous application of the inclusion and exclusion criteria. To avoid information bias, tests designed by the World Health Organization, cross-culturally validated for disability assessment and HRQoL were used. To avoid measurement bias, masked independent evaluators who were physiotherapists, master degree holders in neurorehabilitation, previously up to date in training were invited to the research.

Statistical Analyses: Data was processed in the statistical package SPSS version 22.0 for Windows (*Statistical Package for the Social Science*). A univariate analysis of sociodemographic, clinical, disability and HRQoL characteristics is presented. In order to define the test statistics, normality tests for disability and HRQoL were performed: pre-test, post-test, and change measurements (pre-test vs post-test). Finally, depending on data normality, hypotheses tests were carried out for the difference of intra-sample means (related samples) by means of Student *t* Test or Wilcoxon Z test, and for difference of inter-sample means (independent samples) with the Student *t* test or Mann-Whitney U test. All hypotheses tests for comparison of means were performed at a confidence level of 95% ($\alpha \leq 0.05$) by applying a two-tailed test. No data were lost while processing and analyzing it.

III. Result

Characterization of disability and HRQOL: Disability level of participants ranged between 7 and 80 points/100 for the pre-test with an average of 36 points (table 2). Forty-two percent were classified with moderate disability, no extreme disability was found (table 1). *Participation* and *Life activities* areas accounted for the greatest disability. The lowest scores were *Self-care*, and *Cognition* areas. Average overall HRQoL in the pre-test for all participants was 62 points/100 and ranged from 36 to 88 points. The dimension with the lowest score was *Physical Health* and the best rated was *Environment* dimension (table 2).

Table 1. Descriptive and inter-sample difference tests for the pre-test proportions (Qualitative variables)

Variable		Control Group (n = 34)		Experimental Group (n = 35)		Chi^2 *	Sig. §
		N	%	N	%		
City of origin	Barranquilla	2	5.9%	2	5.7%	1,048	0.998
	Bogota	3	8.8%	4	11.4%		
	Cali	2	5.9%	2	5.7%		
	Manizales	8	23.5%	7	20.0%		
	Medellin	6	17.6%	5	14.3%		
	Pereira	6	17.6%	8	22.9%		
	Popayan	3	8.8%	4	11.4%		
	Tunja	2	5.9%	1	2.9%		
	Ipiales	2	5.9%	2	5.7%		
Gender	Female	14	41.2%	12	34.3%	0,349	0.555
	Male	20	58.8%	23	65.7%		
Marital status	Single	15	44.1%	19	54.3%	4,324	0.229
	Married	11	32.4%	9	25.7%		
	Divorced	3	8.8%	6	17.1%		
	Free Union	5	14.7%	1	2.9%		
Employment situation	Employee	3	8.8%	4	11.4%	3,320	0.345
	Independent	4	11.8%	6	17.1%		
	Student	4	11.8%	1	2.9%		
	Retired	0	0.0%	2	5.7%		
	Disability pensioner	6	17.6%	10	28.6%		
	Unemployed by health condition	13	38.2%	10	28.6%		
	Unemployed for other causes	1	2.9%	2	5.7%		
	Housewife	3	8.8%	0	0.0%		

Socio-economic level	Low	18	52.9%	13	37.1%	7,519	0.111
	Medium	14	41.2%	16	45.7%		
	High	2	5.9%	6	17.1%		
Affiliation to Social Security Health System	Not affiliated	1	2.9%	0	0.0%	3,320	0.345
	Subsidized	9	26.5%	9	25.7%		
	Contributory	22	64.7%	26	74.3%		
	Special regime	2	5.9%	0	0.0%		
Medical diagnostic	Stroke	20	58.8%	22	60.9%	2,172	0.704
	Trauma Brain lnjury	7	20.6%	7	20.3%		
	Brain tumor	5	14.7%	6	15.9%		
	Brain infection	1	2.9%	0	1.4%		
	Other	1	2.9%	0	1.4%		
Hemibody compromised	Right	15	44.1%	19	54.3%	0.713	0.368
	Left	19	55.9%	16	45.7%		
Degree of disability (WHO-DAS 2.0)	Mild	10	29.4%	10	28.6%	0.020	0.990
	Moderate	14	41.2%	15	42.9%		
	Severe	10	29.4%	10	28.6%		

* Chi square test, §: Bilateral asymptotic significance

Table 2. Descriptive and inter-sample difference tests for pre-test means (Quantitative variables)

Variable		Control group (n=34)				Experimental Group (n=35)				Test statistic		Sig. §
		Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation			
Age (years)		18	58	40.82	12.15	19	61	41.91	13.59	T	0.351	0.727
Years of schooling		4	19	11.56	3.70	2	19	12.53	4.50	T	0.976	0,333
Age of occurrence of the condition (years)		3	53	36.00	14.95	13	60	36.17	15.04	T	0.047	0.962
Evolution time (months)		4	384	58.06	82.65	3	276	66.97	69.01	Z	1,243	0.214
Treatment sessions (number)		15	18	17.79	0.69	18	18	18.00	0.00	Z	1,783	0.075
Disability (0-100)	Cognition	0	70	26.76	18.46	0	55	22.14	16.15	T	-1,108	0.272
	Mobility	0	100	30.88	30.23	0	94	37.86	29.51	T	0.970	0.336
	Self-care	0	80	21.18	20.86	0	90	24.86	29.34	Z	0.376	0.707
	Getting along	0	92	28.19	22.94	0	75	26.67	23.12	T	-0.274	0.785
	Life activities	0	100	47.50	36.30	0	100	44.00	31.46	T	-0.428	0.670
	Participation	13	92	51.35	18.46	13	92	53.57	19.10	T	0.492	0.625
	Global disability	8	80	35.70	17.96	7	79	36.44	19.32	T	1,165	0.870
HRQOL (0-100) *	General	13	100	62.13	22.51	25	100	62.50	21.44	T	0.069	0.945
	Physical Health	32	89	56.51	13.08	29	82	52.45	14.04	T	-1,243	0.218
	Psychological Health	38	88	66.05	12.98	29	88	64.40	17.07	Z	-0.012	0.990
	Social relationships	25	92	60.29	19.03	17	100	64.05	21.56	T	0.766	0.446
	Environment	38	91	67.00	14.04	31	100	65.89	18.57	T	-0,280	0.781
	Total HRQoL	46	80	62.81	10.52	36	88	61.46	14.06	T	-0.452	0.653

* Health-Related Quality of Life, §: Bilateral asymptotic significance, T: Student's t-test for independent samples (equal variances are assumed), Z: Mann-Whitney test)

Note: the difference for statistic test was calculated by subtracting the experimental group's mean from the control group's mean.

Related sample differences (intra-sample differences)

Disability: Control and experimental groups showed significant differences in post-test vs pre-test ($p < 0.05$) in global disability and in each disability area, except for *Cognition* in the control group ($p = 0.448$) (table 3). This allows us to conclude that there is significant improvement in the level of disability in subjects with hemiparesis who received both conventional treatment and intervention based on motor re-learning.

HRQoL: As noted in Table 3, neither the control group nor the experimental group exhibited statistically significant differences between post-test and pre-test in the overall assessment of HRQoL, despite the marginal significance observed in the experimental group which showed an average improvement of three points ($p=0.056$), in contrast to the perception in the control group that remained stable ($p=0.841$). However, there were significant differences in *Physical Health* dimension in the experimental group and in the general HRQoL dimension of both groups ($p < 0.05$). For the latter, the experimental group perceived an average improvement of 8 points in contrast to 6 points in the control group.

Table 3. Related sample differences (intra-sample differences)

	Variable	Control Group (n = 34)						Experimental Group (n = 35)					
		Mean (0-100)			Test statistic		Sig. §	Mean (0-100)			Test statistic		Sig. §
		Pre-test	Post-test	Difference				Pre-test	Post-test	Difference			
Disability	Cognition	26,76	24,85	-1,91	T	-0,768	0,448	22,14	17,29	-4,85	T	-2,412	0,021
	Mobility	30,88	22,61	-8,27	T	-2,721	0,010	37,86	23,21	-14,65	T	-5,745	0,000
	Self-care	21,18	9,71	-11,47	Z	-4,061	0,000	24,86	8,86	-16,00	Z	-3,744	0,000
	Getting along	28,19	9,31	-18,88	Z	-4,694	0,000	26,67	8,81	-17,86	Z	-4,390	0,000
	Life activities	47,50	27,55	-19,95	T	-6,602	0,000	44,00	19,24	-24,76	T	-6,229	0,000
	Participation	51,35	37,62	-13,73	T	-5,791	0,000	53,57	33,45	-20,12	T	-8,237	0,000
	Global disability	35,70	24,51	-11,19	T	-7,293	0,000	36,44	20,82	-15,62	T	-8,681	0,000
HRQOL *	General	62,13	68,38	6,25	T	2,054	0,048	62,50	70,71	8,21	T	2,446	0,020
	Physical Health	56,51	56,30	-0,21	T	-0,114	0,910	52,45	56,02	3,57	T	2,305	0,027
	Psychological Health	66,05	64,46	-1,59	Z	-0,669	0,504	64,40	67,50	3,10	Z	1,629	0,103
	Social relationships	60,29	61,03	0,74	T	0,286	0,777	64,05	61,67	-2,38	T	-0,741	0,464
	Environment	67,00	65,72	-1,29	T	-0,754	0,456	65,89	68,93	3,04	T	1,494	0,144
	Total HRQoL	62,81	62,56	-0,25	T	-0,202	0,841	61,46	64,42	2,97	T	1,976	0,056

* Health-Related Quality of Life, §: Bilateral asymptotic significance, T: Student's t-test for related samples, Z: Wilcoxon signed rank test.
Note: Differences were calculated by subtracting the post-test's mean from the pre-test's mean.

Differences of independent samples for measurements of change (post-test vs pre-test)

Disability: As shown in Table 4, in all areas, and in global disability, decrease in the perception of disability was greater in the experimental than in the control group, except in the *Getting along* area. However, these differences on measures of change were not statistically significant (p> 0.05) These findings led to conclude that there are no significant differences of the improvement level of disability assessed with the WHO-DAS 2,0, between the group of people with hemiparesis who received conventional treatment and the one who received motor re-learning-based program.

HRQoL: As shown in Table 4, no statistically significant differences were found on measures of change in the global HRQoL or in any of its dimensions (p> 0.05). These findings allow us to conclude that there are no significant differences of the improvement of health-related quality of life among subjects with hemiparesis who received an intervention program based on motor re-learning and those who received a conventional therapy program.

Table 4. Inter-sample differences for change measures (post-test - pretest)

Variable		Mean (0-100)			Test statistic		Sig. §
		Control	Experimental	Difference			
Disability	Cognition	-1.91	-4.86	-2.95	Z	-0,833	0.405
	Mobility	-8.27	-14.64	-6.37	T	-1,610	0,112
	Self-care	-11.47	-16.00	-4.53	Z	-0.497	0.619
	Getting along	-18.87	-17.86	1.01	Z	0.164	0.870
	Life activities	-19.95	-24.76	-4.81	T	-0,959	0,341
	Participation	-13.73	-20.12	-6.39	T	-1,877	0.065
	Global disability	-11.20	-15.63	-4.43	T	-1,867	0.066
HRQoL *	General	6.25	8.21	1.96	Z	0.423	0.672
	Physical Health	-0.21	3.57	3.78	T	1,573	0.121
	Psychological Health	-1.59	3.10	4.69	Z	1,469	0.142
	Social relationships	0.74	-2.38	-3.12	Z	-0.483	0.629
	Environment	-1.29	3.04	4.33	T	1,625	0.109
	Total HRQoL	-0.25	2.97	3.22	T	1,638	0.106

* Health-Related Quality of Life, §: Bilateral asymptotic significance, Z: Mann-Whitney Z test, T: Student's t-test for independent samples (equal variances are assumed)
Note: the means for the groups were calculated using the difference between post-test and pre-test. The difference was calculated by subtracting the experimental group's mean from the control group's mean.

IV. Discussion

The main goal of this research was to determine the effect of an intervention program based on motor re-learning on disability and HRQoL compared to a physiotherapeutic program under traditional approaches. The results allow us to conclude that there is a significant improvement on the level of disability after both interventions independently, but there is no statistical significance of improvement difference when comparing both groups. On the other hand, there are no significant differences in the overall perception of HRQoL, although there are differences in the *Physical health* dimension of the experimental group, and in *total HRQoL* dimension of both groups.

Several studies in the scientific literature have focused on establishing the effectiveness of the motor relearning approach in subjects with hemiparesis caused by brain lesions. Although, none of the referenced studies considers disability assessment from a comprehensive approach, some of the evaluated outcome measures can provide information from their different components. Langhammer and Stanghelle conducted several comparative studies between Bobath and motor relearning programs on rehabilitation results in post-stroke patients [13-15]. From their first research with a population in acute phase, and in line with the findings of the current study, the authors report no significant differences between the groups from the measurement of performance in activities of daily life, assessed with the Barthel Index [13]. However, they conclude that due to the given comprehensiveness of the motor relearning approach, it is important to recommend its use in the first phase of rehabilitation on people with stroke. In their second-long term research in a population from one to four years of stroke evolution, in spite of the fact that they still failed to find important differences between the two treatments on long-term motor function, they reported fast deterioration of the basic activities of daily life and a greater dependence on family members [14]. In their last study, they made a randomized, controlled clinical trial comparing both interventions. The results favored the motor relearning approach in terms of improvement of biomechanical and physiological qualities of movement, as well as in psychosocial and cultural aspects of the participants [15]. For the latter, they relate positive effects for emotional state, energy and social interaction capacity.

On the other hand, Bhalerao *et al*. conducted another clinical trial with this same population, comparing a motor relearning approach with training-based on the Bobath approach [16]. The results show that the amount of change in all primary outcome measures (Motor Evaluation Scale –MAS-, Barthel Index, FIM, Functional Ambulation Category –FAC- and Dynamic Gait Index- DGI), except Fugl Meyer Motor evaluation, was higher in the group intervened with the motor relearning program compared to the Bobath group ($p < 0.05$). For his part, Chan conducted a similar study comparing the motor relearning approach with conventional therapy and it showed the effectiveness of the first approach in functional recovery of balance, performance in personal care, performing instrumental activities of daily life, and integration into the community [17]. In contrast, research conducted by Batool *et al*., in which this same type of program was compared with restriction-induced movement therapy in patients with post-stroke hemiplegia, they reported a significant improvement in the motor function of the upper limb, and better results in self-care-assessed with FIM- in favor of those who applied the restriction therapy [18].

The findings from this study do not show significant differences in the overall perception of HRQoL between groups. Similar results were found by Bovolenta *et al.* who focused on determining the recovery of motor deterioration, functionality, and the effect on quality of life of a robot-assisted treatment in patients with hemiparesis, in this case using the EURO-QoL [22]. In contrast, Matsumoto *et al*. evaluated the comparative effectiveness between the application of an underwater exercise program vs conventional therapy in people with post- stroke hemiplegia, and they found significant differences in quality of life [23].

These results could be attributed to two general situations: the time of evolution of health condition – which ranged from 3 months to 32 years, and the time between the measurements of quality of life -six weeks between the pre- and the post-test. In this sense, Mesa *et al* indicate that the time between the occurrence of a stroke and the measurement of the quality of life can influence a person's response, since this variable has an ambiguous and changeable nature during the time [24]. Similarly, Baylor *et al*. report that self-perception of quality-of-life declines over a period of six months, even if there is evidence of clinical improvement [25]. In contrast, a prospective multicenter study conducted in Mongolia it was found that after one year of rehabilitation the quality of life of stroke patients in the domains of physical and environmental aspects improved significantly; however, social relationship and psychological health declined, but the decline was not significant. The authors argue that efficient rehabilitation therapy for poststroke patients can improve their QoL [26].

Other authors have associated the effect of motor impairment, fatigue, post-stroke depression, functional impairment and disability with self-report of difficulties in physical and psychosocial domains of

HRQoL [6-7]. A unit increase in the level of disability indicates an 8% decrease in HRQoL in *Psychosocial Health* domain, and a 17% decrease in HRQoL in *Physical Health* domain [27]. Oyewole *et al* conclude in their predictive model, using WHO-DAS, that disability in stroke survivors is determined by having right dominant limb affected, increase in blood pressure, longer stroke duration, increase in age and being a male, and decreases with a productive lifestyle [28]. Doan *et al*. further expounded on the relationship between disability and quality of life relationship as potentially useful in future research: a) to characterize disease burden on stroke in results reported by the person, and in relation to the social impact, and b) to distinguish disease burden according to the degree of disability [29].

The *Physical Health* domain of quality of life was assessed the lowest by all the participants in both pre- and post-test. In this regard, Mesa *et al.* stated that stroke has a negative impact on quality of life due to its effects on people's physical and psychological health [24]. Besides, Gillard *et al*. showed that spasticity, associated with physical function, causes a negative impact on the perception of quality of life in post-stroke patients [30]. The latter authors asked individuals with spasticity which aspect has more impact on quality of life, and they found that the worst quality of life is associated with limited movement ranges, muscle contractures and limitations in daily life activities. Other studies on subjects with different neurological conditions showed that physical goals can lead to a more positive subjective quality of life and greater satisfaction with physical ability [31].

V. Conclusion

In conclusion, the previous findings indicate that interventions focused on training on activities such as self-care or the performance of daily life tasks constitute an important challenge for people with hemiparesis due to the potential effects these have on disability and quality of life. Instruments such as WHODAS 2.0 should be used to deepen our understanding of the relationship between the performance of activities and social participation of people with disabilities. Regarding the measurement of quality of life, aspects related to the minimum time needed to detect changes in their perception and perform differential analyses based on age and time of evolution of health condition could be considered.

In future studies, participants should be chosen at random to form control and experimental groups, as well as to standardize conventional interventions on the group assigned as control

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References

[1]. Malouin F, Potvin M, Prévost J, Richards CL, Wood-Dauphinee S. Use of intensive task-oriented gait training program in a series of patients with acute cerebrovascular accidents. Phys Ther. 1992;72:781-93. Doi: 10.1093/ptj/72.11.781

[2]. Odriozola FA, Iriarte M, Mendía A, Murgialdai A, Marco P. Pronóstico de las secuelas tras la lesión cerebral. Med. Intensiva. 2009;33(4):171-81. http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S0210-56912009000400004

[3]. Institute for Health Metrics and Evaluation (IHME). Findings from the Global Burden of Disease Study 2017. Seattle, WA: IHME, 2018.

[4]. World Health Organization. Global status report on road safety: time for action. Geneva (Switzerland): WHO Library Cataloguing-in-Publication Data, 2009.

[5]. Carvalho-Pinto B, Faria C. Health, function and disability in stroke patients in the community. Braz J Phys Ther. 2016;20(4):355–66. Doi: 10.1590/bjpt-rbf.2014.0171

[6]. Elloker T, Rhoda A, Arowoiya A, Lawal IU. Factors predicting community participation in patients living with stroke in the Western Cape, South Africa. Disabil Rehabil. 2018;29:1-8. Doi: 10.1080/09638288.2018.1473509

[7]. Ezekiel L, Collett J, Mayo N, Pang L, Field L, Dawes H. Factors associated with participation in life situations for adults with stroke: A systematic review. Arch Phys Med Rehabil. 2019 May;100(5):945-955. Doi: 10.1016/j.apmr.2018.06.017

[8]. Arowoiya AI, Elloker T, Karachi F, Mlenzana N, Jacobs-Nzuzi Khuabi L, Rhoda A. Using the World Health Organization's Disability Assessment Schedule (2) to assess disability in community-dwelling stroke patients. S. Afr. J. Physiother 2017;73(1), a343. Doi: 10.4102/sajp.v73i1.343

[9]. Murtezani A, Hundozi H, Gashi S, Osmani T, Krasniqi V, Rama B. Factors associated with reintegration to normal living after stroke. Med Arh. 2009;63(4):216-9. PMID: 20088178

[10]. Hamzat TK, Olaleye OA, Akinwumi OB. Functional ability, community reintegration and participation restriction among community-dwelling female stroke survivors in Ibadan. Ethiop J Health Sci. 2014 Jan;24(1):43-8. Doi: 10.4314/ejhs.v24i1.6

[11]. Carr J, Shepherd RB. A Motor Learning Model for Stroke Rehabilitation. Physiotherapy 1989;75(7):372-380. Doi: 10.1016/S0031-9406(10)62588-6

[12]. Carr JH, Shepherd RB. The changing face of neurological rehabilitation. Rev. Bras. Fisioter. 2006;10(2):147-56. Doi: 10.1590/S1413-35552006000200003
[13]. Langhammer B, Stanghelle JK. Bobath or Motor Relearning Program? A Comparison of two different approaches of physiotherapy in stroke rehabilitation: a randomized controlled study. Clin Rehabil. 2000;14(4):361-9. Doi: 10.1191/0269215500cr338oa
[14]. Langhammer B, Stanghelle JK. Bobath or motor relearning programme? A follow-up one and four years post stroke. Clin Rehabil. 2003 Nov;17(7):731-4. Doi: 10.1191/0269215503cr670oa
[15]. Langhammer B, Stanghelle JK. Can physiotherapy after stroke based on the Bobath concept result in improved quality of movement compared to the motor relearning program. Physiother. Res. Int. 2011;16(2):69-80. Doi: 10.1002/pri.474
[16]. Bhalerao G, Kulkarni V, Kapoor D. Comparison of two Physiotherapy Approaches in Acute Stroke Rehabilitation: Motor Relearning Program versus Bobath Approach. JOR 2011;1(1):79-88. https://www.researchgate.net/publication/276266288
[17]. Chan DY, Chan CC, Au DK. Motor relearning program for stroke patients: a randomized controlled trial. Clin Rehabil. 2006;20(3):191-200. Doi: 10.1191/0269215506cr930oa
[18]. Batool S, Soomro N, Amjad F, Fauz R. To compare the effectiveness of constraint induced movement therapy versus motor relearning programme to improve motor function of hemiplegic upper extremity after stroke. Pak J Med Sci 2015;31(5):1167-1171. Doi: 10.12669/pjms.315.7910
[19]. Pinzón-Bernal MY, Henao-Lema CP, Pérez-Parra J.E. Efecto de un programa de intervención basado en reaprendizaje motor sobre el control postural en adultos con hemiparesia. Fisioterapia 2020;42(1):5-16. Doi: 10.1016/J.Ft.2019.09.001
[20]. Ortega-Barrio MA, Herce-Martínez MB, Valiñas-Sieiro F, Mariscal-Pérez N, López-Cunquero MA, Cubo-Delgado E. Estudio del impacto del medio rural o urbano sobre la discapacidad residual tras un ictus. Enferm Clin. 2013;23(5):182-8. Doi: 10.1016/j.enfcli.2013.08.005
[21]. De Lima ML, Ferreira-Santos JL, Okino-Sawada N, Pereira de Lima LA. Quality of life of individuals with stroke and their caregivers in a city of Triângulo Mineiro. Rev Bras Epidemiol. 2014;(2):453-64. Doi: 10.1590/1809-4503201400020013ENG
[22]. Bovolenta F, Sale P, Dall'Armi V, Clerici P, Franceschini M. Robot-aided therapy for upper limbs in patients with stroke-related lesions. Brief report of a clinical experience. J Neuroeng Rehabil. 2011 Apr 9;8:18. Doi: 10.1186/1743-0003-8-18
[23]. Matsumoto S, Uema T, Ikeda K, Miyara K, Nishi, T, Noma T, Shimodozono M. Effect of Underwater Exercise on Lower-Extremity Function and Quality of Life in Post-Stroke Patients: A Pilot Controlled Clinical Trial. J Altern Complement Med. 2016 Aug;22(8):635-41. Doi: 10.1089/acm.2015.0387
[24]. Mesa Y, Hernández T, Parada Y. Factores determinantes de la calidad de vida en pacientes sobrevivientes a un ictus. Rev Haban Cienc Med [Internet]. 2017;16(5):735-750. http://scielo.sld.cu/scielo.php?script=sci_ arttext&pid=S1729-519X2017000500007
[25]. Baylor C, Yorkston KM, Jensen MP, Truitt AR, Molton IR. Scoping review of common secondary conditions after stroke and their associations with age and time post stroke. Top Stroke Rehabil [internet]. 2014 Sep-Oct; 21(5):371-82. Doi: 10.1310/Tsr2105-371.
[26]. Chuluunbaatar E, Chou YJ, Pu C. Quality of life of stroke survivors and their informal caregivers: A prospective study. Disabil Health J. 2016 Apr;9(2):306-12. Doi: 10.1016/j.dhjo.2015.10.007
[27]. Oyewole OO, Ogunlana MO, Gbiri CA, Oritogun KS. Prevalence and impact of disability and sexual dysfunction on Health-Related Quality of Life of Nigerian stroke survivors, Disabil Rehabil. 2017 Oct;39(20):2081-2086. Doi: 10.1080/09638288.2016.1219395
[28]. Oyewole OO, Ogunlana MO, Oritogun KS, Gbiri CA. Post-stroke disability and its predictors among Nigerian stroke survivors. Disabil Health J. 2016 Oct;9(4):616-23. Doi: 10.1016/j.dhjo.2016.05.011
[29]. Doan QV, Brashear A, Gillard PJ, Varon SF, Vandenburgh AM, Turkel CC, Elovic EP. Relationship between disability and Health-related quality of life and caregiver burden in patients with upper limb Post stroke spasticity. PMR. 2012 Jan;4(1):4-10. Doi: 10.1016/j.pmrj.2011.10.001
[30]. Gillard J, Sucharew H, Kleindorfer D, Belagaje S, Varon S, Alwell K, Moomaw C, Woo D, Khatri P, Flaherty M, Adeoye O, Ferioli S and Kissela B. The negative impact of spasticity on the health-related quality of life of stroke survivors: a longitudinal cohort study. Health Qual. Life Out. 2015;13:159 Doi: 10.1186/s12955-015-0340-3.
[31]. Mashola MK, Mothabeng DJ. Associations between health behaviour, secondary health conditions and quality of life in people with spinal cord injury. Afr. J. Disabil. 2019;8(0):a463. Doi: 10.4102/ajod.v8i0.463.