

GROUP PHYSIOTHERAPY AND QUALITY OF LIFE IN PARKINSONISM: QUASI-EXPERIMENTAL STUDY

**FISIOTERAPIA EM GRUPO E QUALIDADE DE VIDA NO PARKINSONISMO:
ESTUDO QUASI-EXPERIMENTAL**

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ABSTRACT: *Context:* According to systematic reviews, a short-term treatment of aquatic physiotherapy, mind-body therapies and exergame improve quality of life of people with parkinsonism. But few studies examined the group physiotherapy effects on quality of life of people with parkinsonism. *Objective:* We aimed to investigate the short-term effects of group physiotherapy protocols on the quality of life of people with Parkinson's disease or secondary parkinsonism. *Methods:* This is a quasi-experimental study, a controlled, non-randomized, unmasked trial, with consecutive arms for one group and parallel to another, with 15 participants with parkinsonism. They were organized in 3 groups: OG-E1wI (n = 9), observed group treated with group physiotherapy once a week; EG-C (n = 6), in the control phase without treatment, concomitant with OG-E1wI; EG-2wI (n = 6), the same subjects as EG-C, they were treated with group physiotherapy twice a week, in a posterior consecutive phase. The PDQ-39 scale was used to assess Quality of Life. *Results:* The mean differences between OG-E1wI and

EG-C and between EG-2wI and EG-C in the various domains of PDQ-39 were not statistically significant. **Conclusion:** A group physiotherapy protocols performed once or twice a week may not be enough to improve quality of life for people with parkinsonism. The literature suggests that group physiotherapy protocols performed three to five times a week improve quality of life in a short period.

Keywords: Parkinsonian disorders; Parkinson Disease; Quality of Life; Physical Therapy Modalities; Non-Randomized Controlled Trials as Topic.

RESUMO: *Contexto:* Revisões sistemáticas sugerem que fisioterapia aquática, terapias corporais complementares e *exergame* aumentam a qualidade de vida da pessoa com parkinsonismo em tratamento de curto prazo. Porém, os efeitos da fisioterapia em grupo na qualidade de vida da pessoa com parkinsonismo são pouco estudados. *Objetivo:* Investigar os efeitos em curto prazo de protocolos de fisioterapia grupal sobre a Qualidade de Vida de pessoas com doença de Parkinson e parkinsonismo secundário. *Métodos:* Estudo quasi-experimental, ensaio controlado não randomizado, sem mascaramento, com braços consecutivos para um grupo e paralelo para outro, com 15 participantes com parkinsonismo. Os participantes foram organizados em 3 grupos: OG-E1wI (n= 9), intervenção de fisioterapia em grupo uma vez por semana; EG-C (n= 6), em fase controle sem tratamento, concomitante ao OG-E1wI; EG-2wI (n=6), os mesmos sujeitos do EG-C, em fase consecutiva com intervenção de fisioterapia em grupo, duas vezes por semana. A escala PDQ-39 foi utilizada para avaliar a Qualidade de Vida. *Resultados:* As diferenças médias entre OG-E1wI e EG-C e entre EG-2wI e EG-C nos vários domínios da PDQ-39 não são estatisticamente significativas. *Conclusão:* Protocolos de fisioterapia em grupo com frequência de uma ou duas vezes por semana podem não ser suficiente para promover ganhos na qualidade de vida de pessoas com parkinsonismo. A literatura sugere que protocolos de fisioterapia em grupo feitos três a cinco vezes por semana obtêm ganho de qualidade de vida em um período de curto prazo.

Palavras-chave: Transtornos Parkinsonianos; Doença de Parkinson; Qualidade de vida; Modalidades de Fisioterapia; Ensaios Clínicos Controlados não Aleatórios como Assunto.

INTRODUCTION

Parkinson's Disease (PD) and Secondary Parkinsonism (SP) cause impairments and activity limitations and they have a significant impact on quality of life (QoL). In addition to musculoskeletal signs, symptoms related to lower QoL can happen, such as loss of appetite, anguish, sleep disturbances, loss of self-esteem, anxiety, feeling of embarrassment, emotional insecurity, impotence, communication difficulties, major changes of mood, functional dependence and restriction of autonomy¹.

Physiotherapy is essential in the rehabilitation treatment of PD and SP. Mainly, physiotherapy aims to improve or maintain motor function and independence in activities of daily living, with impact on QoL¹. The frequent practice of physical exercises, predominantly aerobic, seems to have a neuroprotective effect. Exercises help delay symptoms that impair QoL, mobility and balance. Exercises also have beneficial effects on the cognitive function and mood of people with parkinsonism².

According to an important systematic review³ produced by the Cochrane Collaboration, the clinical studies available in the literature failed to demonstrate that individual physiotherapy has a relevant effect on QoL, when compared with placebo or no treatment. Thus, individual physiotherapy has no effects of clinically important improvement in the PDQ-39 scale or other QoL scales for PD and SP. However, this systematic review is old, from 2013, and does not consider more recent experimental studies. Most current systematic reviews⁴⁻⁷ indicate that aquatic physiotherapy, mind-body therapy exercises (Tai Chi, Yoga, Qigong) and exergame (video game training) improve QoL of individuals with PD with clinically important and statistically significant gains. However, other systematic reviews^{8,9} suggest the opposite, that aquatic physiotherapy and complementary therapy exercises do not have a significant effect on QoL, that is, they are not different from control intervention.

There are few clinical studies that address the effects of group physiotherapy on the QoL of people with mild to moderate PD or SP. For this reason, we have done this research aiming to

investigating the effects of group physiotherapy protocols on the QoL of people with PD and SP, through a mixed study with a quasi-experimental and observational research design.

METHODS

This is a quasi-experimental study (observational with therapeutic intervention), controlled, non-randomized, unmasked trial, with consecutive arms for one group and parallel arm for another. The study followed the recommendations of CONSORT – CONSolidated Standards of Reporting Trials (<http://www.consort-statement.org>).

This study was approved by the Research Ethics Committee of the State University of Goiás under opinion 2,024,873/2017. The study is registered in the Brazilian Clinical Trials Registry (REBEC – Registro Brasileiro de Ensaio Clínicos) under the digital identifier (ID): RBR-392cxdp. All participants signed the informed and free consent form, after they were informed about all aspects of the research. The study was done between October 2017 and December 2018.

Inclusion criteria. The participant should:

- Show parkinsonism, diagnosed at least six months ago, at stages 1, 2 or 3 of the Hoehn and Yahr scale (HYS)¹¹ for PD or to show an equivalent motor condition, in the case of SP;
- Be able to walk with total or modified independence;
- Be aged between 40 and 70 years old;
- Be under medical supervision for at least 2 months;
- Have medical authorization to practice exercises;
- Make regular use of antiparkinsonian medicines.

Exclusion criteria. The participant should not:

- Have undergone surgery for PD;

- Present cardiovascular diseases or musculoskeletal disorders (rheumatological, orthopedic, traumatological diseases, arthrodesis) that contraindicate the performance of physical exercises;
- Present great limitation of joint movement in a body segment;
- Have secondary balance disorders, such as severe vestibulopathies;
- Have a severe cognitive impairment, which makes it difficult for the participant to understand verbal instructions; the deficit should be confirmed by the Mini-Mental State Examination (MMSE) with a score of less than 24 points (8 years of schooling), less than 18 points (4-7 years of schooling) or less than 14 points (non-literate people)¹¹.

The assessment and intervention arms were organized into:

- OG-E1wI (observed group, exposed to once week intervention): observed group, exposed to group physiotherapy intervention once a week, each session lasting 40 minutes. The exercises performed included flexibility training, trunk and limb strengthening, motor coordination and gait training. This group was not treated by the researchers, the group was only observed and assessed by them. The participants were treated at a public service of rehabilitation in Goiania, Goias, Brazil. They were assessed twice by the researchers, with a difference of 5.5 to 7.5 months (minimum and maximum time), with an average of 6.4 months (193 days) between measurements. This was an observational group exposed to a protection factor (group motor training).
- EG-C (experimental group, controlled phase): experimental group, control phase, monitored exclusively by the team of researchers. The treatment and assessment were done at the College of Physiotherapy and Physical Education at the State University of Goias, Goiania. This group was assessed three times over time. However, the participants were not exposed to motor training between the first and second assessment, they remained sedentary. Thus, the period between the 1st and 2nd assessment constitutes a control group independent of the OG-E1wI and paired with the EG-2wI. This control period ranged from 3.7 to 6 months (minimum and maximum time), with an average of 5 months (150 days).

- EG-2wI (experimental group, twice a week intervention phase): experimental group, monitored at State University of Goiás, intervention phase, period between the second and third assessment. During this period, participants were exposed to a group physiotherapy protocol, which lasted twelve weeks, with two sessions per week, lasting fifty to sixty minutes each, totaling twenty-four sessions. The second assessment was done in the week before the treatment, and the third assessment was done after three months (ninety days) of treatment. The protocol included self-stretching and isometry exercises with yoga and Pilates postures held for thirty seconds; trunk and limb strengthening exercises, performed in an active-free or active-resisted manner, followed by circuit gait training and gait training with auditory cues.

Therefore, there were two therapeutic comparison arms in this research:

- once-a-week treatment arm: comparison between OG-E1wI (group treated once a week) and EG-C (untreated control group), with independent samples data (different groups with different people);
- twice-weekly treatment arm: comparison between EG-2wI (group treated twice a week) and EG-C (untreated control group), with paired (dependent) sample data.

Two researchers (GSM and MCF) assessed the participants blindly using the Brazilian version of PDQ-39 scale¹² (Parkinson's disease questionnaire). This scale is specific psychometric instrument for measuring the QoL of people with PD. The scale has 39 questions distributed in eight different domains. The score for each item ranges from zero to four points. The scores for each domain and the overall score are expressed on a percentage scale of zero to one hundred points, where the lowest score is the highest QoL¹².

The Excel®¹³ was used to do data tabulation and descriptive statistics. The online version of OpenEpi¹⁴ was used to define the median and mean confidence intervals. The PDQ-39 domains and their overall score were dependent variables. Independent variables were the interventions, according to the therapeutic arm. The Action Stat Pro version 3.6¹⁵ application was used to do inferential statistics.

There are five measures (assessments) for each dependent variable. There are ten possible pairs

of differences between measures, but only three pairs are relevant to the research: difference between values of the first and second assessment in the OG-E1wI, difference between values of the first and second assessment in EG-C and difference between values of the second and third assessment in EG-2wI. For these differences, it was possible to use the T-test for paired samples or the Wilcoxon Test. The Shapiro-Wilk test was applied to all PDQ-39 samples collected, showing statistically significant results, that is, they showed non-normal distribution. The Wilcoxon Test was then used, but with an unusual p-value ($p= 0.005$). It was necessary to divide the p-value by ten to have a maximum alpha error of 5 %, considering the ten possible comparisons. Absolute mean differences (MD) were calculated for each dependent variable, comparing control and intervention groups.

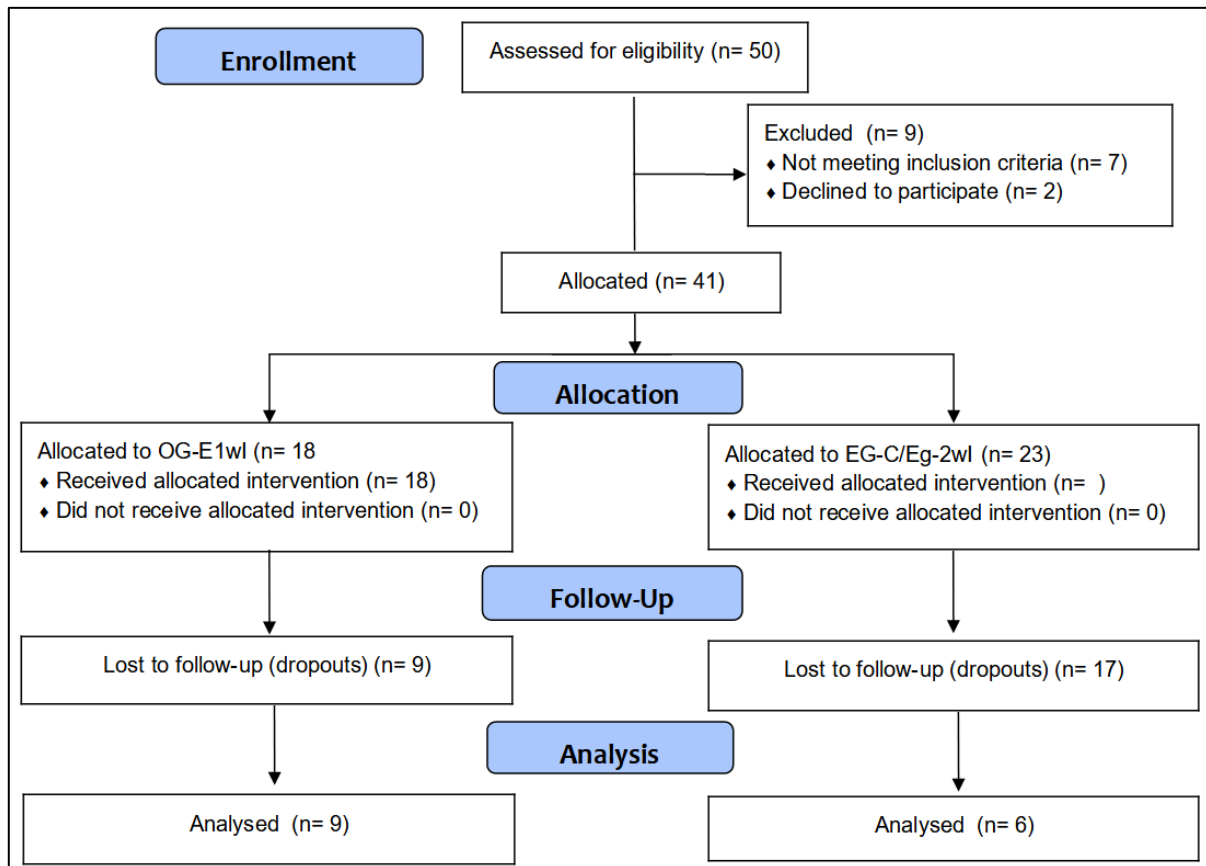
The recruitment was publicized in a large public university hospital, in a rehabilitation center from the Goiás public health system, in associations of people with PD and their families and in social media. But the study had significant difficulty in adherence, with large sample losses due to dropouts. The final small sample size may not have guaranteed adequate statistical power of 80% for the statistical analyses.

RESULTS

Fifty participants were recruited, they gave consent and were screened according to the inclusion and exclusion criteria. The study was initiated with forty-one volunteers who met all inclusion criteria. There were twenty-six sample losses in the follow-up, with a final sample of fifteen participants. Figure 1 presents the flowchart of the intervention procedures performed in the study.

In OG-E1wI, seven participants were male and two were female. Age ranged from 44 years (minimum) to 77 years (maximum), $\bar{x}(s)= 62.3 (7.6)$ years. BMI (body mass index) ranged from 20.7 kg/m^2 (minimum) to 32.7 kg/m^2 (maximum), $\bar{x}(s)= 25.7 (3.4) \text{ kg/m}^2$. Three participants had SP and six had PD, of which four were in HYS stage I, one participant was in HYS stage II and one participant was in HYS stage III.

Figure 1 – Flowchart of the participant flow.



In the experimental group (EG-C/EG-2wI), two participants were male and four were female. Age ranged from 43 years (minimum) to 72 years (maximum), $\bar{x}(s)= 62.8 (8.2)$ years. BMI ranged from 21.6 kg/m² (minimum) to 32.0 kg/m² (maximum), $\bar{x}(s)= 25.8 (2.4)$ kg/m². Also, five participants had PD, all in stage I of HYS, and one participant had SP. This subject with SP and a participant with PD had choreoathetosis secondary to the use of antiparkinsonian drugs.

The results obtained in the PDQ-39 in each assessment are shown in table 1. The results of the differences in PDQ-39 values between groups/therapeutic arms are shown in table 2.

Table 1 – Distribution of values in the measurements of the PDQ scale in the OG-E1wI e EG (EG-C/EG-2wI).

Domains of PDQ-39	Assessment	OG-E1wI				Experimental Group (EG-C/EG-2wI)				
		M	IC95%-M		Wilcoxon test 1 st -2 nd *	M	CI 95%-M		Wilcoxon test 1 st -2 nd *	Wilcoxon test 2 nd -3 rd *
			L.I.	L.S.			L.I.	L.S.		
Mobility	1 ^a	20.0	10.0	27.5	Z= -2.371	8.8	0.0	37.0	Z= -1.892	
	2 ^a	30.0	20.0	65.0	p= 0.018	23.8	2.5	60.0	p= 0.058	Z= -1.625
	3 ^a					17.5	0.0	57.5		p= 0.104
Activities of daily living	1 ^a	25.0	12.5	50.0	Z= -1.781	29.1	0.0	50.0	Z= -0.314	
	2 ^a	33.3	25.0	54.0	p= 0.075	18.8	4.2	54.2	p= 0.753	Z= -0.406
	3 ^a					14.6	0.0	50.0		p= 0.684
Emotional well-being	1 ^a	33.3	0.0	50.0	Z= -2.056	27.0	8.0	41.0	Z= -0.405	
	2 ^a	41.7	8.0	58.3	p= 0.040	27.1	4.2	58.3	p= 0.686	Z= -1.378
	3 ^a					31.3	16.7	88.3		p= 0.168
Stigma	1 ^a	43.8	6.3	56.3	Z= -1.362	9.0	0.0	62.0	Z= -0.736	
	2 ^a	25.0	0.0	31.3	p= 0.173	25.0	0.0	93.8	p= 0.461	Z= -1.342
	3 ^a					0.0	0.0	50.0		p= 0.180
Social support	1 ^a	8.3	0.0	33.3	Z= -1.755	58.3	33.3	91.7	Z= -1.761	
	2 ^a	33.3	33.3	50.0	p= 0.079	41.7	0.0	66.6	p= 0.078	Z= -1.095
	3 ^a					25.0	0.0	41.7		p= 0.273
Cognitions	1 ^a	6.3	0.0	43.8	Z= -0.593	15.0	0.0	100.0	Z= -0.943	
	2 ^a	16.7	8.0	41.7	p= 0.553	37.5	18.8	68.8	p= 0.345	Z= -0.406
	3 ^a					37.5	6.3	100.0		p= 0.684
Communication	1 ^a	33.3	0.0	50.0	Z= -0.211	8.0	0.0	75.0	Z= -0.730	
	2 ^a	25.0	0.0	50.0	p= 0.833	20.8	0.0	66.7	p= 0.465	Z= -0.816
	3 ^a					33.4	0.0	75.0		p= 0.414
Bodily discomfort	1 ^a	50.0	33.3	75.0	Z= -0.297	33.0	25.0	100.0	Z= -0.530	
	2 ^a	50.0	33.3	83.3	p= 0.767	50.0	16.7	91.7	p= 0.596	Z= -1.289
	3 ^a					25.0	0.0	91.7		p= 0.197
Overall score	1 ^a	26.3	16.7	33.3	Z= -2.547	18.1	13.9	53.8	Z= -1.782	
	2 ^a	35.5	22.9	51.7	p= 0.011	26.3	15.4	50.0	p= 0.075	Z= -1.051
	3 ^a					23.7	10.2	51.9		p= 0.293

*Differences in the Wilcoxon Test are statistically significant when the p-value ≤ 0.005 (namely, less than usual for an alpha error equivalent to 5% or less). We have already explained this in the methods section.

Table caption:

M: median.

CI 95%-M: 95% confidence interval of the median.

L.I.: lower bound of the median confidence interval.

L.S.: upper bound of the median confidence interval.

Wilcoxon test 1st-2nd: statistical test for the difference between values of the 1st and 2nd assessment.

Wilcoxon test 2nd-3rd: statistical test for the difference between values of the 2nd and 3rd assessment.

Z: Z score, statistical value of the Wilcoxon Test, to compare two distributions of paired samples.

p: p-value, or probability value of the statistical test, equals the alpha error.

Table 2 – Distributions of differences in the measurements of the PDQ scale in the OG-E1wI, EG (EG-C/EG-2wI).

Domains of PDQ-39	Difference before-after OG-E1wI		Difference before-after EG-C		Mean difference between groups	
	$\bar{x}(s)$	IC95%	$\bar{x}(s)$	IC95%	MD	CI 95%
Mobility	14.7 (20.9)	-1.4; +30.8	10.9 (11.2)	-0.9; +22.7	3.8 †	-16.5; +24.1
Activities of daily living	10.6 (14.4)	-0.5; +21.7	-2.0 (19.6)	-22.5; +18.5	12.6 †	-6.3; +31.5
Emotional well-being	10.1 (12.2)	+0.7; +19.5	4.5 (12.1)	-8.2; +17.2	5.6 †	-8.3; +19.5
Stigma	-11.1 (22.0)	-28.1; +5.8	14.8 (38.2)	-25.3; +54.9	-25.9 †	-7.5; +59.3
Social support	19.4 (28.6)	-2.5; +41.4	-18.1 (21.4)	-40.5; +4.3	37.5 *	+7.8; +67.2
Cognitions	4.1 (25.1)	-15.2; +23.4	9.8 (27.8)	-19.3; +39.0	-5.7 †	-24.1; +35.5
Communication	0.0 (14.4)	-11.1; +11.1	7.1 (23.9)	-18.0; +32.1	-7.1 †	-14.1; +28.3
Bodily discomfort	0.0 (32.0)	-24.6; +24.6	8.6 (25.4)	-18.1; +35.2	-8.6 †	-25.1; +42.3
Overall score	7.7 (6.4)	+2.8; +12.6	5.5 (6.2)	-1.0; +12.1	2.2 †	-5.0; +9.4
Domains of PDQ-39	Difference before-after EG-2wI ‡		Difference before-after EG-C §		Mean difference between groups	
	$\bar{x}(s)$	IC95%	$\bar{x}(s)$	IC95%	MD	CI 95%
Mobility	-4.2 (5.4)	-9.8; +1.5	5.9 (6.4)	-0.8; +12.6	-10.1 *	-19.4; -0.8
Activities of daily living	1.4 (12.8)	-12.1; +14.8	-1.2 (13.5)	-15.4; +12.9	2.6 †	-22.2; 27.4
Emotional well-being	9.2 (13.8)	-5.3; +23.6	2.3 (6.7)	-4.7; +9.3	6.9 †	-2.8; 16.6
Stigma	-22.9 (38.9)	-63.7; +17.9	11.6 (30.5)	-20.4; +43.6	-34.5 †	-104.1; 35.1
Social support	-18.0 (39.6)	-59.6; +23.5	-11.0 (12.0)	-23.6; +1.7	-7.1 †	-55.1; 40.9
Cognitions	1.0 (22.8)	-22.9; +25.0	7.7 (16.0)	-9.1; +24.6	-6.7 †	-46.3; 32.9
Communication	5.6 (14.6)	-9.8; +20.9	4.3 (13.1)	-9.4; +18.0	1.3 †	-25.0; 27.6
Bodily discomfort	-16.7 (29.8)	-47.9; +14.6	6.2 (18.3)	-13.0; +25.5	-22.9 †	-66.3; 20.5
Overall score	-3.9 (8.0)	-12.4; +4.5	3.6 (3.8)	-0.3; +7.6	-7.6 †	-19.1; 3.9

*MD value is not statistically significant, because the lower limit of the confidence interval has the same sign as the upper limit (both negative or positive value).

†MD value is not statistically significant, as the lower limit of the confidence interval has a different sign than the upper limit.

‡ 3-month period between assessments (12.8 weeks between assessments [90 days]).

§ The before-after difference of each patient, in this period, was corrected with a time weighting, in order to have time equivalence between the two periods (90 days). The difference in the PDQ-39 value was divided by the value of the fraction between the number of days in the control period (variable number, from 110 to 180 days) and in the intervention period (90 days).

Table caption:

\bar{x} : mean (average).

s: standard deviation.

We observe, in table 1, that there were no statistically significant differences between the values of the first and second assessment in the OG-E1wI, between the values of the first and second assessment in the EG-C and between the values of the second and third assessment in the EG-2wI. When comparing the groups with each other (table 2), in the “Social Support” domain, the OG-E1wI showed a statistically significant reduction in QoL with MD, compared to the EG-C. Similarly, in the “Mobility” domain, the EG-2wI showed an increase in QoL, with a statistically significant MD, compared to the EG-C. However, these statistically significant MD values may be biased, as there are no statistically significant differences between the assessment values of QoL obtained before and after the follow-up period in each group. There were no harms or adverse events to the participants during the follow-up of the study.

DISCUSSION

The results indicate that a exposure to a short-term group motor training intervention, either twice a week or once a week, did not have significant effects in the PDQ-39 domains scores and overall score, when we compare the values before and after each intervention. Maybe, the reduced sample did not allow adequate statistical power to detect differences. However, it is also possible that a low-intensity intervention (once a week or twice a week) does not elicit clinically important therapeutic effects on the QoL of people with PD and PS with mild to moderate disability.

An important fact to consider, when we analyze continuous data, is the minimal clinically important difference (MCID). If the value of the difference before-after a treatment follow-up is equal to or greater than the MCID, this means: there is a relevant change for that specific health variable, the treatment improved that health domain and this improvement has clinically importance. According to Horváth et al.¹⁶, in their research with 365 participants and 985 paired samples of the PDQ-39, the MCID for the PDQ-39 overall score is – 4.72 points, for improvement in QoL, and + 4.22, for worsening QoL.

Only the value of MD in the “Social Support” domain was statistically significant, when we compare OG-E1wI and EG-C. Also, only the value of MD in the “Mobility” domain was

statistically significant, when we compare EG-2xI and EG-C. These MD values are greater than the MCID¹⁶ and this fact suggests that physiotherapy intervention is superior to control. However, the differences after-before intervention or after-before control are not statistically significant. Perhaps this fact invalidates the aforementioned significant results of the mean differences.

Thus, the QoL did not change during the follow-up period in the three therapeutic arms, either in the control phase (EG-C) or in the intervention phases (EG-2xI and OG-E1wI). This fact is confirmed by the following scientific finding: a large cohort study¹⁷ (with n=207) indicates that the PDQ-39 overall score, for populations with PD, has no statistically significant and clinically important changes over a two years period (MD = 1.02 [-1.57; +3.61] 95% CI). So, it is expected that a group of people with PD or PS, in experimental research, will not have statistically significant nor clinically important changes over any follow-up period of less than 2 years, at least in people not exposed to motor training intervention.

The results of some randomized clinical trials¹⁸⁻²³ suggest that various programs of group motor training with different frequencies (from 3 to 5 times a week) obtain short-term effects on QoL, with clinically important improvement in the PDQ-39 overall score, considering the mentioned MCID¹⁶ value. The programs included: focused sensory attention exercises (which include flexibility, motor coordination, balance and gait)¹⁸, exergame¹⁹, resistance training²⁰, gait training with visual cues²¹, the ABC program (Agility Boot Camp)²² and multimodal training²³. It seems that the type of motor training is not important but the weekly frequency of the therapeutic program is important for the final results and improvement of QoL^{3-9, 18-23}.

The present study had some limitations: the reduced number of participants and large sample losses may have led to a lower statistical power of the research. There is a need for future studies, with randomization, large sample (more than 1000 participants, to reduce sample confidence intervals) and longer follow-up time (at least two years) to verify the effects of group physiotherapy performed on a weekly basis 1 or 2 times a week on QoL compared to controls without motor training.

CONCLUSIONS

The data from the present research suggest that a group physiotherapy protocol in short-term treatment with a frequency of once or twice a week — training flexibility, strength (mild to moderate resistance training) and gait — may not be sufficient to achieve results of clinically important improvement on the QoL of people with PD in stages 1-3 and mild to moderate PS. However, studies in the scientific literature indicate that a short-term group physiotherapy programs with a frequency of three times a week or more, with varied motor training, achieve clinically important improvement in QoL.

INFORMATIONS ABOUT THE STUDY

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REFERENCES

1. Santos ISC, Menezes M do R de, Souza A dos S. Concepções de idosos sobre a vivência com a doença de Parkinson. Rev Enferm UERJ. 2009;17(1):69–74. Available from: <http://www.revenf.bvs.br/pdf/reuerj/v17n1/v17n1a13.pdf>.

2. Marinho MS, Chaves PM, Tarabal TO. Dual task in Parkinson's disease: a systematic review of randomized clinical trials. *Rev bras geriatr gerontol* [Internet]. 2014 [cited 2020 Sep 28];17(1):191–9. Available from: <https://doi.org/10.1590/S1809-98232014000100018>.
3. Tomlinson CL, Patel S, Meek C, Clarke CE, Stowe R, Shah L, Sackley CM, Deane KH, Herd CP, Wheatley K, Ives N. Physiotherapy versus placebo or no intervention in Parkinson's disease. *Cochrane Database Syst Rev*. 2012 Jul 11;(7):CD002817. Available from: <https://doi.org/10.1002/14651858.cd002817.pub2>.
4. Santos P, Scaldaferrri G, Santos L, Ribeiro N, Neto M, Melo A. Effects of the nintendo wii training on balance rehabilitation and quality of life of patients with Parkinson's disease: A systematic review and meta-Analysis. *NeuroRehabilitation* [Internet]. 2019 [cited 2020 Aug 11];44(4):569–77. Available from: <https://pubmed.ncbi.nlm.nih.gov/31256088/>.
5. Jin X, Wang L, Liu S, Zhu L, Loprinzi PD, Fan X. The impact of mind-body exercises on motor function, depressive symptoms, and quality of life in parkinson's disease: A systematic review and meta-analysis. *Int J Environ Res Public Health* [Internet]. 2020 Jan 1 [cited 2020 Aug 11];17(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/31861456/>.
6. Gomes Neto M, Pontes SS, Almeida L de O, da Silva CM, da Conceição Sena C, Saquetto MB. Effects of water-based exercise on functioning and quality of life in people with Parkinson's disease: a systematic review and meta-analysis. *Clin Rehabil* [Internet]. 2020 [cited 2020 Aug 11]; Available from: <https://pubmed.ncbi.nlm.nih.gov/32715810/>.
7. Cugusi L, Manca A, Bergamin M, Di Blasio A, Monticone M, Deriu F, et al. Aquatic exercise improves motor impairments in people with Parkinson's disease, with similar or greater benefits than land-based exercise: a systematic review. *J Physiother* [Internet]. 2019 Apr 1 [cited 2020 Aug 11];65(2):65–74. Available from: <https://pubmed.ncbi.nlm.nih.gov/30904467/>.
8. Fidan O, Seyyar GK, Aras B, Colak E, Aras O. The effect of Tai Chi and Qigong on health-related quality of life in Parkinson's disease: A systematic review and meta-analysis of systematic reviews [Internet]. Vol. 42, *International Journal of Rehabilitation Research*. Lippincott Williams and Wilkins; 2019 [cited 2020 Aug 11]. p. 196–204. Available from: <https://pubmed.ncbi.nlm.nih.gov/31116118/>.
9. Pinto C, Salazar AP, Marchese RR, Stein C, Pagnussat AS. The effects of hydrotherapy on balance, functional mobility, motor status, and quality of life in patients with Parkinson disease: A systematic review and meta-analysis. *PM R* [Internet]. 2019 Jan 1 [cited 2020 Aug 11];11(3):278–91. Available from: <https://pubmed.ncbi.nlm.nih.gov/30884205/>.
10. Goulart F, Pereira LX, Goulart DF. Uso de escalas para avaliação da doença de Parkinson em fisioterapia. *Fisioter e Pesqui* [Internet]. 2005 Apr 30 [cited 2022 Jun 26];11(1):49–56. Available from: <https://www.revistas.usp.br/fpusp/article/view/76385>.

11. Bertolucci PHF, Brucki SMD, Campacci SR, Juliano Y. O Mini-Exame do Estado Mental em uma população geral: impacto da escolaridade. *Arq Neuropsiquiatr*. 1994;52(1):01–7. Available from: <https://doi.org/10.1590/S0004-282X1994000100001>.
12. Silva JAMG, Dibai Filho AV, Faganello FR. Mensuração da qualidade de vida de indivíduos com a doença de Parkinson por meio do questionário PDQ-39. *Fisioter em Mov* [Internet]. 2011 Mar [cited 2020 Aug 7];24(1):141–6. Available from: <https://doi.org/10.1590/S0103-51502011000100016>.
13. Microsoft Corporation. Microsoft 365 Excel [Internet]. Redmond: Microsoft Corporation; 2018. Available from: <https://www.office.com/>.
14. Dean AG, Sullivan KM, Soe MM, Mir RA. OpenEpi: Open Source Epidemiologic Statistics for Public Health [Internet]. Atlanta; 2013 [cited 2020 Aug 9]. Available from: <https://www.openepi.com>.
15. Grupo EstatCamp. Action Stat Pro® [Internet]. Campinas: Grupo EstatCamp; 2017. Available from: <http://loja.portalaction.com.br/produto/action-stat-pro/>.
16. Horváth K, Aschermann Z, Kovács M, Makkos A, Harmat M, Janszky J, et al. Changes in Quality of Life in Parkinson's Disease: How Large Must They Be to Be Relevant? *Neuroepidemiology* [Internet]. 2017 Jun 1 [cited 2020 Aug 1];48(1–2):1–8. Available from: <https://pubmed.ncbi.nlm.nih.gov/28161701/>.
17. Ellis TD, Cavanaugh JT, Earhart GM, Ford MP, Foreman KB, Thackeray A, et al. Identifying clinical measures that most accurately reflect the progression of disability in Parkinson disease. *Park Relat Disord*. 2016;25:65–71. Available from: <https://doi.org/10.1016/j.parkreldis.2016.02.006>.
18. Beck EN, Wang MTY, Intzandt BN, Almeida QJ, Martens KAE. Sensory focused exercise improves anxiety in Parkinson's disease: A randomized controlled trial. *PLoS One* [Internet]. 2020;15(4):1–17. Available from: <http://dx.doi.org/10.1371/journal.pone.0230803>.
19. Tollár J, Nagy F, Kovács N, Hortobágyi T. Two-Year Agility Maintenance Training Slows the Progression of Parkinsonian Symptoms. *Med Sci Sports Exerc*. 2019;51(2):237–45. Available from: <https://doi.org/10.1249/mss.0000000000001793>.
20. Lima TA, Ferreira-Moraes R, Alves WMG da C, Alves TGG, Pimentel CP, Sousa EC, et al. Resistance training reduces depressive symptoms in elderly people with Parkinson disease: A controlled randomized study. *Scand J Med Sci Sport*. 2019;29(12):1957–67. Available from: <https://doi.org/10.1111/sms.13528>.
21. Costa-Ribeiro A, Maux A, Bosford T, Aoki Y, Castro R, Baltar A, et al. Transcranial direct current stimulation associated with gait training in Parkinson's disease: A pilot randomized clinical trial. *Dev Neurorehabil*. 2017;20(3):121–8. Available from:

<https://doi.org/10.3109/17518423.2015.1131755>.

22. King LA, Wilhelm J, Chen Y, Blehm R, Nutt J, Chen Z, et al. Effects of Group, Individual, and Home Exercise in Persons With Parkinson Disease. *J Neurol Phys Ther* [Internet]. 2015 Oct 1 [cited 2020 Aug 1];39(4):204–12. Available from: <http://journals.lww.com/01253086-201510000-00003>.

23. Kurt EE, Büyükturan B, Büyükturan Ö, Erdem HR, Tuncay F. Effects of Ai Chi on balance, quality of life, functional mobility, and motor impairment in patients with Parkinson's disease. *Disabil Rehabil* [Internet]. 2018;40(7):791–7. Available from: <https://doi.org/10.1080/09638288.2016.1276972>.