

The Impact of Mindfulness on Quality of Life in Parkinson's Disease: (A Randomized Clinical Trial)

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Abstract

Background: Parkinson's disease (PD) is the second common neurodegenerative disorder afflicting a large number of elder populations. It is mainly considered a movement disorder; however, the non-motor symptoms have a significant impact on the patients' quality of life. This study aimed to evaluate the possible effect of mindfulness-based stress reduction training (MBSR) on the quality of life of patients with PD.

Materials and Methods: This study was conducted at the outpatient neurology clinic of Imam Reza and Razi University-Hospital-Tabriz, Iran. Participants were 40 patients aged 67.95 ± 6.8 years (56-80) with a definite diagnosis of PD who were receiving dopaminergic drugs for at least one year. Participants were randomly categorized into experiment and control groups with 20 patients in each. The experiment included 8-week MBSR training each for 2h with a 15-minute break between the first and second hours. The assessments included patients' quality of life using the 39-Item Parkinson's disease questionnaire (PDQ-39) at baseline and after the experiment. The results were compared between two study groups and within each group using t-test analysis.

Results: The assessment revealed a lower mean score in all PDQ-39 items in the experiment group compared to control group; however, the difference was only significant for social support (34.13 ± 9.7 vs 26.19 ± 7.7 for control and experiment group, respectively. $P=0.007$). The mean PDSI score of patients in the experiment group was 31.88 ± 6.5 after one month compared to the baseline score of 33.93 ± 6.2 ($p<0.001$). Overall PDSI decreased modestly in the experiment group by 5.12% after the experiment.

Conclusion: In our study, mindfulness training improved the overall quality of life in PD patients. However, long-term follow up on a large-scale population is required to evaluate the impact of mindfulness-based stress reduction on each item.

Keywords: Mindfulness, Quality of Life, Parkinson's Disease

Abbreviations: PD-Parkinson's disease; MBSR-mindfulness-based stress reduction training; HY-Hoehn and Yahr; MMSE- Mini Mental Status Examination; PDQ-The Parkinson's Disease Questionnaire; MOB -Mobility; ADL-Activities of daily living; EMO -Emotional well-being; STI -Stigma; SOC-Social support; COG-Cognitions; COM -Communication; BOD -Bodily discomfort; PDSI -Parkinson's disease summary Index.

Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disease. It is associated with loss of dopamine leading to motor disorders¹. However, non-motor symptoms such as anxiety, stress, and depression as well as cognitive impairment are also abundant among patients². It has been hypothesized that non-motor symptoms can affect the quality of life in PD patients³. The current therapeutic approach relies on dopamine substitution, which has no curative effect and does not improve non-motor symptoms. Studies have shown that meditation and other relaxation techniques can provide relief in non-motor symptoms. Mindfulness-based stress reduction (MBSR) is a technique used for improving stress-related symptoms in long-term conditions such as stroke, cancer, and PD⁴⁻⁶. It involves focused attention, open monitoring, and self-awareness of body movements in a non-judgemental state in the present moment. Studies have shown that mindfulness improves brain plasticity in some areas of interest. The areas of plasticity are involved in emotional

regulation and processing^{7, 8}. Thus, we hypothesized that mindfulness techniques could also have a positive effect on non-motor symptoms of PD patients which can enhance the quality of life after training sessions. This clinical trial aimed to investigate the impact of mindfulness training on the quality of life of PD patients.

Materials and Methods

Participants and Ethical issues

This randomized clinical trial was conducted at the neurology outpatient clinic of Imam Reza and Razi University-Hospital. Participants were 40 patients aged 67.95 ± 6.8 years (56-80) with a definite diagnosis of PD who were receiving dopaminergic drugs for at least one year. Twenty-seven of the patients were males, and 13 were females. They all were married, and 4 of them reported a family history of PD. Participants were randomly categorized into two experiment and control groups with 20 patients in each. For randomization, a list of random numbers was used based on the

computer program and applied to the patients at the time of their neurologist visit at the clinic.

The inclusion criteria were: definite diagnosis of idiopathic PD based on UK Brain Bank criteria, mild and moderate forms of disease according to Hoehn and Yahr (HY) staging (1-3), stable and normal dosage of PD medications within last six months, normal cognitive function or mild cognitive impairment according to Mini-Mental State Examination (MMSE) score 17-30, enthusiasm and commitment to participate in mindfulness training sessions and to practice the required works at home.

The patients with the following criteria were excluded: focal neurologic deficit, abnormal brain imaging findings suggestive of brain lesions, other medical conditions that would affect the quality of life, use of antiepileptic drugs and symptoms of psychosis,

The protocol of the study was reviewed and confirmed by the local ethics committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.551). All patients received an informed written consent to participate in the study and to the use of their information. This trial was registered on the IRCT.ir website (IRCT20181007041258N1).

Mindfulness Training sessions

The interventions included 8-week mindfulness-based stress reduction (MBSR) sessions each for 2 hours with a 15-minute break between the first and second hours. The sessions followed by a one-day retreat program between sixth and seventh sessions and took for 7 hours. The patients were asked to practice the requested homework at least for 30 minutes after each session. The protocol of the training sessions was conducted as per the steps described by Kabat-Zinn⁹. The sessions were performed by a psychiatrist with over 5-year of experience in MBSR instructions. The instructions were based on the teaching of three techniques: body scanning, mindfulness meditation, and gentle yoga. The sessions focused on physical and mental awareness of body, how to diminish the physiological effect of pain and stress, how to perform less emotional reaction when facing distress, mental calmness in challenges through life, non-judgmental awareness, equity in stress management and joy of every moment.

Controls

The patients in the control group received eight 1-hour sessions during the same time as the experiment group. The sessions centered on basic information about PD based on brochures published by the American Parkinson Disease Association with topics: medications, symptoms of the disease, mood and sleep, and connecting with resources.

Assessments

All participant's general data, regarding age, gender, type of medication, and duration of disease were gathered according to patients' self-report and the information documented in patients' clinical records. Two neurologists assessed the HY stage, disease severity, and probable motor disturbance at baseline (within patient recruitment within one week before the initial session). The assessments of the quality of life were conducted at baseline (on the day of the first training session before the class), and after the experiment.

For the evaluation of the quality of life, the PDQ-39 questionnaire was used. PDQ-39 is a 39-item questionnaire based on the patient report of health status. It evaluates eight scales of daily activities including Mobility (MOB), Activities of daily living (ADL), Emotional well-being (EMO), Stigma (STI), Social support (SOC), Cognitions (COG), Communication (COM) and Bodily discomfort (BOD) and how these scales are being affected by PD. Participants are required to choose one of five orders of responses based on how often due to their disease, they have faced difficulties defined in each item. The final score of each item is calculated as a percentage score. The overall score is measured by calculating the mean percentage score of eight items as Parkinson's disease summary Index (PDSI). The assessments were conducted in-person by the principal investigator (N.Gh) who was blinded about the group of study which patients were enrolled in.

Statistical Analysis

The scores of each item were described as mean \pm SD. The between-group and within-group comparisons were made by the independent and sample T-test, respectively. The chi-square test was performed for the comparison of categorical variables. To investigate the change in the quality of life each PDQ-39 item scores and the PDSI scores were compared before and after the experiment in either control or experiment group by splitting the data into two study groups and comparing the mean scores of each item using independent T-test. All the analyses were performed using SPSS software version 19.0 (IBM Corp., Armonk, N.Y., USA). The boxplot figures were drawn using medCalc.ink software. Figures of the change in questionnaires' scores were provided by GraphPad.prim v.6.0.7 Ink software.

Results

All the 40 patients completed the training sessions in 8 weeks. The primary assessment was made after the last MBSR session and during their first neurologic visit at the clinic.

The general characteristics of the patients in each experiment and control group are shown in Table 1. The baseline characteristic data did not differ significantly between the two study groups.

As it is demonstrated in Table 2, at baseline, the PDQ-39 item scores did not differ significantly between two study groups,

Table 1. Patients' demographic data in each study group

	Controls (N= 20)	Experimental group (N = 20)	P value
Age	68.60 ± 7.32	67.3 ± 6.39	
Gender (F:M) ratio	(7:13) 42.8	(6:14) 53.8	0.06
Duration of Disease (y)	3.9 ± 1.97	4.6 ± 2.39	0.41
Family History	3 (75%)	1 (25%)	0.29
HY stage			0.90
I	3 (42.9%)	4 (57.1%)	
II	8 (50%)	8 (50%)	
III	9 (52.9%)	8 (47.1%)	
Severity of PD			0.74
Mild	11 (47.8%)	12 (52.2%)	
Moderate	9 (52.9%)	8 (47.1%)	
Motor Fluctuation	5 (41.7%)	7 (58.3%)	0.49
Dyskinesia	6 (60%)	4 (40%)	0.46

Note: Abbreviations: Female (F), Male (M), Hoehn Yahr (HY), Parkinson's disease (PD)

Table 2. PDQ-39 score items and PDSI before and after the mindfulness sessions in control and experiment group pf patients

	Study Group	Before Experiment		After Experiment		P [†] value	95% CI [€]	The mean difference in score		95% CI [€]
		Mean Score	P [*] value	Mean Score	P [*] value			Delta	P [*] value	
MOB	Control	47.87 ± 8.7	0.84	48.50 ± 8.4	0.62	0.26	-1.7 – 0.5	0.62 ± 2.4	0.02	0.24 – 3.28
	Experiment	48.37 ± 6.8		47.23 ± 7.5		0.04	0.04 – 2.2	-1.14 ± 2.3		
ADL	Control	34.72 ± 12.3	0.90	34.95 ± 13.8	0.47	0.75	-1.7 – 1.2	0.22 ± 3.2	0.004	1.11 – 5.60
	Experiment	35.17 ± 10.8		32.04 ± 11.1		0.002	1.3 – 4.9	-3.13 ± 3.7		
EMO	Control	37.41 ± 6.3	0.56	37.21 ± 7.0	0.43	0.83	-1.8 – 2.2	-0.23 ± 4.3	0.01	0.78 – 6.65
	Experiment	38.92 ± 9.4		34.96 ± 10.4		0.001	1.7 – 6.1	-3.95 ± 4.7		
STI	Control	25.94 ± 9.9	0.26	25.29 ± 10.2	0.26	0.47	-1.2 – 2.5	-0.65 ± 4.0	0.97	-2.24 – 2.18
	Experiment	22.81 ± 7.3		22.18 ± 6.8		0.33	-0.6 – 1.9	-0.62 ± 2.7		
SOC	Control	35.80 ± 9.7	0.02	34.13 ± 9.7	0.007	0.10	-0.3 – 3.7	-1.67 ± 4.3	0.40	-1.71 – 4.20
	Experiment	29.11 ± 8.7		26.19 ± 7.7		0.01	0.6 – 5.2	-2.91 ± 4.8		
COG	Control	28.43 ± 7.4	0.69	28.75 ± 7.9	0.15	0.71	-2.0 – 1.4	0.31 ± 3.7	0.09	-0.47 – 5.47
	Experiment	27.60 ± 5.9		25.41 ± 6.3		0.08	-0.3 – 4.7	-2.18 ± 5.3		
COM	Control	29.14 ± 9.9	0.47	29.97 ± 9.5	0.88	0.32	-2.5 – 0.9	0.83 ± 3.7	0.08	-0.36 – 5.35
	Experiment	31.21 ± 8.0		29.54 ± 8.7		0.16	-0.7 – 4.0	-1.66 ± 5.1		
BOD	Control	44.71 ± 11.2	0.08	43.05 ± 11.2	0.12	0.04	0.6 – 3.2	-1.66 ± 3.4	0.47	-3.11 – 1.46
	Experiment	38.31 ± 11.9		37.47 ± 10.9		0.32	-0.9 – 2.5	-0.84 ± 3.7		
PDSI	Control	35.50 ± 7.1	0.46	35.23 ± 7.5	0.14	0.29	-0.2 – 0.8	-0.27 ± 1.1	< 0.001	0.84 – 2.72
	Experiment	33.93 ± 6.2		31.88 ± 6.5		<0.001	1.2 – 2.8	-2.05 ± 1.7		

Note: Abbreviations: Confidence Interval (CI), Mobility (MOB), Activities of daily living (ADL), Emotional well-being (EMO), Stigma (STI), Social support (SOC), Cognitions (COG), Communication (COM), Bodily discomfort (BOD), Parkinson's disease summary Index (PDSI).[†]: P value of the differences before and after the experiment in each group; ^{*}: P value of the differences between mean score of experiment and control group; [€]: 95% CI of the differences between mean score of experiment and control group.

Table 3. The quality of life in patients with different stages of PD before and after the mindfulness sessions in each experiment and control group

Stage (HY)	PDQ-39	Control group				Experiment group			
		Before Experiment	After Experiment	P value	95%CI of difference	Before Experiment	After Experiment	P value	95%CI of difference
I	PDSI	25.93 ± 2.1	24.62 ± 2.0	0.03	0.31 – 2.30	26.60 ± 1.8	23.34 ± 0.9	0.009	1.55 – 4.95
	MOB	37.50 ± 0.0	37.50 ± 2.5	1.00	-6.21 – 6.21	40.62 ± 1.2	38.12 ± 1.2		
	ADL	23.61 ± 2.4	18.01 ± 2.4	0.06	-0.42 – 11.62	23.93 ± 7.1	19.72 ± 6.2	0.09	-1.24 – 9.66
	EMO	29.13 ± 4.1	29.13 ± 4.1			29.15 ± 7.6	22.87 ± 7.9	0.10	-2.27 – 14.84
	STI	18.75 ± 10.8	14.58 ± 3.6	0.42	-13.76 – 22.09	17.18 ± 5.9	17.19 ± 5.9	0.39	-0.03 – 0.01
	SOC	22.20 ± 4.8	22.16 ± 9.6	0.99	-20.70 – 20.77	22.80 ± 8.0	20.70 ± 8.4	0.39	-4.58 – 8.78
	COG	20.83 ± 7.2	22.91 ± 9.5	0.42	-11.04 – 6.88	27.07 ± 4.1	20.31 ± 5.9	0.08	-1.51 – 15.04
	COM	24.96 ± 8.3	24.96 ± 8.3			27.07 ± 4.1	22.87 ± 7.9	0.18	-3.51 – 11.91
II	BOD	30.50 ± 12.7	27.73 ± 9.6	0.42	-9.13 – 14.67	24.97 ± 6.8	24.97 ± 6.8		
	PDSI	32.02 ± 4.0	31.48 ± 3.8	0.21	-0.38 – 1.45	31.36 ± 3.2	30.03 ± 4.0	0.12	-0.48 – 3.14
	MOB	43.12 ± 4.5	44.37 ± 4.1	0.31	-3.98 – 1.48	45.62 ± 4.9	44.65 ± 4.8	0.41	-1.71 – 3.66
	ADL	27.59 ± 7.3	28.11 ± 6.9	0.35	-1.75 – 0.71	34.34 ± 6.9	31.22 ± 8.6	0.11	-0.91 – 7.16
	EMO	36.93 ± 6.0	36.88 ± 7.5	0.98	-4.91 – 5.01	37.46 ± 6.3	32.77 ± 6.0	0.06	-0.03 – 9.40
	STI	23.43 ± 9.8	22.61 ± 10.0	0.32	-1.01 – 2.65	21.87 ± 7.4	21.09 ± 7.4	0.35	-1.06 – 2.62
	SOC	33.30 ± 7.6	30.18 ± 6.1	0.08	-0.47 – 6.70	27.05 ± 8.6	24.96 ± 7.7	0.17	-1.14 – 5.31
COG	25.78 ± 6.1	25.78 ± 7.0	1.00	-2.79 – 2.79	24.21 ± 5.3	25.25 ± 6.2	0.35	-3.49 – 1.41	

	COM	23.93 ± 8.2	24.97 ± 6.3	0.34	-3.49 – 1.41	27.06 ± 7.3	27.05 ± 8.6	0.99	-5.24 – 5.27
	BOD	42.05 ± 8.9	38.92 ± 6.5	0.08	-0.48 – 6.73	33.30 ± 7.6	33.30 ± 6.2	1.000	-3.70 – 3.70
III	PDSI	41.79 ± 3.6	42.09 ± 3.6	0.43	-1.14 – 0.53	40.18 ± 3.1	37.99 ± 3.3	0.001	1.19 – 3.18
	MOB	55.55 ± 5.6	55.83 ± 5.5	0.59	-1.43 – 0.87	55.00 ± 2.9	54.37 ± 4.1	0.35	-0.85 – 2.10
	ADL	44.77 ± 10.0	46.67 ± 10.2	0.03	-3.63 – -0.16	41.64 ± 11.3	39.02 ± 10.1	0.04	0.02 – 5.20
	EMO	40.60 ± 4.5	40.18 ± 5.5	0.74	-2.42 – 3.24	45.26 ± 8.7	43.20 ± 8.0	0.10	-0.55 – 4.67
	STI	30.57 ± 8.5	31.23 ± 8.2	0.61	-3.59 – 2.26	26.56 ± 6.4	25.78 ± 5.2	0.59	-2.56 – 4.12
	SOC	42.55 ± 6.5	41.62 ± 5.9	0.34	-1.21 – 3.08	34.32 ± 6.9	30.17 ± 6.1	0.10	-1.09 – 9.39
	COG	33.33 ± 5.4	33.33 ± 6.2	0.99	-3.39 – 3.39	31.24 ± 5.7	28.12 ± 5.7	0.17	-1.70 – 7.94
	COM	35.15 ± 9.0	36.07 ± 9.2	0.59	-4.75 – 2.91	37.42 ± 6.2	35.37 ± 5.8	0.17	-1.12 – 5.22
	BOD	51.82 ± 6.9	51.82 ± 6.9			49.98 ± 4.4	47.88 ± 5.9	0.17	-1.15 – 5.35

Note: Abbreviations: Confidence Interval (CI), Mobility (MOB), Activities of daily living (ADL), Emotional well-being (EMO), Stigma (STI), Social support (SOC), Cognitions (COG), Communication (COM), Bodily discomfort (BOD), Parkinson's disease summary Index (PDSI)

except for the SOC score, which was significantly higher in control subjects compared to the experiment group (35.80 ± 9.7 vs 29.11 ± 8.7 , $p = 0.02$).

Quality of life assessment

The statistical analysis revealed a lower mean score in all PDQ-39 items in the experiment group compared to control subjects; however, the difference was insignificant for MOB, ADL, EMO, STI, COG, COM, and BOD and was only significant for SOC (34.13 ± 9.7 vs 26.19 ± 7.7 for control and experiment group, respectively. $P = 0.007$) (Table 2).

On the other hand, the within-group analysis yielded a significant improvement in the mean score of subjects in the experiment group. Their mean PDSI score was 31.88 ± 6.5 after one month compared to the baseline score of 33.93 ± 6.2 ($p < 0.001$). However, the mean scores of the participants in the control group did not significantly differ from the baseline.

A comparison of the delta values between the experimental and control groups showed MOB, ADL, and EMO to be significantly different.

The classification of the patients based on the stage of disease by HY revealed a significant improvement in PDSI score in patients in the experiment group at the severe stage (III). In contrast, the PDQ-39 item scores did not significantly differ (except for the ADL) after the training for mindfulness. The analysis also showed that patients in milder stages (I) have significant improvement after the experiment. However, the same improvement was noted in the control group (Table 3).

Discussion

Significant improvement in the quality of life between the patients who received mindfulness training and the control group was observed in this clinical trial of people with Parkinson's disease within eight weeks of trial.

Overall PDSI decreased modestly in the experiment group by 2.05 points and decreased in the control group by 0.27 points after the experiment.

Among the PDQ items, MOB, ALD, and EMO significantly improved in the experiment group compared to the control

group. These results show that mindfulness training has a significant impact on not only motor symptoms of the disease but also the non-motor emotional wellbeing of the patients. The most significant effect of mindfulness training was on patients' daily activity, which was also obvious in the severe cases of the disease.

Up to now, a few trials have been conducted on the effect of mindfulness training on PD¹⁰⁻¹³. The effect of mindfulness on different features of motor and non-motor symptoms has been measured. However, the outcome was discrepant regarding the time duration of the follow-up and improvement in the measured symptoms.

Similar to our findings, Geong son et al. found a significant difference in the quality of life and ADL of 33 experiment patients who received mindfulness training in comparison to 30 control subjects¹³. Some other studies found mindfulness an effective modality for a few subscales of PDQ-39^{11,12}.

In a clinical trial by Cash et al. 39 patients were enrolled in 8-week mindfulness sessions and their EMO and COG improved after the experiment¹¹. In a similar study conducted by Advocat et al., the effect of mindfulness training on the quality of life in 35 PD patients was compared with 37 control subjects within seven weeks and six months. In a two-step analysis, ADL was the only improved factor in experiment group¹⁴.

In contrast, Dissanayaka et al. examined the effect of mindfulness on fourteen PD patients in the 8-week training program and compared the results with baseline at post-intervention assessment and 6-month follow up¹⁵. Their results did not yield a significant improvement in any subscales of the quality of life in primary and secondary evaluation. Similarly, non-significant results were reported by Rodgers et al. and Pickut et al.¹².

Birtwell et al. also assessed the long-term efficacy (16 weeks) of mindfulness training on STI and EMO in thirteen individuals with PD. They found an insignificant change in these two subscales of PDQ-39¹⁶.

In the present study, EMO and ADL were more subjective to the short-term effect of mindfulness training. The results of

Rodger's et al. study were consistent with our primary outcome. Their between-group analysis revealed a significant difference in depression subscale of DASS-21 after mindfulness intervention in PD patients¹⁷. Cash et al. also found depression to improve after mindfulness interventions in PD patients¹¹.

In contrary to our findings, the difference between PD experiment and control subjects was not meaningful in Pickut et al.'s study¹². COG was unaffected to mindfulness training in our study. This finding was supported by the clinical trial of Cash et al. They found an insignificant change in PD patients' cognitive function in immediate post-intervention assessment¹¹.

On the other hand, Dissanayaka et al. found post-interventional improvement in PD patients' cognition by obtaining PD Cognitive Rating Scale (PDCRS), extended for six months¹⁵.

Similarly, Geong son et al. showed a significant difference between experiments who received mindfulness training with controls in the mean score of Korean Montreal Cognitive Assessment¹³.

As described above, there are discrepant results regarding the role of mindfulness stress reduction sessions on quality of life in PD patients. Our results were consistent with some studies and contrary to others. The main factors that might have affected these differences are the size of the sample, including a control group in the study, subjective mood changes in the patients, the severity of the disease, and the likelihood of practicing the Learned lessons at home.

Mindfulness-based interventions aim to improve the current wellbeing of the individuals by self-awareness of present emotions and body movements. It might also help individuals to manage daily stress, have a better judgment of their own, and adjust to daily life. There is also evidence suggesting that mindfulness training leads to neuroplasticity in the brain areas which are involved in emotions¹⁸.

Studies have also suggested that early therapeutic interventions are more practical in terms of diminishing the probable severity of the disease in the future^{13, 18}. In our study, patients in the early stages had improvement in their overall quality of life, which was also noted in controls of the same stage, too. However, a meaningful change in the quality of life of patients at the severe stage of PD was recorded after the training sessions. We suggest a long term follow up of the patients in each group and with different stages of the disease to find if the mindfulness training would help in diminishing the progress of the disease.

This study was a pilot study in which MBSR showed a great impact in improving the quality of life in PD patients. However, there were limitations in the study that must be considered. First, the sample size of the study was not large comparing to the prevalence of the disease, and it was

constrained by other important factors such as disease severity and level of education. Patients needed to have a minimum level of education to be able to attend the sessions and apply them in their routine life. Second, the psychological nature of the intervention limited the blindness of the patients to the intervention.

We did not perform an intention to treat analysis or crossover randomization as all the randomly selected patients completed the trial, and none dropped out of the clinical trial.

Conclusion

In our study, mindfulness training improved the overall quality of life in PD patients. However, long-term follow up on a large-scale population is required to evaluate the impact of mindfulness-based stress reduction on each item.

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Competing Interests

None declared

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