

Introduction

The main goal of this thesis is to evaluate effects of dance activity on symptomatology of patients with Parkinson's disease. It assesses the impact on motor and non-motor symptoms after two-month intensive dance activity.

The aim is to evaluate the effectiveness of dance classes in the frame of influence on a wide range of motor and non-motor symptoms of Parkinson's disease. The effectiveness is assessed on 9 probands (participants of the research). Eventual changes of their problems are evaluated after two-month period of dance classes. To evaluate the effectiveness we used modified Movement Disorder Society - Unified Parkinson's Disease Rating Scale (MDS – UPDRS) and a questionnaire for subjective perception of the effectiveness of the treatment. Measurements and dance lessons are done in cooperation with Prague branch of organization Parkinson-Help, z.s. The findings are presented in tables and graphs below and described in text.

Characteristics of the group

All nine patients (3 women and 6 men) were members of Prague branch of Parkinson-Help organization. All of them suffered from the late-onset Parkinson's disease form of the illness. All nine patients, using Levodopa as a pharmacotherapy, were assessed in the same time of the day in an ON state. None of the members has undergone any invasive treatment as DuoDopa or Deep Brain Stimulation.

Results of the study

There are overall study results presented in the tables below.

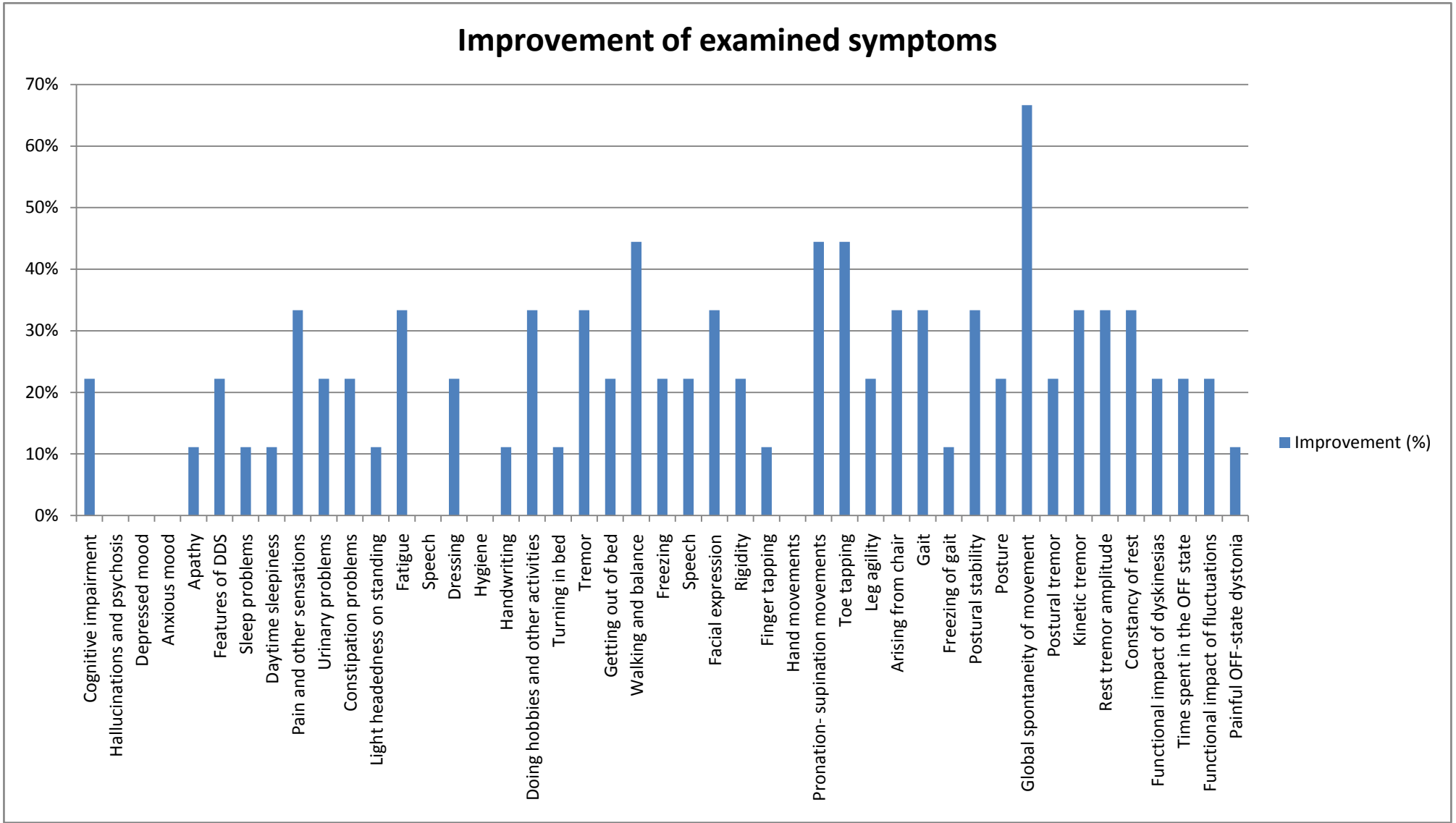
The **Table 1** shows which probands has improved in any of examined symptoms. If the improvement was found, there was "1" appointed to him in the relevant field of the table. Herewith, we can follow the results of how many patients have improved in every single symptom. The sum of these results gives opportunity to assess the final level of symptom improvement in this group. Results are expressed as numeric or in percentage. Using the colour range clearly indicates which symptoms among probands developed the most and the least frequently (darker colour means higher frequency of improvement). The Table 1 is complemented by a bar **Chart 1** where there is a clear overview of percentages of individual improvement across the range of clinical symptoms.

Tables 2 and 3 depict severity of disability for each of the symptoms both among individuals and for the whole group (evaluated using the arithmetic average). Scoring was used the same as in the MDS-UPDRS (0-4; 0=normal, 4=severe). **Table 2** shows the condition of the patients and their difficulties before the start of dance classes (baseline examination), **Table 3** shows the situation after two months of dance interventions (final examination). Severity of disability of each of the symptoms are expressed by the arithmetic average. For clarity, results were marked by colour range (lightest colour - the lowest handicap in the file).

Table 1

Symptoms	Score									Sum	Percentage
	VW	JJ	LK	JPa	JPo	Jr	JFr	JFa	MK		
Patients											
Cognitive impairment				1		1				2	22%
Hallucinations and psychosis										0	0%
Depressed mood										0	0%
Anxious mood										0	0%
Apathy									1	1	11%
Features of DDS					1				1	2	22%
Sleep problems						1				1	11%
Daytime sleepiness								1		1	11%
Pain and other sensations					1			1	1	3	33%
Urinary problems						1		1		2	22%
Constipation problems		1	1							2	22%
Light headedness on standing									1	1	11%
Fatigue						1		1	1	3	33%
Speech										0	0%
Dressing			1				1			2	22%
Hygiene										0	0%
Handwriting								1		1	11%
Doing hobbies and other activities					1		1		1	3	33%
Turning in bed					1					1	11%
Tremor					1			1	1	3	33%
Getting out of bed				1	1					2	22%
Walking and balance				1		1		1	1	4	44%
Freezing					1				1	2	22%
Speech	1						1			2	22%
Facial expression		1			1		1			3	33%
Rigidity	1						1			2	22%
Finger tapping							1			1	11%
Hand movements										0	0%
Pronation- supination movements	1	1		1					1	4	44%
Toe tapping	1				1			1	1	4	44%
Leg agility		1			1					2	22%
Arising from chair		1	1				1			3	33%
Gait	1	1							1	3	33%
Freezing of gait		1								1	11%
Postural stability		1					1	1		3	33%
Posture	1						1			2	22%
Global spontaneity of movement	1	1	1		1		1	1		6	67%
Postural tremor		1			1					2	22%
Kinetic tremor			1					1	1	3	33%
Rest tremor amplitude					1		1		1	3	33%
Constancy of rest		1			1		1			3	33%
Functional impact of dyskinesias						1			1	2	22%
Time spent in the OFF state		1						1		2	22%
Functional impact of fluctuations		1						1		2	22%
Painful OFF-state dystonia									1	1	11%

Chart 1



In **Table 4**, there are results compared from input (table 2) and output (table 3) scores collected and again accompanied by colour gradation for clarity. The column "Subtraction" in this table shows the mathematical subtraction of arithmetic averages from input and output testing. This column provides an objective assessment of which symptoms have improved and which has worsened after the dance lessons. For clarity, the table is complemented by the column "Overall result". Green colour with "+" means improvement and red colour with "-" means worsening, white colour and "0" means without difference.

The results from the Table 4 are supplemented by bar **Chart 3** showing all improved and worsened symptoms, based on the calculated difference. For symptoms that have positive values in the column above the zero axis, has improved. In those columns which have a peak below the zero axis are worsened. The total percentage of improvement / worsening of symptoms is showed in **Chart 2**.

Chart 2

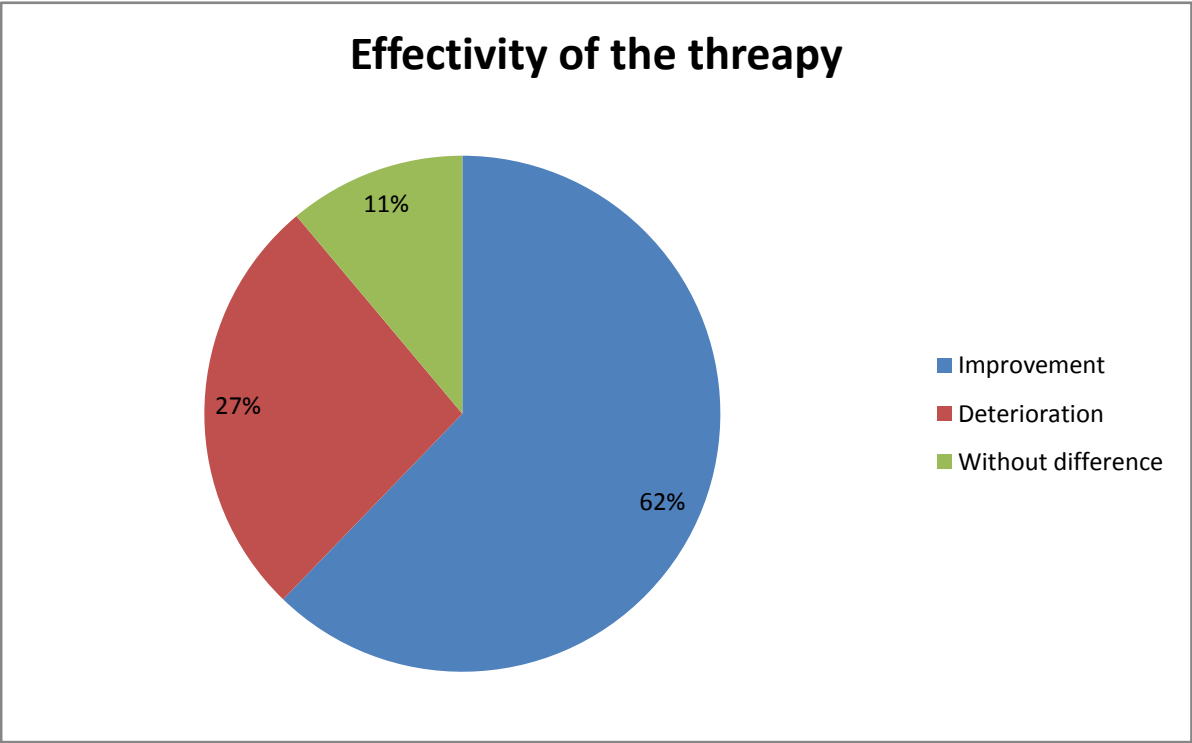
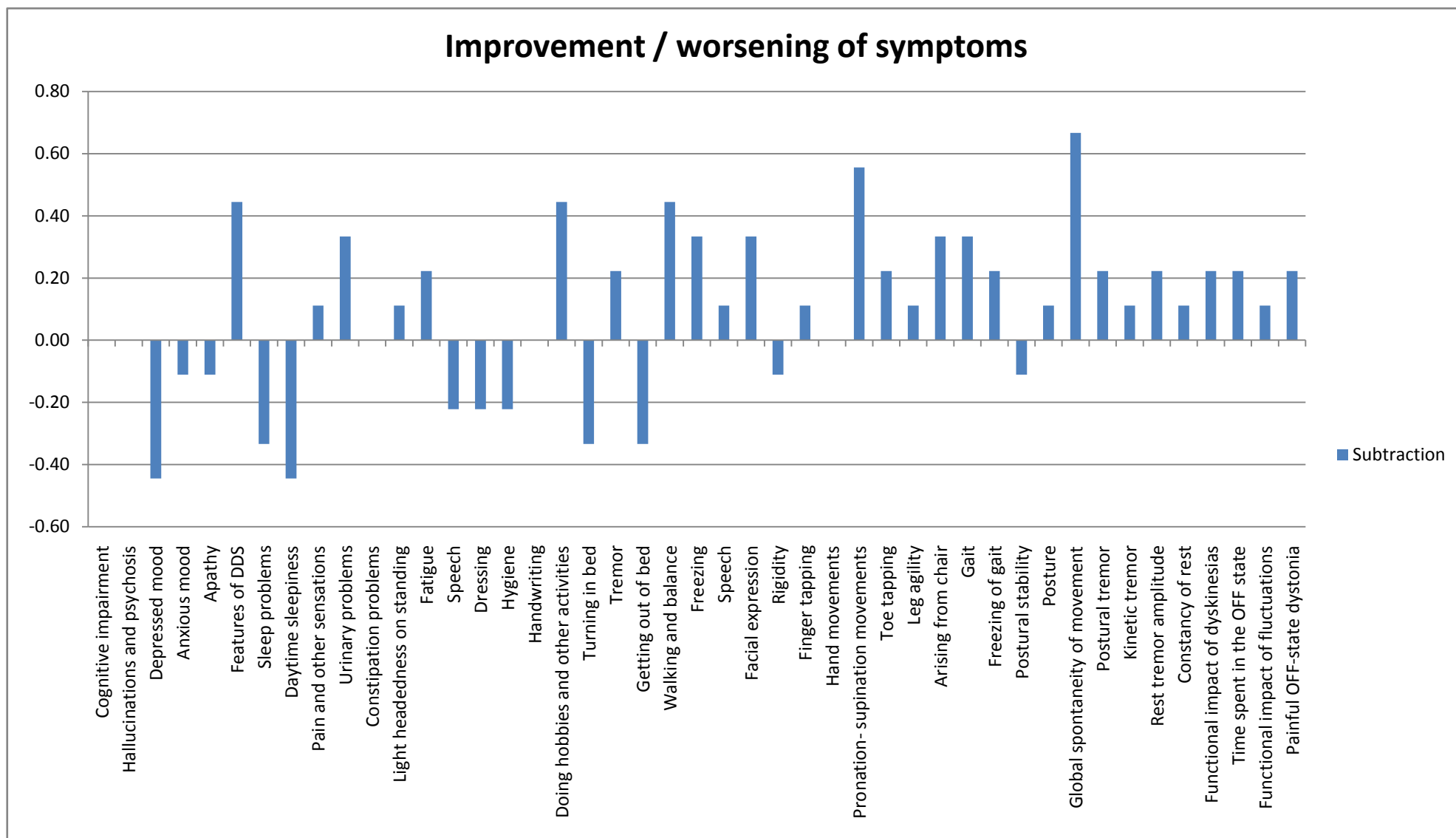


Table 4

Symptoms	Arithmetic average before	Arithmetic average after	Subtraction	Overall result
Cognitive impairment	0,89	0,89	0,00	0
Hallucinations and psychosis	0,67	0,67	0,00	0
Depressed mood	0,56	1,00	-0,44	-
Anxious mood	0,78	0,89	-0,11	-
Apathy	0,44	0,56	-0,11	-
Features of DDS	0,78	0,33	0,44	+
Sleep problems	0,67	1,00	-0,33	-
Daytime sleepiness	1,11	1,56	-0,44	-
Pain and other sensations	1,11	1,00	0,11	+
Urinary problems	1,44	1,11	0,33	+
Constipation problems	1,78	1,78	0,00	0
Light headedness on standing	1,56	1,44	0,11	+
Fatigue	1,78	1,56	0,22	+
Speech	1,22	1,44	-0,22	-
Dressing	1,22	1,44	-0,22	-
Hygiene	0,67	0,89	-0,22	-
Handwriting	1,56	1,56	0,00	0
Doing hobbies and other activities	1,44	1,00	0,44	+
Turning in bed	0,56	0,89	-0,33	-
Tremor	1,22	1,00	0,22	+
Getting out of bed	1,00	1,33	-0,33	-
Walking and balance	1,78	1,33	0,44	+
Freezing	0,89	0,56	0,33	+
Speech	1,22	1,11	0,11	+
Facial expression	1,22	0,89	0,33	+
Rigidity	2,11	2,22	-0,11	-
Finger tapping	0,56	0,44	0,11	+
Hand movements	0,44	0,44	0,00	0
Pronation- supination movements	0,78	0,22	0,56	+
Toe tapping	1,33	1,11	0,22	+
Leg agility	0,33	0,22	0,11	+
Arising from chair	0,67	0,33	0,33	+
Gait	1,00	0,67	0,33	+
Freezing of gait	0,33	0,11	0,22	+
Postural stability	1,22	1,33	-0,11	-
Posture	1,44	1,33	0,11	+
Global spontaneity of movement	1,22	0,56	0,67	+
Postural tremor	0,89	0,67	0,22	+
Kinetic tremor	0,44	0,33	0,11	+
Rest tremor amplitude	0,56	0,33	0,22	+
Constancy of rest	0,89	0,78	0,11	+
Functional impact of dyskinesias	1,22	1,00	0,22	+
Time spent in the OFF state	0,78	0,56	0,22	+
Functional impact of fluctuations	0,56	0,44	0,11	+
Painful OFF-state dystonia	0,22	0,00	0,22	+

Chart 3



Final Table 5 and Charts 4-6 are devoted exclusively to the subjective evaluation of the effect of dance classes experienced by patients. The results are under influence of subjective evaluation. **Table 5** analyzes patient's responses to questions about the effectiveness of their dance activity. In each row of this table there are presented all the answers of all patients to one question. Each marked answer in the questionnaire corresponds with the number "1" in the table. Using that, we can see the most common answers among the patients (column "Sum") and count the percentage. In this way we can evaluate the results of a subjective questionnaire (column "Percentage"). The percentage results are marked again with colour scale (under the previous rules).

Table 5 is supplemented by Charts 4-6. **Chart 4** shows the patient's responses to the first question about the onset of curative effect. **Chart 5** shows the patient's responses regarding the duration of curative effect. The last **Chart 6** shows the overview of the symptoms in which the patients have found the greatest improvement. In this chart we can see the percentage distribution of positive responses, not the percentage of patients responding improvement in the symptom.

Table 5

Subjective evaluation of the effect of therapy											
Patient	VW	JJ	LK	JPa	JPo	JR	JFr	JFa	MK	Sum	Percentage
Improvement											
After each therapy lesson				1	1	1	1	1		5	56%
After couple of therapy lessons		1	1							2	22%
I don't feel any difference	1								1	2	22%
Duration of curative effect											
5-7 days		1	1	1			1	1		5	56%
7-14 days					1	1				2	22%
I don't feel any difference	1								1	2	22%
Improved symptoms											
Psychological state			1	1		1	1	1		5	56%
Gait						1		1		2	22%
Deftness			1			1		1		3	33%
Self-care		1			1	1	1			4	44%
Sleep		1	1			1	1			4	44%
Balance				1		1				2	22%
Fine motor skills				1						1	11%
Handwriting		1								1	11%
Initiating of movement						1				1	11%

Chart 4

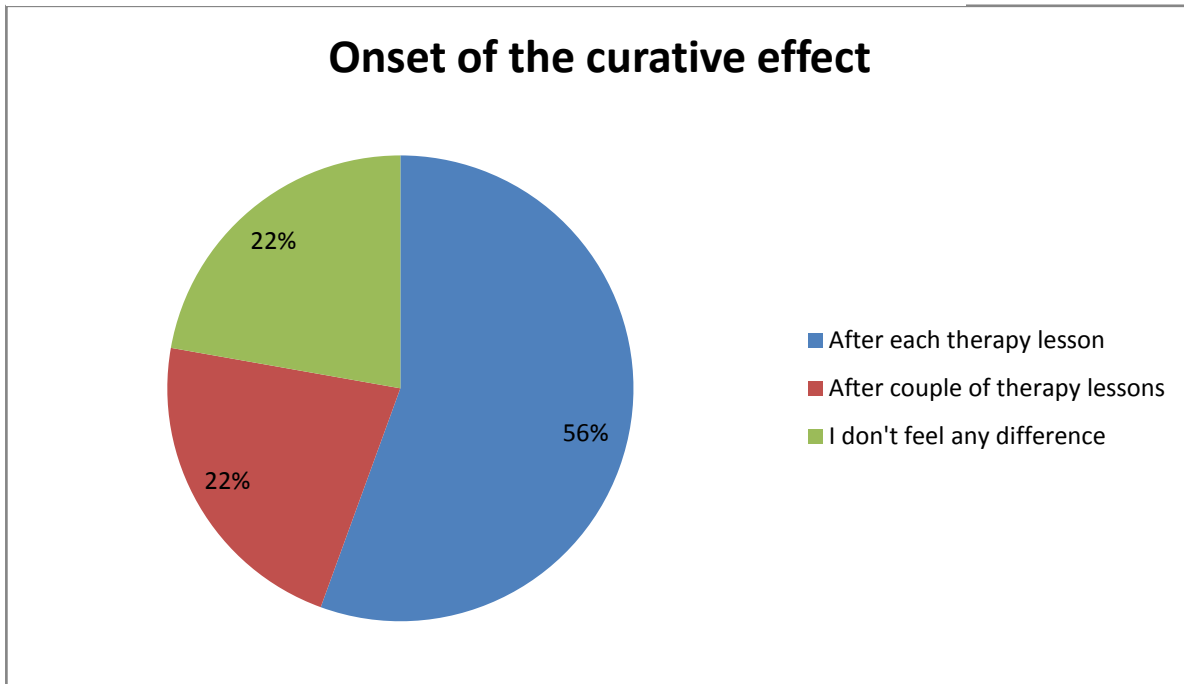


Chart 5

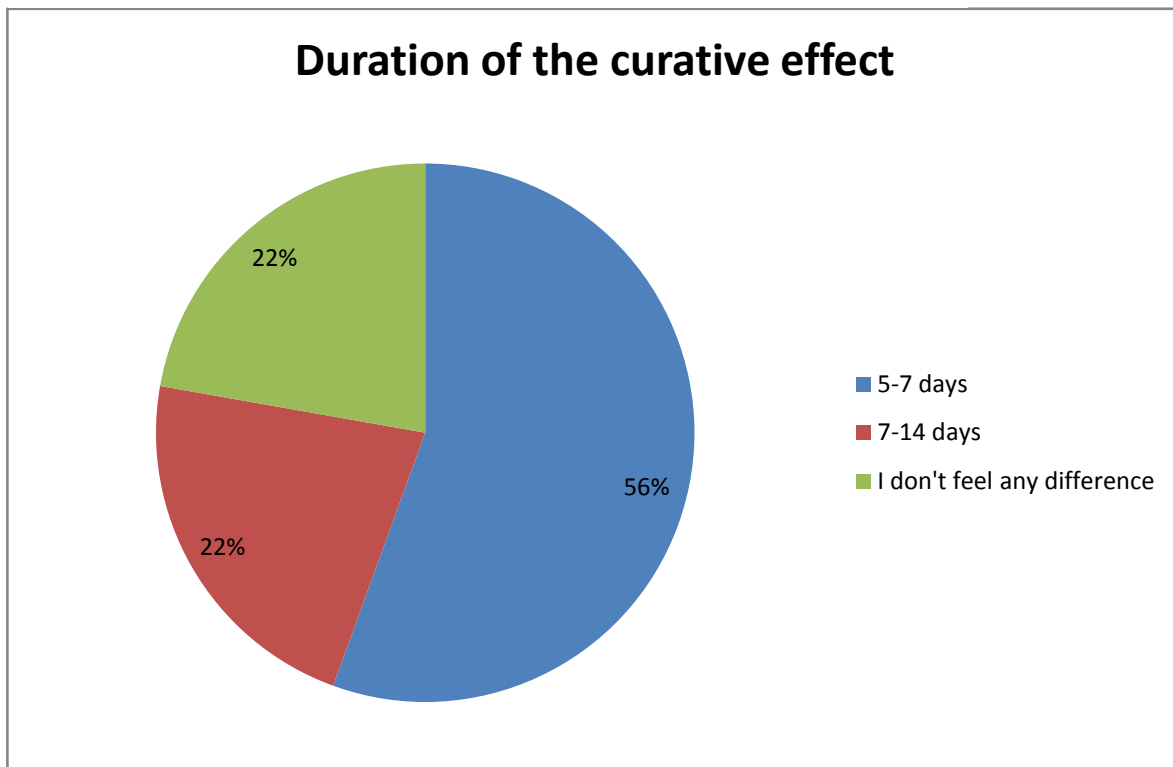
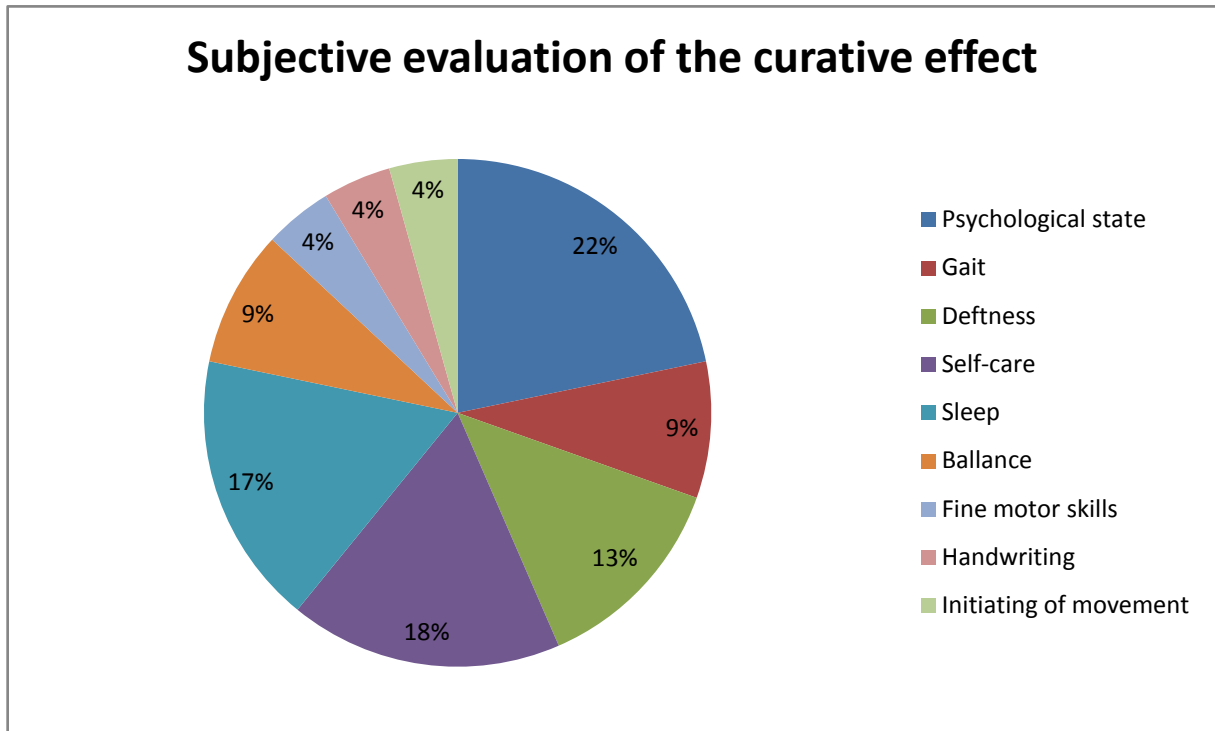


Chart 6



Conclusion

This research was conducted in the Czech Republic for the very first time and realization of this study was supported by the Prague branch of the club Parkinson-Help, z.s. who has decided to provide dance and movement classes for their clients as a part of a comprehensive curative program. I personally consider this step as a great shift towards improving the condition for many patients with Parkinson's disease.

The research itself also brought some pleasing results and findings. As you could see in the tables and charts, there are several improvements registered after short duration of dance interventions. The finding, that only two months of the dance and movement activity leads the patients to improvement in 62% of the investigated symptoms is a clear proof, that dance is one of the greatest options as a non-pharmacological therapy of Parkinson's disease symptoms. The comparison of the objective assessment of modified version of MDS-UPDRS with subjective feelings of patients expressed in the added questionnaire is interesting. Probably the most interesting is finding that patients responded that the dance activity had a positive effect on their psychological state in their subjective questionnaire. On the other hand results from objective MDS-UPDRS including the depressed mood got worse after therapy. The circumstances and context can offer some explanation of this. For example, the patients experience after each of dance lessons mental improvement, but the general state is undermined by the effect of bad weather, modification of medications or other circumstances during the week. Anyway, it is interesting gauge of subjective and objective evaluation.

The greatest improvement among all patients was at a point of evaluating the Global spontaneity of movement. Second place got the test of pronation-supination movements of the hand and a third

place Features of DDS, Doing hobbies and other activities and Walking and balance (see Chart 3). These results are kind of novelty to other studies with similar topic and may bring a new therapeutic approaches for many patients with Parkinson's disease in the Czech Republic.