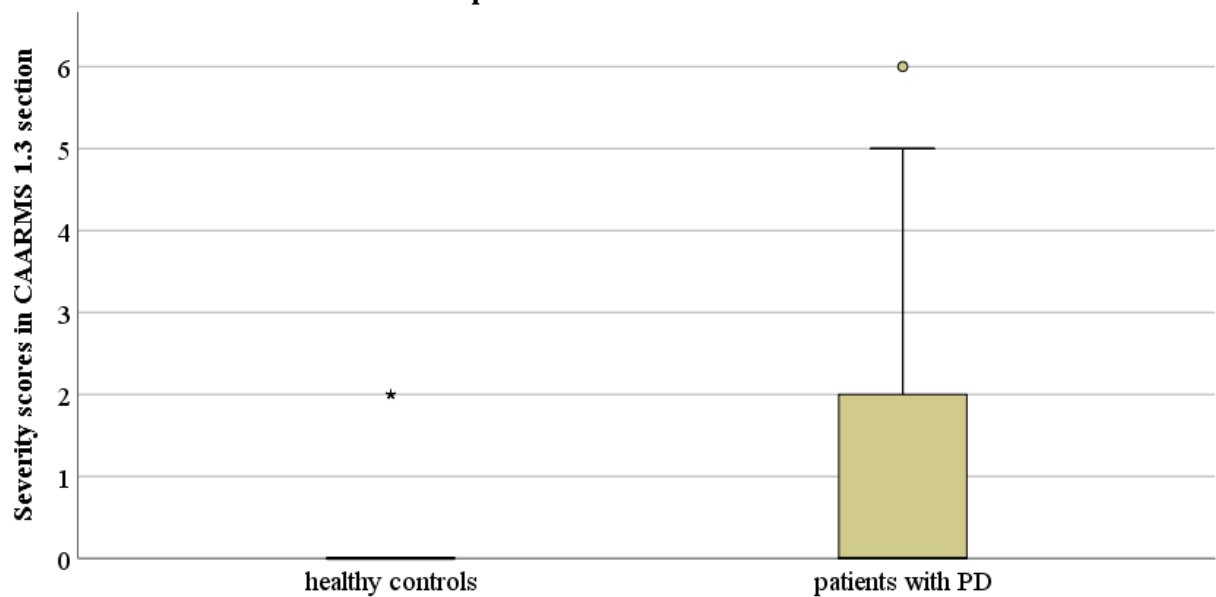


Supplementary Material

Comprehensive Evaluation of Psychotic Features and Their Clinical Correlates in Early Parkinson's Disease

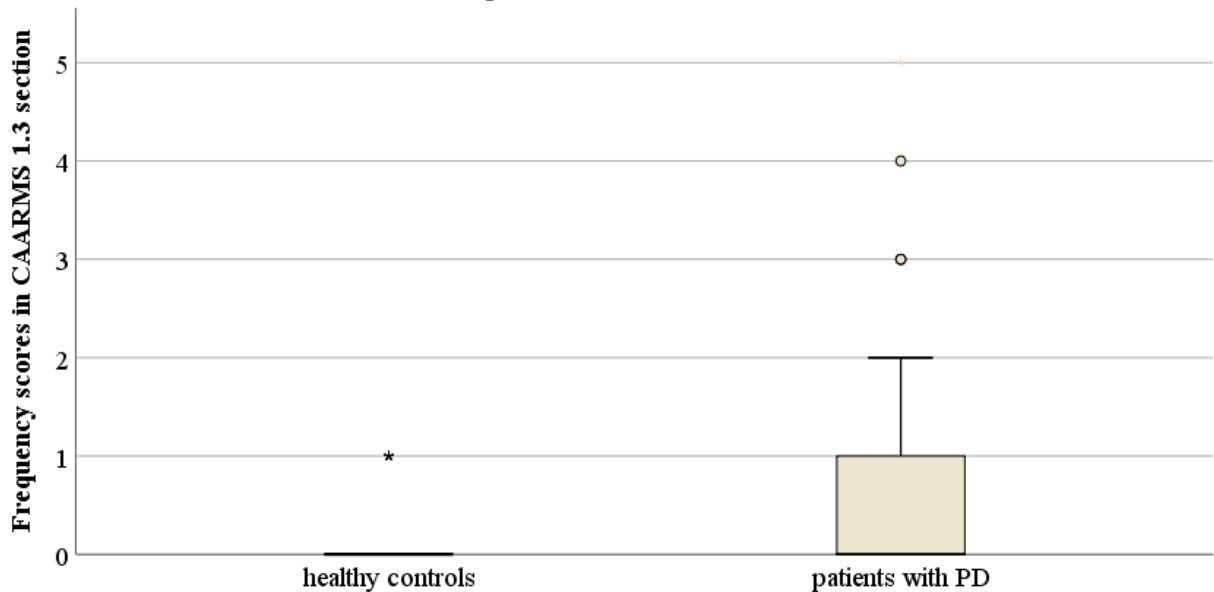
Supplementary Boxplot 1. This boxplot illustrates the distribution of severity scores in CAARMS 1.3 category in healthy participants and patients with PD. In the PD group, there is a wide range in intensity scores of perceptual abnormalities, even reaching the “psychotic and severe” form of psychotic experience (score of 6), compared to healthy individuals.

Boxplot 1: Boxplot of severity scores in Perceptual Abnormalities (1.3) section of CAARMS in patients and controls



Supplementary Boxplot 2. This boxplot illustrates the distribution of frequency scores in CAARMS 1.3 category in healthy participants and patients with PD. In the PD group, the distribution in PD patients was heavily skewed with a large proportion of “once a month to twice a week - less than one hour per occasion” responses (score of 2).

Boxplot 2: Boxplot of frequency scores in Perceptual Abnormalities (1.3) section of CAARMS in patients and controls



Among 70 patients with PD, 23 (33%) were identified as cases by the 10PDQ scale, while 27 (39%) were defined as cases by the CAARMS interview. Due to the mild difference in prevalence of psychotic phenomena after the application of the two rating scales, the PD group was separated in two sub-categories based on the performance in 10PDQ testing: patients with 10PDQ score >0 (10PDQ cases) and patients with 10PDQ score =0 (10PDQ non-cases).

Clinical factors including total levodopa equivalent daily dose (LEDD), FAB and MoCA scores, as well as severity and frequency scores of the four categories of positive symptoms in CAARMS interview were compared between 10PDQ cases and non-cases (Supplementary Table 1). Mean scores of the CAARMS subscales did not differ in 10PDQ cases and non-cases, except for the sections of perceptual abnormalities and disorganized speech, which were higher in the cases' group ($p < 0.001$, $p = 0.001$ and $p = 0.002$). The 10PDQ total score was significantly correlated with the individual scores of perceptual abnormalities and disorganized speech in CAARMS (Supplementary Table 2).

Supplementary Table 1. Comparison of levodopa equivalent daily dose and CAARMS item scores between 10PDQ cases and non-cases

		10PDQ cases N=23	10PDQ non-cases N=47	Adjusted p
	<i>mean±SD</i>			
	LEDD (mg)	282±161	213±194	0.116
	FAB	15±3	16±2	0.237
	MoCA	25±3	26±3	0.251
CAARMS 1.1	Unusual Thought Content-Global Rating Scale [mean±SD]	0.1±0.4	0.0±0.3	0.603
CAARMS 1.1	Frequency and Duration [mean±SD]	0.2±0.8	0.0±0.3	0.588
CAARMS 1.2	Non-bizarre Ideas-Global Rating Scale [mean±SD]	0.1±0.6	0.2±0.7	0.744
CAARMS 1.2	Frequency and duration [mean±SD]	0.1±0.6	0.3±1.1	0.698
CAARMS 1.3	Perceptual Abnormalities-Global Rating Scale [mean±SD]	2.3±1.0	0.0±0.9	<0.001
CAARMS 1.3	Frequency and duration [mean±SD]	1.8±1.2	0.0±0.1	<0.001
CAARMS 1.4	Disorganized Speech- Global Rating Scale [mean±SD]	1.1±1.3	0.2±0.5	0.001
CAARMS 1.4	Frequency and Duration [mean±SD]	0.9±1.2	0.2±0.8	0.002

Data are given as mean±SD or N (%). Significance level for comparison is p<0.05.

Supplementary Table 2. Correlations between 10PDQ total score and CAARMS individual scores. Spearman's rank correlation coefficient was used.

		10PDQ total score
CAARMS 1.1	Unusual Thought Content-Global Rating Scale	0.114; p=0.346
	Frequency and Duration	0.118; p=0.332
CAARMS 1.2	Non-bizarre Ideas-Global Rating Scale	-0.012; p=0.919
	Frequency and duration	-0.021; p=0.862
CAARMS 1.3	Perceptual Abnormalities-Global Rating Scale	0.900; p<0.001
	Frequency and duration	0.938; p<0.001
CAARMS 1.4	Disorganized Speech-Global Rating Scale	0.449; p<0.001
	Frequency and Duration	0.415; p<0.001

Supplementary Table 3. Psychotic symptoms in patients with PD and healthy controls

N, %	PD patients N=70	Healthy controls N=74	adjusted p
Minor Hallucinations			
<i>Illusions</i>	5 (7)	0 (0)	0.025
<i>Sense of presence</i>	3 (4)	1 (1)	0.356
<i>Passage hallucinations</i>	9 (13)	1 (1)	0.008
Visual Hallucinations	5 (7)	1 (1)	0.109
Auditory Hallucinations	6 (9)	2 (3)	0.158
Olfactory Hallucinations	4 (6)	1 (1)	0.200
Tactile Hallucinations	4 (6)	0 (0)	0.053
Delusional Ideas	4 (6)	0 (0)	0.053
<i>Persecution</i>	2 (3)	0 (0)	0.235
<i>Guilt</i>	2 (3)	0 (0)	0.235
<i>Reference</i>	1 (1)	0 (0)	0.486
<i>Grandiosity</i>	1 (1)	0 (0)	0.486

Data are given as mean±SD or N (%). Significance level for comparison is p<0.05.
PD, Parkinson's disease.

Supplementary Table 4. Cognitive and frontal examination in PDP and PDnP individuals

	PDP group N=27	PDnP group N=43	MW u, χ^2	p
<i>MoCA score</i>				
Visuospatial-Executive Median [Q1,Q3]	3 [3,4]	5 [4,5]	273.0	0.001
Trail Making Test N, %	10 (42)	7 (17)	5.0	0.040
Cube N, %	17 (71)	15 (36)	7.5	0.010
Clock N, %	9 (38)	6 (14)	4.7	0.038
Naming Median [Q1,Q3]	3 [3,3]	3 [3,3]	410.0	0.012
Naming N, %	5 (21)	1 (2)	6.3	0.021
Attention Median [Q1,Q3]	6 [5,6]	6 [6,6]	447.5	0.262
Attention N, %	6 (25)	6 (14)	1.2	0.329
Language Median [Q1,Q3]	2 [1,2]	2 [2,2]	466.5	0.495
Language N, %	6 (25)	9 (21)	0.1	0.767
Fluency Median [Q1,Q3]	0 [0,1]	0 [0,0]	465.0	0.484
Fluency N, %	17 (71)	33 (79)	0.5	0.556
Abstraction Median [Q1,Q3]	2 [1,2]	2 [2,2]	415.5	0.048
Abstraction N, %	6 (25)	3 (7)	4.1	0.063
Delayed Recall Median [Q1,Q3]	4 [3,5]	3 [2,4]	421.0	0.258
Delayed Recall N, %	18 (75)	34 (81)	0.3	0.755
Orientation Median [Q1,Q3]	6 [6,6]	6 [6,6]	492.0	0.450
Orientation N, %	0 (0)	1 (2)	0.6	1.000
<i>FAB score</i>				
Similarities Median [Q1,Q3]	3 [3,3]	3 [3,3]	552.0	0.859
Similarities N, %	2 (8)	4 (9)	0.1	1.000
Lexical fluency	2 [2,3]	3 [2,3]	497.0	0.388

Median [Q1,Q3]				
Lexical fluency N, %	14 (54)	17 (40)	1.3	0.320
Luria Median [Q1,Q3]	3 [2,3]	3 [3,3]	442.5	0.056
Luria N, %	10 (39)	7 (16)	4.3	0.048
Conflicting Instructions Median [Q1,Q3]	3 [2,3]	3 [3,3]	448.0	0.062
Conflicting Instructions N, %	9 (35)	7 (16)	3.1	0.139
Go-No-Go Median [Q1,Q3]	2 [2,3]	3 [2,3]	441.5	0.108
Go-No-Go N, %	16 (62)	17 (40)	3.1	0.088
Prehension Behavior Median [Q1,Q3]	3 [3,3]	3 [3,3]	516.0	0.067
Prehension Behavior N, %	2 (8)	0 (0)	3.4	0.139

The individual items of MoCA and FAB scores (either treated as continuous or categorical variables) were compared between PDP and PDnP groups. Patients with deficits in the individual items of MoCA and FAB scales are indicated (N, %). There was a trend of visuospatial, executive, naming and abstraction deficit in patients with psychotic phenomena. FAB, Frontal Assessment Battery; PDP, patients with psychotic features; PDnP, patients without psychotic manifestations; MoCA, Montreal Cognitive Assessment; MW, Mann-Whitney non-parametric test; SD, Standard Deviation.