The hidden face of hypomimia in Parkinson's disease: exploring clinical motor and non-motor symptoms correlates

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Background

Reduced facial expressions (i.e. hypomimia) is frequent in Parkinson's disease (PD), but its clinical correlates are poorly investigated. We aimed to provide a comprehensive assessment of the clinical motor and non-motor features associated with hypomimia in people with PD (PwPD).

Materials & Methods

We conducted a retrospective cross-sectional study on a dataset of 117 consecutive PwPD recruited from the Movement Disorders Centre at Sant'Andrea University Hospital in Rome between February 2023 and May 2024. Exclusion criteria were: (I) severe cognitive impairment (MoCA score ≤18); (ii) missing or unreliable assessment of hypomimia due to pathological condition that could affect facial movements; (iii) missing clinical data. Participants underwent detailed motor and non-motor assessments, using validated clinical scales. Hypomimia severity was evaluated using MDS-UPDRS item 3.2 (Hypomimia score). PwPD were classified as with (PD+Hyp) or without (PD-Hyp) hypomimia according to a cut-off of ≥2 and clinical features were compared between groups. False discovery rate (FDR) approach using Benjamini-Hochberg method was applied. Correlations and multivariable linear regression analysis using backward selection process were performed to evaluate association between Hypomimia score and clinical features.

Results

We included 41 PwPD classified as PD+Hyp and 76 PD-Hyp. Due to the significant difference in gender distribution and disease duration, comparisons were adjusted for these variables. PD+Hyp showed significantly higher disease stage, motor symptoms (particularly bradykinesia, rigidity and axial symptoms) and non-motor burden (including urinary problems, sleep disturbances, depressive symptoms, executive dysfunction), percentage of patients with fluctuations and worse quality of life (Table 1). Hypomimia score was significantly correlated with male gender, tremor, bradykinesia, rigidity and axial MDS-UPDRS subscores, urinary, sleep and executive dysfunctions (Figure 1). Eighty-eight PwPD were included in the multivariable regression. The analysis revealed that bradykinesia MDS-UPDRS subscore, male gender and urinary dysfunction significantly predicted hypomimia severity (adjusted R^2 = 34.9%, p<.001) (Table 2).

Discussion

Hypomimia is associated with a greater disease severity and gender differences. The association between hypomimia and bradykinesia, rigidity and axial symptoms is in line with previous evidence[1,2], supporting the hypothesis of a common neurobiological basis including dopaminergic dysfunction. Nevertheless, the associations with non-motor features suggest that hypomimia could not be a purely motor symptom[3], but rather a marker of overall disease severity in PD.

Conclusion

These findings support the concept that hypomimia could be associated with the severity of motor and non-motor dysfunctions and expand previous knowledge about its clinical correlates. Further studies are needed to better elucidate the biological basis of this symptom in PD.

	PD No-Hypomimia (n=76)	PD with Hypomimia (n=41)	$p\text{-value}_{FDR\text{-}adj}$
Male sex, n (%)	48 (63.1%)	34 (83%)	0.08
Age at evaluation	67.7 ± 9	70.4 ± 8	0.14
Disease duration, years	5.3 ± 4	7 ± 4	**0.01**
mHY stage	1.9 ± 0.5	2.3 ± 0.4	**0.001**
LEDD, mg/Kg/day	6.4 ± 4	8.5 ± 4	0.09
Falls past year	0.3 ± 0.8	0.5 ± 1.5	0.67
Fluctuators, n (%)	8 (10.6%)	13 (33.3%)	**0.04**
WOQ-19	0.86 ± 1.5	1.8 ± 2.5	0.23
Motor Phenotype			
Tremor-dominant, n (%)	32 (42.7%)	7 (17%)	**0.02**
Postural Instability Gait Difficulty, n (%)	38 (50.6%)	30 (73%)	0.09
Indeterminate, n (%)	5 (6.6%)	4 (9.7%)	0.27
MDS-UPDRS part I	6.2 ± 4	8.6 ± 5	**0.01**
1.2 Hallucinations and psychosis	0.03 ± 0.2	0	0.39
1.5 Apathy	0.09 ± 0.4	0.18 ± 0.5	0.27
1.10 Urinary problems	0.55 ± 0.8	1.32 ± 0.8	**0.005**
1.11 Constipation	0.57 ± 0.7	0.9 ± 0.8	0.06
1.12 Light headness on standing	0.37 ± 0.6	0.63 ± 0.8	0.4
MDS-UPDRS part II	4 ± 3.5	8 ± 4.6	**<0.001**
2.3 Chewing and swallowing	0.06 ± 0.2	0.29 ± 0.6	0.09
MDS-UPDRS part III	23.4 ± 8	32 ± 6.6	**<0.001**
Bradykinesia subscore	11.3 ± 5	16.4 ± 4	**<0.001**
Rigidity subscore	4.7 ± 2.2	6.5 ± 1.7	**<0.001**
Axial subscore	3.2 ± 2.1	5.2 ± 2.6	**<0.001**
Tremor subscore	2.9 ± 3	1.5 ± 2	0.25
MDS-UPDRS part IV	0.6 ± 1.3	1.2 ± 1.5	0.27
NFOG-Q	0.7 ± 3	3.3 ± 6.5	0.15
PDSS-2	10 ± 6	12.8 ± 7.9	**0.04**
ESS	5.7 ± 3	6.4 ± 2.7	0.57
FSS	3.3 ± 1.8	3.3 ± 1.5	0.84
MoCA	26.3 ± 2	25.5 ± 2	0.08
SCWT-T	38.9 ± 13.4	46.8 ± 19	**0.02**
BDI-II	7 ± 5	8.5 ± 5.4	**0.02**
PDQ-39	10.9 ± 9.6	15 ± 8.6	**0.02**

Table 1 Clinical-demographic features of the study population.

Continuous variables are reported as mean ± SD, frequencies as n (%). Significant p-values corrected for multiple comparisons are reported in bold.
Abbreviations: mHY, modified Hoehn & Yahr stage; LEDD, levodopa equivalent daily dose; WOQ-19, Wearing-Off Questionnaire 19-items; MDS-UPDRS, Movement Disorders Society Unified Parkinson's Disease Rating scale; NFOG-Q, New Freezing of Gait Questionnaire; PDSS-2, Parkinson's disease sleep scale second version; ESS, Epworth Sleepiness Scale; FSS, Fatigue Severity Scale; MoCA, Montreal Cognitive Assessment; SCWT-T, Stroop Color and Word test time; BDI-II, Beck Depression Inventory-II; PDQ-39, Parkinson's Disease Questionnaire 39-items.

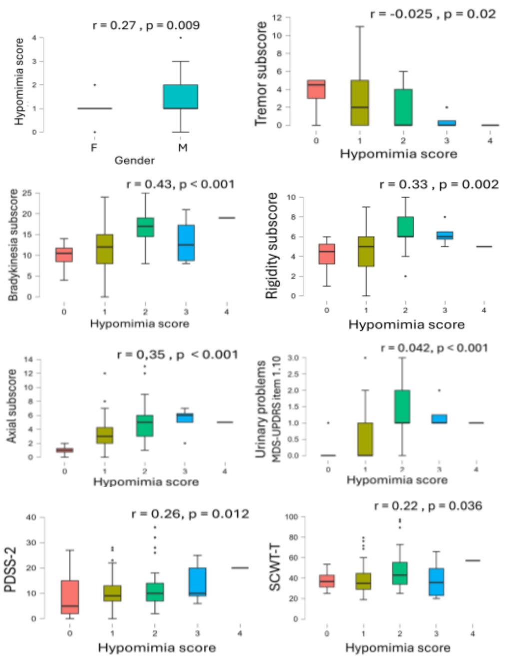

Figure 1 Correlations between hypomimia score and clinical features.
Abbreviations: MDS-UPDRS, Movement Disorders Society Unified Parkinson's Disease Rating scale; PDSS-2, Parkinson's disease sleep scale second version; SCWT-T, Stroop Color and Word test time.

Predictors	Coefficient	t	p-value	VIF
Urinary problems MDS-UPDRS 1.10	β = 0.304	3.370	**0.001**	1.091
Bradykinesia subscore	β = 0.375	4.149	**< 0.001**	1.093
Male sex	B = 0.406	3.248	**0.002**	1.004
Model fit: R^2 = 0.371, Adj. R^2 = 0.349, F(3,84) = 16.5, p <0.001				

Table 2 Multivariate regression model using Hypomimia score as the dependent variable.

Significant p-values are reported in bold.
Abbreviations: MDS-UPDRS, Movement Disorders Society Unified Parkinson's Disease Rating scale; VIF, variance inflation factor

References
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