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Validation of Polish version of Gastrointestinal Dysfunction Scale for Parkinson's Disease

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ABSTRACT

Aim of study. The Gastrointestinal Dysfunction Scale for Parkinson's Disease (GIDS-PD) is a novel, disease-specific self-report questionnaire used to quantitatively assess features of gastrointestinal dysfunction symptoms in patients with Parkinson's Disease. The aim of this paper was to validate the Polish translation of the scale, to summarise its consistency with the English language version, and to assess its clinimetric properties.

Clinical rationale for study. Gastrointestinal dysfunction is a common and often debilitating manifestation of Parkinson's Disease (PD). Gastrointestinal symptoms are also considered to be prodromal features of this disease. To date, there has been no scale in Polish that has precisely assessed gastrointestinal symptoms in patients with PD.

Material and methods. The GIDS-PD was translated into Polish by two investigators (M.K. and J.N.). A back-translation was completed by two separate investigators (M.F. and A.A.) who were not involved in the original translation. Afterwards, 10 Polish PD patients underwent cognitive pre-testing. After the final translation was officially approved by the Movement Disorder Society, it was tested on 64 individuals with PD during field testing. For the purpose of testing scale reliability, 20 of the patients recruited for field testing underwent the GIDS-PD for a second time after 8-12 weeks.

Results. The GIDS-PD demonstrated overall good consistency (Cronbach's alpha of 0.74, ICC of 0.74). Regarding the individual domains, the constipation subscore demonstrated good reliability, the bowel irritability subscore demonstrated moderate reliability, and the upper GI subscore demonstrated poor reliability. Upper GI symptoms seem to be less pronounced, and also more varied, in the Polish PD population than in its English language counterpart.

Conclusions and clinical implications. This paper provides a validated Polish translation of the GIDS-PD questionnaire. We highly recommend using the GIDS-PD for research purposes, as well as everyday clinical practice in the Polish PD population.

Key words: Parkinson's Disease, gastrointestinal dysfunction, constipation, GIDS-PD

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Introduction

Parkinson's Disease (PD) is currently the most common neurodegenerative movement disorder. An analysis conducted in 2019 revealed more than 8.5 million individuals living with this condition worldwide. Furthermore, PD prevalence is on the rise, with its global burden more than doubling between 1990 and 2016 [1]. Incidence rates increased from 40,000–60,000 per year to nearly 90,000 cases annually in North America [2, 3]. PD prevalence and incidence rates in Europe are currently estimated at 108–257/100,000 and 11–19/100,000 per year, respectively [4]. In Poland, c.100,000 people suffer from

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PD, a number that, compared to previous years, has been steadily increasing. In light of these concerning figures, the Polish healthcare system is having to adapt to the increasing burden posed on it by PD. Providing Polish PD patients and their physicians with the most up-to-date resources will continue to play an important role in improving its management.

Non-motor symptoms (NMS) have a great impact on health-related quality of life of PD patients [5, 6]. These NMS include pain, cognitive dysfunction, gastrointestinal (GI) symptoms, loss of olfaction, and depression among others [7–9].

Identification of these symptoms is necessary so as to address them and implement specific therapies or to exclude potentially triggering factors [10, 11]. GI symptoms are very common in PD patients. Constipation is reported by 24.6–63% of patients [12]. Other GI symptoms include abnormal saliva production, dysphagia, and delayed gastric emptying, which correlate with the presence of the pathological hallmark of PD i.e. Lewy neurites in the gastroenteric system [13]. Hyposmia and constipation may precede motor symptom onset by as much as 10-20 years in individuals with 'body-first' PD, an observation implicating the digestive tract as a key player in the pathogenesis of this disease [14, 15]. The gut microbiome has recently become of particular interest to researchers, as intestinal dysbiosis may be the cause of the widely-documented inflammation and neurodegeneration in the digestive tracts of PD patients [14, 16, 17]. GI biomarkers are being extensively investigated and increasingly recognised for PD. These biomarkers include the oligomeric form of salivary alpha synuclein, and specific microbes found in the gut [9, 17, 18].

Symptomatology and disease progression in individual patients can be evaluated using self-reported questionnaires, which are simple, although often underrated, assessment tools. These include the Gastrointestinal Dysfunction Scale for Parkinson's Disease (GIDS-PD).

GIDS-PD is a novel, validated psychometric tool used to assess gastrointestinal symptom severity in individuals with PD as a Patient-Reported Outcome (PRO) measure [19]. This scale has been proven to help physicians adequately evaluate the severity and frequency of patients' digestive problems and take the steps required to lessen their discomfort [19]. The GIDS-PD covers a wide range of clinical manifestations of GI dysfunction in at least one of the 12 items across the three domains included in the scale [19]. The three domains are: constipation, bowel irritability, and upper GI symptoms [19]. The GIDS-PD is a Likert type self-report scale.

As a self-report questionnaire, the GIDS-PD needs to be presented to patients in their native language. Thus, our goal was to officially translate and validate a Polish version of the GIDS-PD. Our study was conducted in accordance with the Movement Disorder Society (MDS) Clinical Outcome Assessment Translation Programme, which has a detailed protocol for high-quality translations. The aim of our study was to provide Polish clinicians with a validated tool to adequately address the non-motor GI burden of PD and summarise our validation results.

Clinical rationale for study

The GIDS-PD is a novel, disease-specific self-report questionnaire used to quantitatively assess features of gastrointestinal dysfunction (GID) symptoms in patients with PD. GID is a common and often debilitating manifestation of PD. GID symptoms are also considered to be prodromal features of this disease. Until now, there has been no scale in Polish that has precisely assessed GID symptoms in patients with PD. The presented validation of the Polish translation of the GIDS-PD is consistent with the English language version, and meets clinimetric standards.

Material and Methods

Patients were recruited in the Department of Neurology of the Mazovian Brodnowski Hospital, Warsaw, Poland and the outpatient Movement Disorders Clinic of the Mazovian Brodnowski Hospital. Written participation consent was obtained from each patient. This study was approved by the Ethics Committee of the Medical University of Warsaw (AKBE/56/2022). Developing an officially approved Polish translation of the GIDS-PD was a four-stage process, comprising (1) translating and then separately back-translating the scale, (2) cognitive pre-testing, (3) field testing on a large sample of PD patients, and (4) full clinimetric testing. 10 PD patients were enrolled for cognitive pre-testing, and later a further 64 for field testing. For the purpose of testing scale reliability, 20 of the patients recruited for field testing were asked to complete the GIDS-PD again for a second time after 8–12 weeks.

Translation of GIDS-PD

The task of translating the GIDS-PD into Polish involved the following steps: the GIDS-PD was first translated into Polish by two Polish medical students fluent in English (M.K. and J.N.). This version was afterwards back-translated into English by an independent team not involved in the original translation (M.F. and A.A.). The back-translated version and the original English language version were then compared in order to identify their differences (by M.F.).

Cognitive pre-testing

Cognitive pre-testing is a qualitative approach used to assess questionnaire completion. Its purpose is to understand how respondents perceive and interpret questions and to identify potential problems that can arise in prospective survey questionnaires [20]. Those items that showed discrepancies between the official English language version and the back-translated version were selected for further interrogation at this stage. Upon completion of cognitive pre-testing, no further investigation was required, and the final translation was officially complete. As per the MDS Rating Scale Programme

recommendation, 10 participants were included in this stage of the validation process.

Field testing

Field testing on a large sample of PD patients was conducted in the Mazovian Brodnowski Hospital. Each participant, after confirmation of a PD diagnosis, received the GIDS-PD on site. As it is a self-report questionnaire, an examiner was not needed during GIDS-PD completion by the participant. The MDS Rating Scale Programme recommends a cohort of 5–10 participants per item of the questionnaire for field testing. Therefore a cohort of 66 patients was recruited to perform a 12-item Polish translation of the questionnaire.

Data analysis

Data analyses were performed using IBM SPSS Statistics 29. It was used for basic descriptive statistics, student's t-test for independent samples, and the analysis of Pearson's r correlations. The significance for this analysis was $\alpha = 0.05$. The factors assessed included missingness rate, descriptive statistics, reliability, discriminatory power analysis, internal and external validity of the scale, and temporal stability. 'Missingness rate' describes at least one missing value in the scale. The acceptable rate for missing data in psychometric scales is under 20% [21, 22]. GIDS-PD scales with missing data were not included in the final analysis. Descriptive statistics included the range of scores, average, 95% confidence interval for the mean; median, standard deviation, skewness (limits: −2 to +2), kurtosis, minimum value, maximum value, percentage of the minimum values from the sample, and percentage of the maximum values of the sample [23]. Reliability of the GIDS-PD domains was assessed using Cronbach's alpha coefficient (appropriate value of ≥ 0.70) and Intra-Class Correlation, ICC (< 0.50 — poor reliability; 0.5—0.75 — moderate reliability; 0.75–0.9 — good reliability; > 0.9 — excellent reliability) [24, 25]. A two-factor mixed model was used. In order to check the discriminatory power, Pearson's r correlation of the items with the scales that these items consist of was performed. Correlation values of > 0.3 were considered positive [26]. For internal and external validity of the Polish version of GIDS-PD, Pearson's r correlation was performed between the individual GIDS-PD domains, and between the domains and the MDS-NMS GI scale. Correlation values of >0.3 were considered positive [26]. For the assessment of temporal stability, Pearson's r correlation was performed for the results obtained in the first and second evaluations (8–12 weeks apart) for the individual items in the GIDS-PD. The sample consisted of 20 participants. Correlation values of > 0.3 were considered positive [26]. The relationship between GIDS-PD scale domains, age and disease duration was calculated using Pearson's r correlation. Correlation values of > 0.3 were considered positive [26]. Comparison of GIDS-PD domains between genders was performed using the Student's t-test for independent samples. $P < 0.05$ was considered statistically significant.

Results

Cognitive pre-testing

Ten patients with PD were interviewed in accordance with the cognitive testing format. The chosen questions pertained to items 1a (measures to have more bowel movements), 4 (sensation of incomplete evacuation), 7 (abdominal fullness, pressure, or a sensation of trapped gas), 10 (excessive saliva), and A (Which diet best represents most of your meals?). No issues with questionnaire comprehension were reported by the patients, and the interviewers did not identify any problems regarding the answers provided by the participants. As of this outcome, no modifications were made to the Polish GIDS-PD version and no second round of cognitive testing was needed. This version of the GIDS-PD translation was approved by the MDS.

Sample study characteristics

Two out of 66 participants (3% of the field-testing participants) had at least one missing item. As a result, their scales were invalidated. The demographic characteristics of the selected sample for field testing are set out in Table 1. The sample consisted of 64 Polish PD patients (mean age 62.7 ± 8.2 years (range 45–74), 47% males), with mean disease duration of 5.8 ± 4.5 years (range 1–20). Stages 1–4 of the Hoehn & Yahr scale were represented in our study (stage 1 by 10 patients; stage 1.5 by one patient; stage 2 by 27 patients; stage 2.5 by 11 patients; stage 3 by 12 patients; and stage 4 by three patients). They were all Polish-born, white Caucasian, Polish-speaking PD patients.

Descriptive statistics

The results of the analysis are set out in Table 2. None of the variables exceeded the conventional absolute value of skewness equal to |2|, which means that their distributions were slightly asymmetric. As for the means of the studied

Table 1. GIDS-PD — demographic characteristics of field testing sample: PD participants

Demographic characteristics		PD (n = 64)
Age (years)		62.7 ± 8.2; range 45–74
Sex (% males)		47%
Ethnicity (% white Caucasian)		100%
Disease duration (years)		5.8 ± 4.5
Hoehn & Yahr score	stage 1	10 patients
	stage1.5	1 patient
	stage 2	27 patients
	stage 2.5	11 patients
	stage 3	12 patients
	stage 4	3 patients

GIDS-PD (Gastrointestinal Dysfunction Scale in Parkinson's Disease) — comparison between genders (95% confidence intervals); PD — Parkinson's disease

Table 2. Basic descriptive statistics of studied variables of Polish translation of GIDS-PD

Dependent variable	95% CI LL	M	95% CI UL	Me	SD	Sk.	Kurt.	Min.	Max.	% Min.	% Max.
GIDS-PD total score	14.98	17.95	20.92	17.00	11.89	1.40	3.12	2.00	61.00	1.6	1.6
Constipation score	8.51	10.67	12.83	7.00	8.64	1.30	1.17	1.00	36.00	1.6	3.1
Bowel irritability score	3.16	4.22	5.28	3.00	4.23	1.72	3.41	0.00	21.00	9.4	1.6
Upper GI score	2.21	3.06	3.92	2.00	3.43	1.42	2.26	0.00	16.00	31.3	1.6

GI — gastrointestinal; GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease; M — average; 95% CI — 95% confidence interval for mean; Me — median; SD — standard deviation; Sk. — skewness; Kurt. — Kurtosis; Min. — minimum value; Max. — maximum value; % min. — percentage of minimum values from sample; % max. — percentage of maximum values from sample; LL — lower limit; UL — upper limit

variables, the constipation subscore had a higher mean than the other two subscales. The floor effect ranged from 1.6% to 31.3%. The highest percentage of minimum values was for the upper GI subscore (31.3%), which was more than twice the acceptable value (15%) [27]. The ceiling effect ranged from 1.6% to 3.1%, which fell within the acceptable range (15%) [27]. It was highest for the constipation subscore.

Reliability

Reliability analysis was performed and the intraclass correlation coefficient (ICC) was calculated. For this purpose, a two-factor mixed model was used (Tab. 3). Reliability analysis for the total score showed that the scale translation had sufficiently good consistency. When it came to the individual domains, the constipation subscore had good reliability, the bowel irritability subscore had moderate reliability, and the upper GI subscore had poor reliability.

Discriminatory power analysis

In order to check the discriminatory power, Pearson's r correlation of the items within the scales that these items consist of was performed. Correlation values of less than 0.3 mean that the item does not correlate very well with the factor (Tab. 4). The analysis showed satisfactory discriminatory power of the test items. The items GIDS-PD12, GIDS-PD10 and GIDS-PD5 had the weakest relationship with the overall result.

Internal and external validity of GIDS-PD

In the next part of our analysis, the validity of the GIDS-PD was verified. Pearson's r correlation was performed for the individual GIDS-PD subscales. Then, the tested scale was correlated with the MDS-Non-Motor Rating Scale (MDS-NMS) item J (GI questions), with which the GIDS-PD and its subscales should correspond, as it measures a similar construct to the GIDS-PD (Tab. 5). The analysis showed moderate and strong relationships between the GIDS-PD total score and the remaining subscales, which indicated high internal validity. There were non-significant relationships between the subscales of the upper GI subscore and the constipation subscore, and between the bowel irritability subscore and the upper GI subscore and the constipation subscore. The GIDS-PD total score was positively, moderately, and significantly associated with the MDS-NMS item J score. This is consistent with the hypothesis of a positive correlation between both scales. A positive and strong relationship was also noted for the correlation between the constipation subscore and the MDS-NMS item J score.

Table 3. Reliability analysis for GIDS-PD

Dependent variable	Cronbach alpha	ICC
GIDS-PD total score	0.744	0.744
Constipation score	0.899	0.899
Bowel irritability score	0.555	0.555
Upper GI score	0.182	0.182

ICC — intraclass correlation coefficient; GI — gastrointestinal; GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease

Stability of GIDS-PD scale over time

The stability of the GIDS-PD scale over time was assessed in a group of 20 of the same people. Pearson's r correlation was performed to compare the results obtained in the first and second evaluations for each patient. The results are set out in Table 6. The analysis showed very good reliability for items 1–5 and 9 and 11. It was slightly weaker, but still moderately strong, for item 8. The remaining items did not show stability over time.

Relationship between GIDS-PD scale factors and age and disease duration

Pearson's r correlation analysis was performed to check whether age and disease duration were positively associated with GIDS-PD (see Table 7). The analysis showed a statistically significant, positive and moderately strong relationship between age and the GIDS-PD total score and GIDS-PD constipation subscore. These results indicate that the older the subjects, the more severe their gastrointestinal dysfunction and, more specifically their level of constipation.

Gender differences for GIDS-PD

For this purpose, Student's t-test for independent samples was used (see Table 8 and Figure 1.). The analysis showed significant statistical differences in the GIDS-PD total score, GIDS-PD constipation subscore and GIDS-PD bowel irritability subscore when comparing men to women, with women obtaining higher scores in the above-mentioned domains.

Table 4. GIDS-PD — relationship between individual items included in GIDS-PD and factors of scale

Variable		GIDS-PD total score	GIDS-PD constipation score	GIDS-PD bowel irritability score	GIDS-PD upper GI score
GIDS-PD1	Pearson r	**0.69**	**0.84**		
	significance	**< 0.001**	**< 0.001**		
GIDS-PD2	Pearson r	**0.82**	**0.91**		
	significance	**< 0.001**	**< 0.001**		
GIDS-PD3	Pearson r	**0.81**	**0.90**		
	significance	**< 0.001**	**< 0.001**		
GIDS-PD4	Pearson r	**0.75**	**0.86**		
	significance	**< 0.001**	**< 0.001**		
GIDS-PD5	Pearson r	0.21		**0.54**	
	significance	0.094		**< 0.001**	
GIDS-PD6	Pearson r	**0.26**		**0.70**	
	significance	**0.036**		**< 0.001**	
GIDS-PD7	Pearson r	**0.66**		**0.85**	
	significance	**< 0.001**		**< 0.001**	
GIDS-PD8	Pearson r	**0.46**		**0.53**	
	significance	**< 0.001**		**< 0.001**	
GIDS-PD9	Pearson r	**0.42**			**0.53**
	significance	**< 0.001**			**< 0.001**
GIDS-PD10	Pearson r	0.13			**0.63**
	significance	0.315			**< 0.001**
GIDS-PD11	Pearson r	**0.46**			**0.67**
	significance	**< 0.001**			**< 0.001**
GIDS-PD12	Pearson r	0.05			**0.29**
	significance	0.713			**0.021**

GI — gastrointestinal; GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease

Table 5. GIDS-PD — relationship between individual subscores included in scale and factors of this scale

Variable		GIDS-PD total score	GIDS-PD constipation score	GIDS-PD bowel irritability score	GIDS-PD upper GI score
GIDS-PD constipation score	Pearson r	**0.88**			
	significance	**< 0.001**			
GIDS-PD bowel irritability score	Pearson r	**0.63**	**0.29**		
	significance	**< 0.001**	**0.021**		
GIDS-PD upper GI score	Pearson r	**0.48**	0.16	0.22	
	significance	**< 0.001**	0.206	0.078	
NMS GI domain score	Pearson r	**0.46**	**0.53**	0.06	0.21
	significance	**< 0.001**	**< 0.001**	0.647	0.100

GI — gastrointestinal; GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease; NMS — non-motor symptoms

Discussion

The GIDS-PD is a novel self-report questionnaire used to thoroughly assess GI dysfunction in patients suffering from PD. In this study, we have officially validated a Polish translation of the GIDS-PD. We have confirmed its consistency with the original English language version, and deemed it suitable for both research and day-to-day clinical practice in the Polish population. To our best of our knowledge, until now the GIDS-PD has only been validated in Japanese apart from our validation [28].

Table 6. GIDS-PD — test-retest analysis for 12 items from scale

Variable	Second evaluation of variables GIDS-PD1-12	
	r	significance
GIDS-PD1 (I evaluation)	**0.79**	< 0.001
GIDS-PD2 (I evaluation)	**0.84**	< 0.001
GIDS-PD3 (I evaluation)	**0.79**	< 0.001
GIDS-PD4 (I evaluation)	**0.85**	< 0.001
GIDS-PD5 (I evaluation)	**0.87**	< 0.001
GIDS-PD6 (I evaluation)	-0.04	0.860
GIDS-PD7 (I evaluation)	0.26	0.262
GIDS-PD8 (I evaluation)	**0.36**	0.116
GIDS-PD9 (I evaluation)	**0.64**	**0.002**
GIDS-PD10 (I evaluation)	0.19	0.414
GIDS-PD11 (I evaluation)	**0.47**	**0.036**
GIDS-PD12 (I evaluation)	0.24	0.300

GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease

Table 7. Relationship between GIDS-PD scale factors and age and PD duration

Variable		Disease duration (years)	Age (years)
GIDS-PD total score	Pearson r	0.04	**0.30**
	significance	0.732	**0.014**
GIDS-PD constipation score	Pearson r	0.01	**0.36**
	significance	0.932	**0.004**
GIDS-PD bowel irritability score	Pearson r	0.05	0.10
	significance	0.677	0.452
GIDS-PD upper GI score	Pearson r	0.06	0.04
	significance	0.645	0.763

GI — gastrointestinal; GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease

Table 8. Comparison of GIDS-PD scores between genders

	Men (n = 31)		Women (n = 33)					95% CI		
Dependent variable	M	SD	M	SD	t	df	p	LL	UL	d Cohen
GIDS-PD total score	13.84	7.02	21.82	14.16	-2.88[a]	47.47	**0.006**	-13.55	-2.41	0.71
GIDS-PD constipation score	7.90	5.38	13.27	10.27	-2.64[a]	48.98	**0.011**	-9.45	-1.29	0.65
GIDS-PD bowel irritability score	3.13	3.26	5.24	4.80	-2.07[a]	56.60	**0.043**	-4.16	-0.07	0.51
GIDS-PD upper GI score	2.81	2.75	3.30	4.00	-0.58	62	0.567	-2.22	1.23	0.14

[a] *Result of Levene's test turned out to be statistically significant — result with Welch's correction was reported.* GIDS-PD — Gastrointestinal Dysfunction Scale in Parkinson's Disease; N — number of observations; M — average; SD — standard deviation; t — value of test statistic; df — degrees of freedom; p — statistical significance; CI — confidence interval for difference between means; LL and UL — lower and upper limits of confidence interval

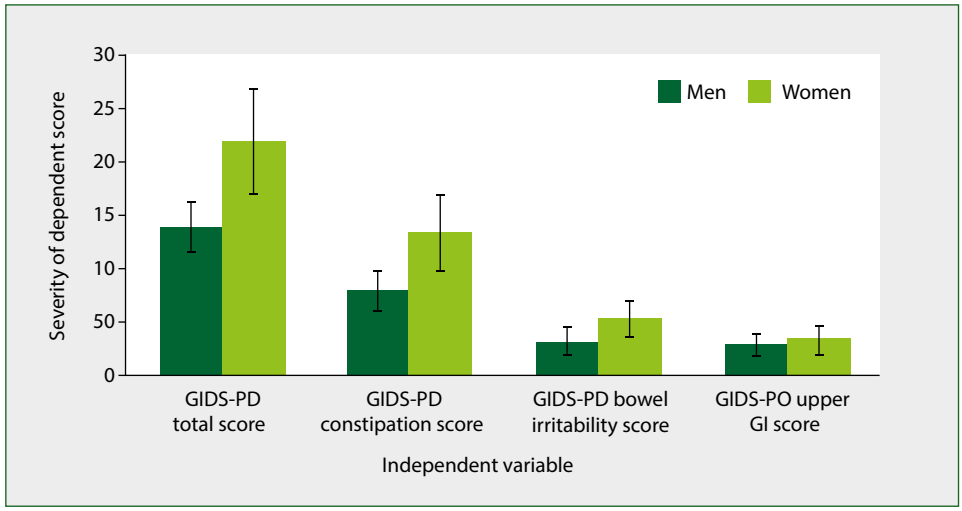

Figure 1. GIDS-PD — comparison between genders (95% confidence intervals)

The missingness rate in our study (3.1%) was lower than in the original study (15.5%) [19]. We hypothesise this may be due to the fact that our participants were on average younger (62.7 ± 8.2 years) than in the original study (69.5 ± 8.7 years). Additionally, our study was held on site, instead of remotely, which may have also led to a lower number of missing answers. Nevertheless, a missingness rate of below 20% is acceptable for psychometric scales [21, 22].

In our cohort, the constipation subscore had a higher mean than the other two subscales. This result however is consistent with what the authors obtained in the original publication of the GIDS-PD [19]. Although there was no floor/ceiling effect observed in the GIDS-PD total, GIDS-PD constipation and GIDS-PD bowel irritability scores, 31.3% of participants achieved the lowest possible score in the upper GI domain. Compared to the percentage of minimum values in the upper GI domain of the original study (20.9%), our cohort scored around 10 percentage points more on average, which reflects lower frequency or severity of symptoms such as heartburn, excessive salivation, dysphagia, or nausea in the Polish sample. This may be partly explained by our cohort's slightly lower average disease duration than that of the English language cohort (5.8 *vs.* 7.1 years). Dysphagia, one of the many upper GI symptoms in PD, has been proven to be associated with longer disease duration and higher Hoehn & Yahr (H&Y) stages [28]. As most of our study participants were in stage 1–2 of H&Y, it was less likely they would have presented with dysphagia. Dietary differences, and/or more frequent administration of therapies, may have also influenced upper GI symptom frequency in the Polish cohort. These factors however are not fully reflected in the questionnaire. Regardless of this difference, we hypothesise that the reason for scoring above the consensus threshold (15%) is similar to that of the original publication i.e. that this finding is more likely to be a reflection of sample characteristics, rather than scale inefficacy [19, 28]. Additionally, based on statistical data provided by studies on upper GI dysfunction in the general population, it is not unreasonable to assume that at least one in three of the PD population would not have these symptoms [30].

Reliability analysis for the GIDS-PD total score showed that the scale was sufficiently reliable, with an ICC of 0.74. This score, although slightly lower than that of the original publication, proves that the Polish GIDS-PD is consistent with the English language version. However, the Polish-translated upper GI domain was found to have poor reliability, which contrasts with the original scale version's good reliability. We hypothesise that this finding is probably due to high within-subjects variance, which is a factor known to lower the intraclass correlation coefficient (ICC). This discrepancy between subjects may also be attributable to the lower prevalence of upper GI dysfunction in our cohort. It has been established that upper GI symptoms (dysphagia, sialorrhea, gastrointestinal reflux) are less frequent than lower GI symptoms (constipation) in PD, especially in earlier stages of the disease [31]. Even though the average disease duration of our sample was only approximately one year younger than of the English language sample's, this difference may have lowered our cohort's upper GI symptom prevalence. Our participants also seem to have presented with a broader spectrum of upper GI symptoms than those in the English language sample. Additionally, as stated in the original publication, the bowel irritability and upper GI domains are merely theoretical and structural suggestions [19]. They do not reflect empirical clusters of symptoms, as the constipation domain on the other hand does [19]. This may be another reason for the lower reliability scores observed in these two domains, which contrast with the high reliability score of the constipation subscore. Lastly, our study had a smaller sample size than did the original study (64 *vs* 316), which may explain the difference in reliability between the GIDS-PD Polish version validation study and the original English language GIDS-PD validation study.

Some items in our study, specifically items 6, 7, 10, and 12, did not display stability over time. This may be explained by the inconsistency of GI symptoms on a week-by-week basis. As the second evaluation was conducted 8–12 weeks after the first, it is plausible that some answers may have changed over this period of time.

Statistical analysis found a moderately strong relationship between constipation and the age of our participants. Our findings are supported by a paper by Yu et al. [32]. Our analysis did not find a correlation between disease duration and constipation, in contrast with a paper by Guo et al. [33]. Women were found to overall have higher scores in the GIDS-PD total, constipation, and bowel irritability scores. Lubomski et al. reported worse constipation intensity in women than in men, which is consistent with our results [34]. The mechanism behind this is not well understood. However, potential factors include women's moderately higher PD duration, potentially increased sensitivity to PD medication, and/or oestrogenic effects on the gut e.g. stool transit prolongation [34, 35]. Interestingly, studies have suggested that lifetime average endogenous oestrogen levels exert a protective effect on the central nervous system, overall resulting in a milder PD course [36, 37]. Different proportions of men and women (47% men in our study *vs* 60% in the original paper) may also explain differences in the prevalence of some GI symptoms between the Polish and the English language cohorts.

Constipation is becoming an increasingly researched topic in PD. Apart from being an important prodromal symptom, it is starting to become a target for PD therapies. The authors of the original publication established a cut-off score of 9 in the GIDS-PD constipation domain to best distinguish between constipated and non-constipated patients [19]. Thus, this questionnaire allows for quick clinical screening for constipation among the PD population. In our study, 45.3% of participants achieved a score of 9 or more in the constipation domain, which is comparable to the 46.8% reported in the original study's cohort [19]. The GIDS-PD can also be used in a research

setting, especially given the recent popularity of foecal microbiota modifications and probiotic therapies that are currently being explored as a possible treatment for PD-related GI symptoms [38–40]. A randomised, double-blind placebo-controlled repeat-dose pilot study conducted by DuPont et al., where PD patients received an orally administered lyophilised foecal microbiota transplant (FMT) product, found that FMT significantly reduced constipation, and improved gut transit, intestinal motility and the subjective perception of PD motor and non-motor symptoms [39]. This study further highlights both the importance the GI system has in PD pathogenesis, and the importance of comprehensive PD patient assessments during their clinical evaluations.

The limitations of our study include a relatively small sample size, even though it was within the recommended sample size of the International Parkinson and Movement Disorder Society (MDS) of 5–10 patients per item. We also recruited a younger cohort, with a slightly shorter disease duration, than in the original study.

Clinical implications

In this study, we have translated and validated the GIDS-PD in accordance with the MDS Rating Scales Programme criteria. We confirm its usefulness in the Polish population.

In light of recent research into gut dysbiosis and the significance of non-motor symptoms in PD, we believe the GIDS-PD will be an important and advantageous clinical assessment tool for GI symptoms for Polish clinicians in the near future.

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