DANISH MEDICAL JOURNAL

Original Article

Dan Med J 2023;70(12):A03230209

Prevalence and severity of freezing of gait in a Danish cohort of people with Parkinson's disease

Victor Schwartz Hvingelby[1*], Miriam Højholt Terkelsen[1*], Rikke Nan Valdemarsen[1], Anne Sofie Møller Andersen[2], Erik H. Danielsen[3], Mette Møller[3], Nicola Pavese[1, 4] & Erik Johnsen[3]

1) Department of Clinical Medicine – Nuclear Medicine and PET, Aarhus University, 2) Department of Neurosurgery, Aarhus University Hospital, 3) Department of Neurology, Aarhus University Hospital, Denmark, 4) Clinical Ageing Research Unit, Newcastle University, Newcastle upon Tyne, UK

Dan Med J 2023;70(12):A03230209

ABSTRACT

INTRODUCTION. Parkinson's disease (PD) is a widespread neurodegenerative disorder characterised by wide range of symptoms. Freezing of gait (FoG), a transient feeling that the patient's feet are nailed to the floor, resulting in an inability to move, is a particularly distressful symptom. The assessment of FoG can be challenging. Often, clinicians are reliant on patients' subjective experiences and patient questionnaires such as the Freezing of Gait Questionnaire (FOGQ) and its updated version, the New FOGQ (NFOGQ).Until now, the NFOGQ has not been validated and piloted for use in Danish. Therefore, few attempts have been made to assess the prevalence and severity of FoG in Danish patients with PD.

METHODS. This report describes a two-step process of adapting the NFOGQ into Danish and piloting its use among a cohort of patients with PD. A satisfactory translation (Danish NFOGQ) was produced and successfully piloted.

RESULTS. The translation showed robust test-retest reliability after two weeks. Patients fully understood the questionnaire. Using the Danish NFOGQ in an online prevalence survey, we found that 35.7% of respondents had experienced FoG and that the prevalence correlated with disease duration.

CONCLUSION. The Danish NFOGQ appears to be appropriate for assessing FoG in Danish patients with PD in both clinical and research settings.

FUNDING. None.

TRIAL REGISTRATION. Not relevant.

Parkinson's disease (PD) is a widespread neurodegenerative disorder with a point prevalence in Europe ranging from 0.37-0.781% at age 60 years to 1.9-4.5% at age 80 years [1]. In Denmark, the Danish Parkinson's Association estimates the prevalence to fall in the 0.7-0.8% range above age 60 years. Many patients develop symptoms of gait impairment and postural instability. Among these, freezing of gait (FoG), a transient feeling of the patient's feet being nailed to the floor, resulting in inability to move forward, is particularly distressful. Typically, FoG occurs when negotiating crowded areas or during multi-tasking. FoG decreases patients' overall mobility and increases the risk of falls, negatively impacting quality of life and ability to function in daily living. In general, FoG represents a major milestone in the symptomatic-clinical progression of the disease [2].

Widely implemented clinical rating scales such as the Movement Disorder Society's Unified Parkinson's Disease Rating Scale [3] have elements assessing FoG in both the clinician-rated motor component and the patient's Activity of Daily Living Questionnaire. However, for a more extensive assessment of the frequency, duration and severity of FoG, other patient questionnaires such as the Freezing of Gait Questionnaire (FOGQ [4]) and the updated New Freezing of Gait Questionnaire (NFOGQ) [5] are used.

Until now, neither of these questionnaires has been translated and validated for Danish patients, despite their usefulness in subjective experiences of FoG.

The aim of this study was two-fold: Firstly, to enable Danish clinicians and researchers to gain accurate and detailed knowledge of FoG in Danish PD patients. Secondly, to assess the prevalence and severity of FoG in a Danish cohort of PD patients. The study was conducted as a two-step process: 1) We translated and adapted the NFOGQ for use among Danish patients; and 2) we distributed the translated the NFOGQ as an online survey aimed specifically at Danish PD patients.

METHODS

Translation and cultural adaptation of the NFOGQ into Danish

The NFOGQ scale comprises nine questions. Patients are asked to evaluate the presence, duration and complexity of FoG over the past month. Items are rated either 0-1 or 1-4, higher scores implying more severe FoG and more impact on daily living.

The NFOGQ was translated according to the guidelines of the World Health Organization (WHO) and the International Society of Pharmacoeconomics and Outcomes Research task force for translation and cultural adaptation [6].

Forward translations and harmonisation

The team consisted of four people (MHT, RNV, ASMA and VSH). Initially, two native Danish speakers (MHT and VSH), one fluent in English, the other bilingual, independently translated the NFOGQ from English into Danish (forward translation). Both are medical doctors and are engaged in PD research. Readability was ensured in Danish without straying from the English phrasing. Forward translations were harmonised by a third native Danish speaker, fluent in English (RNV). Harmonisation occurred independently of the English original. The harmonised forward translation was translated back into English (back translation) by a fourth person (ASMA). The back-translated English version was compared to the original by MHT and VSH. Changes were made to the Danish version to ensure equivalence between the Danish and English versions.

The final step consisted of piloting the questionnaire on two patients with PD in person.

Self-reported survey of freezing of gait in Danish patients with Parkinson's disease

Patients were recruited directly through the Department of Neurology at Aarhus University Hospital, Denmark, or through advertisement through the Danish Parkinson Association. Respondents were given written information about the study, names of and information about the primary investigators and information regarding storage of responses and management of data. Written information specified that participation was voluntary and that consent could be withdrawn at any time by contacting an investigator. Advertising emphasised that anyone with a diagnosis of PD could reply.

The finalised translation of the questionnaire was entered as an online survey using RedCap (Research Electronic Data Capture) web-based software platform hosted by Aarhus University, Denmark.

The survey was structured into three sections. The first section contained information on the study design and rationale. The second section contained the final Danish version of the NFOGQ. A link to a video of a PD patient experiencing an episode of FoG was embedded in this section. Participants were asked to complete the questionnaire twice: at study entry and after two weeks to evaluate the test-retest reliability of the survey. The final section of the online survey was designed to assess the validity of the translation (Validation Questionnaire). For each of the questions contained in the NFOGQ, participants had to indicate 1) whether they understood the question 2) whether the available responses were appropriate and 3) they were invited to give a narrative description of the objective of the question.

The survey commenced on 1 August 2022 and terminated on 1 January 2023.

Trial registration: not relevant.

RESULTS

Issues encountered during the translation process

Initial forward translations were not entirely in agreement with each other. There was disagreement in the translation of "freezing of gait" as one translator opted to transfer the word "freezing" directly into the translation, whereas the other opted for the literal Danish translation. This discrepancy was resolved during harmonisation into a translation of "freezing of gait": "fastfrysning af gang". Questions 1 and 2 did not differ between the two forward translators. Question 3 differed in translation, as the term "turning" does not have a correlate in Danish in the context of gait. This was solved in one of the translations by translating "turning" into two words and using them both, joined by a "/". The two chosen translations specifically indicate "when changing direction" ("Ved retningsskift") and "when you are trying to turn" ("når du prøver at dreje"). The next difference between the forward translations was observed in Question 5, as "gait initiation" does not have a correlate in Danish. In the harmonisation, a workable translation ("når du skal tage det første skridt") was chosen. For Question 9, the translations differed according to the word "score". This was harmonised into the Danish word for the verb "score" ("vurdér").

Regarding back-translation, the team agreed that it was comparable to the original English in substance.

The two patients who reviewed the harmonised Danish translation found that the questionnaire was easy to answer and had no concerns or suggestions to improve it. No further changes were made to the harmonised Danish version.

Results of self-reported survey

Overall, 101 responses to the survey were received in the course of the study period. Among the 101 respondents, 92 indicated a diagnosis of PD and were included in further analyses. The demographics are shown in **Table 1**.

Among the respondents, 36 people (35.7%) indicated experiencing freezing within the past month.

TABLE 1 Demographics of respondents who indicated a diagnosis of Parkinson's disease (N = 92).

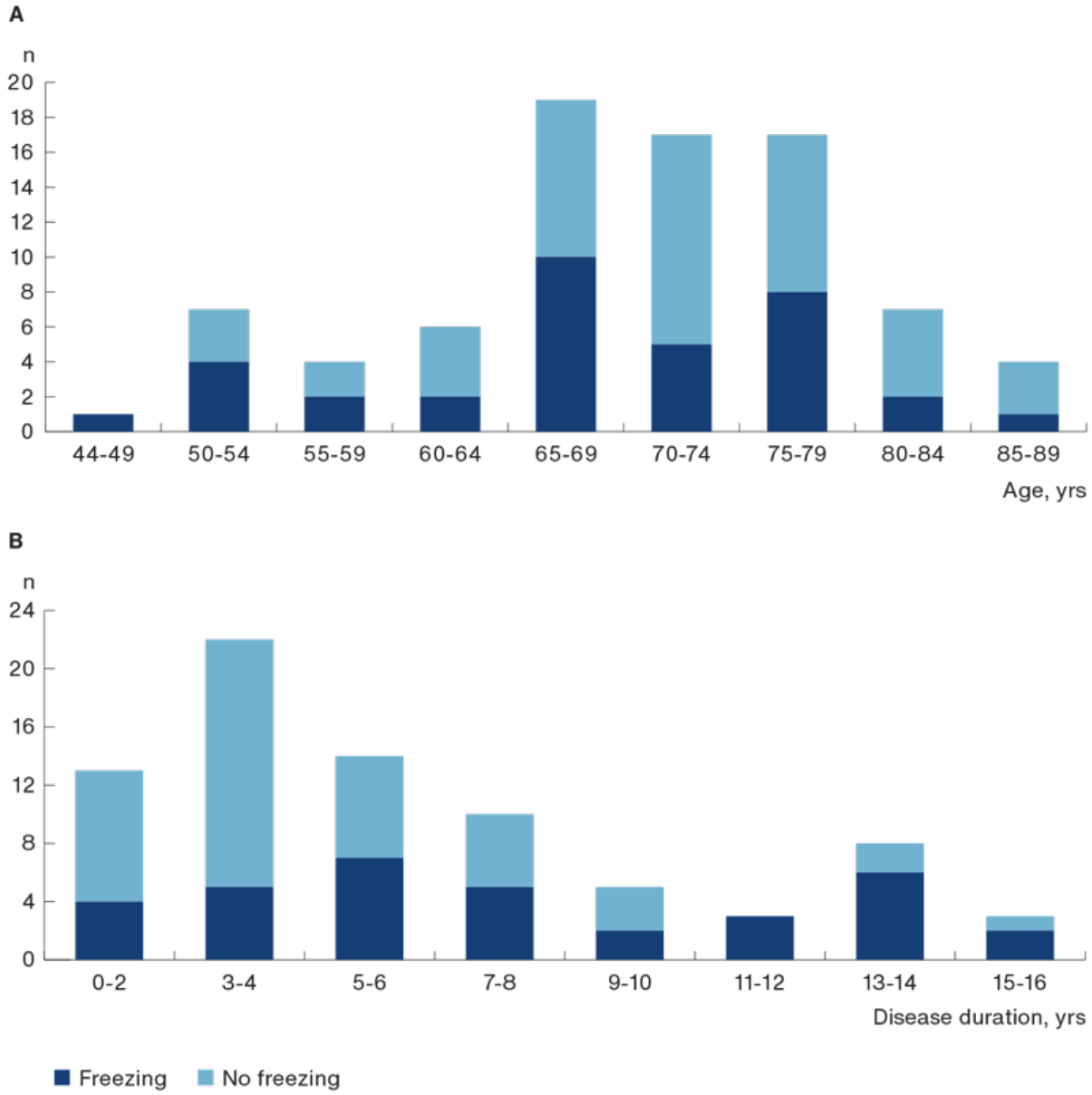
Gender: f/m/nr, n	43/37/11
Age, mean (± SD), yrs	70 (± 8.7)
Disease duration, mean (± SD), yrs	6.2 (± 4.1)
Freezing last month, %	35.7

f = female; m = male; nr = no response; SD = standard deviation.

Results of Danish New Freezing of Gait Questionnaire

Among the 92 respondents indicating a diagnosis of PD, 36 indicated experiencing FoG in the previous month and 56 did not. Stratifying the prevalence of freezing by age disclosed no discernible relationship, see **Figure 1** A.

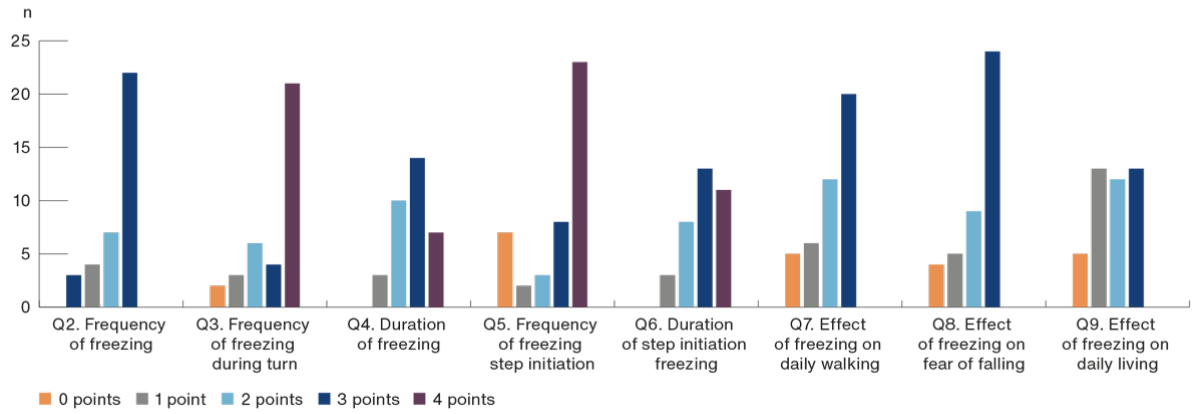
FIGURE 1 Prevalence of freezing of gait in the previous month by age strata (**A**), grouped in five-year strata, and by disease duration (**B**), stratified into two-year groups.



Correlation between prevalence and disease duration, however, was more pronounced. Indeed, when performing a weighted linear regression on prevalence of FoG as a function of disease duration, we achieved a good linear fit ($R^2 = 0.5682$, $p = 0.0308$). The correlation indicated a 3.9 percentage point increase in prevalence per year of living with PD with a 50% prevalence at 7.87 years.

Among the 36 respondents indicating FoG, average severity according to the NFOGQ was 21.6 (95% confidence interval (CI): 19.3-23.9). The indicated severity, NFOGQ total score, showed no significant correlations with age or disease duration. Severity broken down by question is indicated in **Figure 2**.

FIGURE 2 Severity indicated for questions 2-9 of the Danish New Freezing of Gait Questionnaire for respondents having experienced freezing of gait in the preceding month. Please note Questions 2, 3 and 6 span 1-4 and Questions 7-9 span 0-3.



Results of the validation questionnaire

In total, 33 patients (36.23%) completed the validation questionnaire. Participants indicated that they understood the objective of the questions. Two participants reported problems understanding one of the Danish NFOGQ questions. One participant reported that they did not understand Question 1, indicating presence of FoG during the preceding month. The reason given was they had never experienced FoG.

Another participant stated not understanding Question 2, concerning frequency of FoG. The reason given was that they did not understand why they needed to state their weekly FoG frequency when the overall questionnaire inquiries about the previous month.

Regarding suitability of response options, responses were deemed appropriate by most respondents (81.8-100%, depending on question). One person replied that they found the available responses unsuitable to their case as they had never experienced FoG. Another person found that the available responses did not accurately reflect the severity of their FoG and, finally, one participant responded that the available responses lacked discrimination between ON and OFF freezing.

The respondents were prompted to describe each of the questions in the questionnaire. Respondents gave accurate descriptions (79.2-100%), indicating suitable phrasing of the questions. However, some of the descriptions provided were ambiguous, making it unclear whether the participant had fully understood them. One participant offered the following description for Questions 3-6 “The question is impossible to misinterpret” (Danish: “Spørgsmålet er for mig entydigt), and another provided a similar description for Questions 4-8 (“Det er simple spørgsmål. De kan ikke misforstås”).

One respondent misinterpreted the intention of Questions 4 and 9 by describing it as referring to the state of their PD in general, not specifically to FoG. One participant interpreted Question 3 as being about their gait function in general, not specifically about FoG. Finally, one respondent offered a “?” as explanation for Question 7.

Retest results

In total, 19 respondents completed the retest. The range of discrepancy in the test-retest was 13 (–7-6) points. However, there were outliers as the mean change was 2.16 points (95% CI: 1.11-3.20 points) and the median 2 points.

DISCUSSION

Here, we have detailed the process of translating and adapting the NFOGQ into Danish for use among Danish-speaking PD patients. We assessed the applicability of the Danish NFOGQ and the prevalence of FoG in this cohort.

The adaptation of the NFOGQ into Danish produced an easy to read and understand questionnaire that may be used in the clinic to evaluate the presence, duration, complexity and severity of FoG. However, an important point, which was also raised by one of the respondents, is the questionnaire's lack of discrimination between ON and OFF states. Given this, we have amended the Danish version. The Danish version now contains an additional item (Question 6.a): "Hvor stor en procentdel af dine fastfrysninger finder sted imens din parkinson medicin virker, som den skal? Det vil sige, når du har taget din medicin som du skal, og du føler den virker." (Eng: What percentage of your episodes of freezing occur while your medication for Parkinson's disease is working as intended? That is, when you have ingested your medication as prescribed and feel as though it is workin.") The available answers to the question are 0%, less than 25%, 26-50%, 51-75% or 76-100% (Danish: 0% Jeg har ingen fastfrysninger, imens min medicin virker, mindre end 25%, mere end 25 men mindre en 50%, 51-75%, 75-100%, alle eller næsten alle mine fastfrysninger er imens, jeg har taget min medicin, og den virker). The final Danish NFOGQ, including this adjustment, is provided in Appendix 1.

The prevalence of FoG in our survey was 35.7%. Furthermore, we were able to confirm a significant correlation between disease duration and the prevalence of FoG.

However, other estimates of FoG prevalence vary between studies with ranges from 5% to 85.9% [4, 7, 8]. A large systematic review of 66 studies calculated a weighted mean prevalence of 50.6%. Our results seem to agree with this finding.

As in the original English questionnaire, the version of the Danish NFOGQ used for the online survey contained no specific question to differentiate between FoG occurring in the ON or OFF state. Therefore, we are unable to report whether the 35.7% of the patients who reported FoG in our study were experiencing ON-FoG, OFF-FoG or both. This distinction may have significant clinical implications. In fact, if the episodes of freezing occurred during the OFF states, this would suggest that a significant proportion of respondents were not optimally medicated. One reason for this may be that the patients themselves do not recognize FoG as a symptom of dopamine deficiency, poor compliance or related factors. Hopefully, the adjusted version of the Danish NFOGQ provided in Appendix 1 will allow clinicians and researchers to obtain this information. It will also allow researchers to better identify patients with episodes of FoG exclusively during the ON medication state. This will be crucial for future studies designed to achieve a better understanding of the pathophysiology of ON-FoG and novel treatments [9].

CONCLUSION

Our validation indicated that the questionnaire is readily understood by patients and is robust across time. Furthermore, our cohort-based survey indicated that FoG is a prominent symptom among Danish patients with PD.

Correspondence *Victor Schwartz Hvingelby*. E-mail: au340287@clin.au.dk

*) Shared first authorship

Accepted 28 September 2023

Conflicts of interest Potential conflicts of interest have been declared. Disclosure forms provided by the authors are available with the article at ugeskriftet.dk/dmj

Acknowledgements The authors extend their gratitude to professors *A. Nieuwboer* and *N. Giladi* for granting free use of the NFOGQ for translation into Danish. We wish to acknowledge the patients who participated in the survey and the Danish Parkinson Association (Da: Parkinsonforeningen) for their help in distributing the questionnaire among potential respondents. Finally, a special thank you to the pilot patients for helping the team refine the translation.

Cite this as Dan Med J 2023;70(12):A03230209

Supplementary https://content.ugeskriftet.dk/sites/default/files/2023-09/a03230209-supplementary.pdf

REFERENCES

1. Pringsheim T, Jette N, Frolkis A, Steeves TDL. The prevalence of Parkinson's disease: a systematic review and meta-analysis. Mov Disord. 2014;29(13):1583-90.
2. Bloem BR, Hausdorff JM, Visser JE, Giladi N. Falls and freezing of gait in Parkinson's disease: a review of two interconnected, episodic phenomena. Mov Disord. 2004;19(8):871-84.
3. Goetz CG, Tilley BC, Shaftman SR et al. Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): scale presentation and clinimetric testing results. Mov Disord. 2008;23(15):2129-70.
4. Giladi N, Shabtai H, Simon ES et al. Construction of freezing of gait questionnaire for patients with Parkinsonism. Parkinsonism Relat Disord. 2000;6(3):165-70.
5. Nieuwboer A, Rochester L, Herman T et al. Reliability of the new freezing of gait questionnaire: agreement between patients with Parkinson's disease and their carers. Gait Posture. 2009;30(4):459-63.
6. Wild D, Grove A, Martin M et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value Health. 2005;8(2):94-104.
7. Lilleeng B, Gjerstad M, Baardsen R et al. Motor symptoms after deep brain stimulation of the subthalamic nucleus. Acta Neurol Scand. 2015;131(5):298-304.
8. Zhang WS, Gao C, Tan YY, Chen SD. Prevalence of freezing of gait in Parkinson's disease: a systematic review and meta-analysis. J Neurol. 2021;268(11):4138-50.
9. Hvingelby VS, Glud AN, Sørensen JCH et al. Interventions to improve gait in Parkinson's disease: a systematic review of randomized controlled trials and network meta-analysis. J Neurol. 2022;269(8):4068-79.