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Consensus statement

Check for updates

An updated definition of freezing of gait

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Abstract

Freezing of gait (FOG) is among the most debilitating symptoms of Parkinson disease and related disorders, often resulting in falls and a loss of independence. FOG has an episodic and heterogeneous nature that makes it difficult to measure and treat. The field currently lacks a consensus on how to precisely define this phenomenon. For this reason, the International Consortium for Freezing of Gait convened a group of experts to establish an updated 'clinical' definition of FOG for use in the clinical setting and a 'technical' definition for assessors to use when scoring FOG episodes from video recordings as an outcome in fundamental research and clinical trials. Guidelines on how to classify people with Parkinson disease into subgroups of those with or without FOG (non-FOG) are also provided. This position paper presents these new definitions and guidelines, offering a foundation for harmonizing the study and management of FOG.

Sections

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Our dear colleagues and co-authors, N. Giladi and M. Hallett, sadly passed away before the publication of this manuscript. We benefited enormously from their unparalleled scientific and clinical wisdom about freezing of gait and from their sage advice and input throughout our discussions on the definition of FOG and during the writing of this manuscript. We dedicate this work to their memory.

Introduction

Freezing of gait (FOG) is a debilitating symptom that substantially affects the mobility and independence of many people living with Parkinson disease (PD) and related disorders[1]. During FOG, individuals experience a sudden inability to take an effective step when initiating gait or during walking and turning. FOG episodes are frequently provoked during situations that demand high cognitive, sensory or emotional load during ambulation[2–4]. The variety of these provoking circumstances reflects the complexity of the underlying pathophysiology, which is summarized elsewhere[5]. Moreover, the phenomenon is not merely characterized by a complete absence of movement but can involve a multitude of abnormal concurrent motor phenomena, such as trembling of the legs. This complexity makes it challenging to study the phenomenon and, consequently, to administer proper treatments[6–8].

At present, patient-reported outcomes, such as the new freezing of gait questionnaire (NFOGQ)[9] or item 2.13 (on freezing) from the Movement Disorder Society Unified Parkinson's Disease Rating Scale (MDS-UPDRS)[10], are used frequently in the clinic and research settings to evaluate the presence and severity of FOG. Despite their relative ease of use, self-reported outcomes can be biased by recollection errors, feelings of shame and/or reduced disease insight of patients[11], which can result in questionable construct validity[12] and substantial measurement error[13]. Consequently, the outcomes of currently available self-reported measures should be interpreted with caution and might be insufficiently sensitive to detect small-to-moderate improvements in FOG severity in clinical research[13].

As an alternative to patient-reported outcomes, FOG evaluation is also often based on clinical observation, typically using item 3.11 of the MDS-UPDRS. This item requires a participant to walk for at least 10 m, turn 180° and return to the examiner, a protocol that is designed for application in a clinical setting[10], but might not represent the most sensitive approach for provoking FOG[7,14]. Therefore, other walking protocols and various measurement technologies have been introduced to evaluate gait impairment and FOG[14]. Most protocols for FOG detection consist of standardized walking tasks with FOG-provoking conditions, such as 360° turning and walking through a doorway. However, the exact testing protocols have varied across studies[2,3,15,16]. For this reason, the International Consortium for Freezing of Gait (ICFOG) is currently evaluating the psychometric properties of a consensus-based FOG-provoking protocol — the 'Giladi Protocol' — in a large, diverse group of 140 individuals with PD (NCT06519279), with the aim to achieve a uniformly accepted test battery to evaluate FOG in the clinic and research settings[14].

Currently, the gold-standard method to evaluate the presence and severity of FOG for research purposes is to videorecord FOG-provoking gait tasks, which allows post hoc manual scoring via annotation of individual FOG episodes by expert raters according to pre-specified scoring criteria[2,12,14,17–24]. Video ratings can provide several outcomes, including the frequency and duration of episodes and the percentage of time spent with FOG in relation to the total task duration (%TF), which is psychometrically considered the most favourable video-rated outcome of FOG severity[17,23]. However, although %TF is an emerging standard, a fundamental issue regarding how the definition of FOG should be operationalized during video annotation remains.

The most widely used definition of FOG was established during the first international FOG workshop in 2010 (ref. 1). This definition states that FOG is "a brief, episodic absence or marked reduction of forward progression of the feet despite the intention to walk." However, this definition contains ambiguities that can lead to uncertainties in deciding which gait deviations should be classified as FOG[25]. For example, what is considered as 'brief', when is 'forward progression' considered as being 'markedly reduced', and how is the 'intent' of the individual determined? The current definition of FOG also lacks information on what should be considered as the exact onset and termination of an episode[1]. Therefore, the current definition is not optimally suited for precise scoring of FOG episodes from video recordings[17,20]. As a result, various other scoring criteria have been used to obtain the %TF as an outcome, resulting in unwanted variability and reduced interpretability of intervention effects between studies[2,12,14,15,17,20,22–24,26]. Furthermore, current definitions have yielded variable inter-rater reliabilities on the %TF, with intraclass correlations ranging between 0.50 and 0.99 (refs. 20,24,27,28). For this reason, the current recommendation is to have two clinical raters independently score the same videos[17,20,23], and a methodology on how to deal with the expected discrepancies between the ratings, the so-called 'grey area' of FOG, exists[20]. The requirement for double human scoring and associated costs make the application of the gold-standard outcome measure of FOG unattractive in clinical research, and this recommendation is, therefore, not frequently adopted[20]. Moreover, the lack of a reliable gold-standard reference compromises the validation of other FOG metrics, including clinical and patient-reported outcomes, but also new objective measures of FOG, such as automated FOG detection algorithms[14,25].

In 2022, a Scientific Panel of the International Parkinson and Movement Disorder Society issued a review article that highlighted the main roadblocks towards important breakthroughs to resolve this challenging symptom[6,7]. The foundation of progress in the field was determined to rely on the standardization of the definition of FOG to enable consistent measurements of %TF across raters and studies, and to harmonize the determination and interpretation of therapeutic effectiveness. This conclusion resulted in the drafting of a road map paper that addressed these deficiencies and the creation of the ICFOG[25]. With enormous support from our dear colleague, the late N. Giladi, the ICFOG brought together the authors of this manuscript as a working group to establish an updated definition of FOG with the goal of standardizing FOG scoring. The working group met in Jerusalem, Israel and Atlanta, USA during the international FOG workshop meetings in March 2023 and June 2025, respectively, and held regular meetings before and after these workshops, until a consensus was reached.

A key insight of the group was to distinguish between a broad 'clinical' definition, which concisely describes the phenomenon for use in the clinical setting, and a more detailed 'technical' definition for assessors to use when scoring individual FOG episodes in a detailed manner from video recordings. We predict that such guidelines will produce a more reliable gold standard for establishing therapeutic effects and validation of new FOG outcomes, including clinical, patient-reported and fully objective measures. The working group also established a standardized method to classify individuals with PD on the basis of the presence or absence of FOG. Here, we present these new definitions and guidelines, aiming to establish a harmonized evaluation approach to progress towards better understanding and treatment of FOG.

Methods

The Executive Committee of the ICFOG invited the authors of this paper to form a working group with the objective "to operationalize a new definition for FOG." The working group appointed a coordinator (M.G.) and co-coordinators (S.A.F. and J.N.) to prepare and moderate the working group meetings and to devise a first draft of the resulting manuscript.

The working group met physically at the ICFOG consortium meeting in March 2023 in Jerusalem, Israel. In preparation for this event, each member completed an online survey sent out by the coordinators to establish the shortcomings of the previous definition and to gauge the perspectives of each member on how to resolve them in an updated definition. The working group met virtually four times to discuss the survey entries and to reach a consensus on how to update the definition. During the Jerusalem meeting, the working group spent 2 days debating and reviewing 17 video recordings that were deliberately selected to demonstrate a diverse range of FOG phenomenology among people with PD, fine-tuning the proposed solutions until a first consensus-based definition was achieved. Version 1 of the consensus definition was presented to the entire ICFOG consortium on the final day of the meeting.

Following the in-person meeting, ten members of the working group manually and independently annotated FOG episodes in six videos, each of different individuals with PD performing various FOG-provoking walking tasks, according to the updated definition. Review and discussion of these scores led to further fine-tuning of the proposed definition.

The working group continued to debate the definition in another four virtual meetings, and between the coordinators and individual working group members on multiple occasions, revisiting previous videos of FOG to test the updated definition. The viewpoints of experienced FOG assessors outside the working group were also gathered by the coordinators. Finally, the definition was presented and debated with the entire consortium at the ICFOG meeting of June 2025 at Emory University in Atlanta, USA, leading to final fine-tuning. The resulting consensus definitions are outlined in this manuscript.

The clinical definition of FOG

The working group first established a new clinical definition intended for communication purposes, resolving the main ambiguities of the former 2011 definition by Nutt and colleagues[1]. The 2025 ICFOG clinical definition of FOG reads: paroxysmal episodes wherein there is an inability to step effectively, despite attempting to do so. According to this definition, no minimum or maximum duration exists for individual FOG episodes. FOG can also occur during any gait-related stepping movement, including gait initiation, turning and walking forwards, backwards or sideways. The word 'paroxysmal' indicates a sudden occurrence of the symptom, often (but not invariably) with an abrupt onset. The word 'episodes' indicates that the events happen both recurrently and intermittently, rather than continuously. 'Attempt' is used to replace the 'intent', as the latter is not observable by the human eye and because someone can have an intention to take a step without actually attempting to do so. The attempt can be verified by self-report, visible movement of body parts, or objective measures using sensor technology. Finally, given the countless variations in gait and movement abnormalities that can occur during FOG episodes[2], the 'inability to step effectively' is left to be judged by the assessor against the benchmark of typical, or quasi-normal, stepping behaviour in the same individual under similar stepping conditions. A common feature of FOG episodes with ineffective steps is that these steps are shorter than the typical step length of the person. Therefore, this clinical definition is applicable in a broad clinical context.

The technical definition for scoring FOG episodes from video recordings

The working group debated extensively on a new technical definition that would allow pragmatic and consistent scoring of individual FOG episodes from video. Reliable scoring of FOG from video necessitates a clear description of the precise onset and end of each episode, which proved a difficult assignment for several reasons. First, we are bound by what can be visually discerned from video footage by a human rater. Second, the movements that are observed during FOG are not uniform. Indeed, FOG can present with or without complete cessation of the progression of the feet[2,29], and other visible movements in the legs can also be present or absent. If present, the leg movements can vary between appearing tremulous or non-tremulous[2]. Third, the gait pattern in between episodes is also affected and often deteriorates just before a FOG event, complicating the definition of an exact onset[30–32]. Last, shuffling steps and periods of festination (see the section 'Festination') have been inconsistently considered as FOG in the clinic and research settings, with some including these gait impairments as FOG and others not[2,16,32]. However, the most characteristic features of FOG are its episodic occurrence and paroxysmal onset. As a result, the working group came to the consensus that continuous gait difficulties of PD, such as non-episodic reduced step length or continuous shuffling with poor clearance of the feet, slower gait velocity, reduced arm swing, increased gait variability and a narrow base of support[33], will not be considered as FOG.

Bound by what can be observed from a video, the working group proposes that the onset of a FOG episode is marked by one of the following two elements: (1) the first moment that any part of the foot — typically the heel — lifts off the ground as part of the first ineffective step that deviates from the typical step performed by the same individual during a similar gait task under comparable conditions; or (2) the first moment of a visible, self-reported or objectively documented attempt to take a step that does not result in any foot movement, for example, during gait initiation or change of turning direction. The proposed end of an episode is either the first moment when there is no longer a visible, self-reported or objectively documented attempt to take a step, or the first moment that any part of the foot is lifted off the ground, resulting in two consecutive steps that both resemble typical or quasi-normal step performance in the same individual during a similar gait task under comparable conditions. Two consecutive effective steps are required to end the episode because even when a single foot is able to take an effective step, the opposite foot can still be experiencing the freezing episode.

Another proposed rule that ends a FOG episode is a FOG-induced fall, whereby the patient unintentionally comes to rest on the floor or other lower level[34]. The FOG episode then terminates at the first moment any part of either foot leaves the ground, when the cascade of the fall begins. For FOG-induced near-fall events, namely, "a stumble event or a loss of balance that would result in a fall if sufficient recovery mechanisms were not activated" or the individual was not caught by another person[35], the FOG episode terminates using the same rules as for other FOG episodes — when the individual is again able to take two effective steps or is no longer attempting to take a step, which typically coincides with the first moment that the person regains balance control. Supplementary Videos 1 and 2 demonstrate examples of a near-fall event that is induced while the patient still experiences FOG. These supplementary videos are annotated to indicate the termination of the FOG episodes. The working group recommends labelling falls and near-falls separately as FOG-related events of interest. Given the large variability in gait and balance abnormalities[33], determining which step is ineffective or which step resembles typical performance and what to judge as

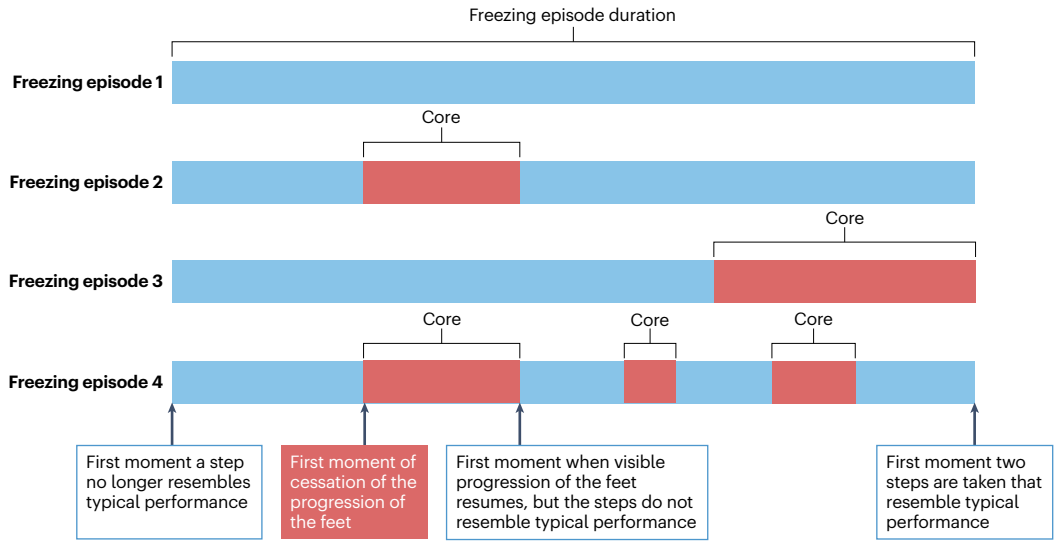

Fig. 1 | Visualization of core events during freezing of gait. Visualization of four different fictitious freezing of gait (FOG) episodes as they could occur in a single individual: without a core (episode 1), with a single core that does not end the entire episode (episode 2), with a single core that ends the entire episode (episode 3), and with multiple cores (episode 4). The dark red colour denotes periods of cessation of the progression of the feet in the horizontal plane. When the period of cessation has passed, the FOG episode will either continue or terminate, depending on whether two typical steps are taken after the core ends. See Supplementary Video 3 for an example of a patient experiencing FOG episodes with multiple cores.

a fall or near-fall remains up to the discretion of an expert. The working group acknowledges that this judgement might still result in a degree of inter-rater and intra-rater variability when scoring FOG episodes. However, when this standardized approach is applied consistently, inter-rater and intra-rater reliability is expected to substantially improve.

The working group contends that the most consistent way of scoring the onset of a FOG episode would be to score the first moment of a cessation of foot progression, whereby the feet are not advancing in the horizontal plane. However, not all FOG episodes exhibit a moment of distinct cessation. Therefore, the working group proposes, instead, to delineate the entire duration of the episode as FOG and optionally to label periods of complete cessation of the progression of the feet as the 'core' of the episode (Fig. 1 and Supplementary Video 3). The core is in line with what was previously considered as motor blocks during gait in PD[29]. When present, the onset of the core is defined as the first moment of complete cessation in foot progression, and the end is marked by the first moment of visible resumption of foot progression in any horizontal direction. In the case wherein two typical steps follow the end of a core, the entire FOG episode terminates at the same time as the core terminates; otherwise, the core terminates and the FOG episode continues until two typical steps are taken. Figure 1 shows that a single FOG episode can have zero, one or multiple cores.

Scoring of the core is advised because the pathophysiology underlying the core and responsiveness to therapy might be different from FOG without a core[28]. Furthermore, objective measures can show different detection accuracies between periods with or without foot progression, especially when based on motion sensors[31]. Finally, whether individuals find episodes with or without a core more or less disabling is currently unknown. Thus, the working group agreed that scoring the core could provide additional insight into the clinical impact and also into the effectiveness of putative therapies. Nevertheless, whether or not to annotate this core depending on the clinical or research interest, and on the available time, is left to the discretion of the investigator.

Regardless of the presence of a core, FOG can manifest in different ways, and these manifestations can have a variable response to therapy and are predicted to have distinct neurobiological fingerprints[28]. Objective outcomes can also achieve different accuracies for detecting FOG episodes with different manifestations[11,14]. Accordingly, researchers have started to label episodes separately according to the most prominent manifestation (also referred to in the literature as the sub-type or phenotype of FOG). At present, the most widely used labels to describe the different manifestations of FOG are 'akinetic FOG', 'trembling FOG' and 'shuffling FOG'[2]. However, when using these labels, Kondo and colleagues found poor inter-rater reliabilities with intraclass correlations (ICC) ranging from 0.31 to 0.44 (ref. 36). Moreover, the definitions underlying these labels have varied across studies. For example, akinetic FOG has been referred to as episodes without observable movement in the legs (pure akinesia)[2], "clear sticking of the feet"[28], moments when very little motion is detectable[14], or any FOG without visible trembling[26]. Trembling FOG has typically been referred to as episodes characterized by alternating tremulous oscillatory movements in the legs, often observed at the ankles or the knees, and typically at an irregular frequency between 3 and 8 Hz, referred to as the freeze band[14,18]. However, studies have been inconsistent in their description of whether trembling FOG occurs with or without forward motion of the feet. Sometimes, only a binary distinction is made between trembling and akinetic FOG, which means that FOG episodes without clear trembling or akinesia were inconsistently allocated to either label[26,28]. Lastly, shuffling FOG is typically referred to as small shuffling steps with minimal forward movement[2,26,28]. However, this definition of shuffling FOG does not describe the need for a paroxysmal onset, which means that continuous shuffling gait has also been variably considered as FOG.

The working group provides an update to enhance consistent labelling of FOG manifestations from videos, which can be reserved for investigations wherein such a detailed level of segmentation is relevant. From a pathophysiological and pragmatic perspective, the working

group consensus highlights that the most considerable distinction is between episodes that occur with clinically observable movements in the legs and/or feet, now termed kinetic FOG, and episodes without any clinically observable movements in the legs and feet, which will continue to be referred to as akinetic FOG. Furthermore, to facilitate efficient scoring while reaching a high level of inter-rater consistency, just two subtype labels of kinetic FOG are proposed, namely, kinetic-trembling and kinetic-no-trembling. Kinetic-trembling is characterized by fast oscillatory movements in the lower limbs that are often irregular, unlike in PD resting tremor wherein the frequency of the oscillations is more rhythmic. Alternatively, kinetic-no-trembling is characterized by any other ineffective movement visible in the legs and feet that are not clearly trembling, including slow irregular oscillatory movements, paroxysmal shuffling and festinating-freezing (Fig. 2 and Supplementary Videos 4, 5 and 6). To be scored as FOG, shuffling and festinating-freezing need to have a paroxysmal onset and episodic nature and to be distinct from the typical or quasi-normal stepping performance of the same individual under similar task conditions. Thus, continuous shuffling in PD is not considered as FOG. The working group defines continuous shuffling as walking with poor clearance of the feet, often with a decreased step length and speed.

Festination

How to define the phenomenon of festination, and whether or not episodes of gait festination should be reckoned among the definition of FOG, was a topic of intensive debate among the working group. The word festination stems from the Latin word *festinare*, which means 'to hasten'[32]. According to this meaning, any ineffective hastening of gait ambulation could be considered as festination, but not all such instances coincide with FOG. Thus, a prior viewpoint paper has noted that two main phenotypes of festination exist[32]. The first phenotype, type I, represents a primary locomotor disturbance that is probably owing to the so-called sequence effect, characterized by a progressive increase in cadence accompanied by a shortening of step length. The second phenotype, type II, can be observed when the centre of gravity of an individual is outside the base of support offered by the feet while the balance-correcting steps are too short to effectively restore the balance perturbation. As a result, more and more balance-correcting steps are taken to prevent a fall, with the result that the individual propels forward with an abnormally high speed while walking.

Although both phenotypes of festination require an acceleration of gait that leads to a faster gait speed than what is typically observed in the same individual under similar conditions, the main distinction between the two phenotypes is the absence of a progressive increase in cadence with a shortening of step length in type II. This second phenotype is believed to be induced by a balance-control deficit, rather than a primary locomotor deficit. The authors of the viewpoint indicated that both phenotypes are not mutually exclusive and can be observed in the same individual, but that type I is more strongly related to FOG than type II[32]. The working group agrees with the viewpoint above, reaching a consensus that only festination type I ('festinating-freezing') should be regarded as FOG and can be defined as a period of abnormally accelerated gait with a progressive increase in cadence and decrease in step length. Notably, festination type I is often accompanied by a forward leaning of the trunk. Gait needs to accelerate compared with the typical gait speed of an individual because without this acceleration, one would label a paroxysmal and ineffective increase in cadence and decrease in step length as a shuffling form of kinetic-no-trembling FOG. The working group further proposes that festination type II can be defined as a period of abnormally accelerated gait with the centre of gravity outside the base of support, featuring short balance-corrective steps insufficient to restore stability, but without a progressive increase in cadence and decrease in step length. This phenotype of festination can be labelled according to whether the centre of gravity is positioned in front (propulsion), behind (retropulsion) or to the side (lateropulsion) of the base of support offered by the feet (Supplementary Videos 7 and 8). Such phenotypes of festination should not be scored as FOG but can be labelled as separate festination-related impairments of interest. Instances when gait propulsion precedes festinating-freezing can occur, in which case only the period of festinating-freezing should be scored as FOG (Supplementary Video 9).

Whether festinating-freezing and FOG represent the same or different neurobiological phenomena is currently unknown. However, the two are highly related for various reasons, namely, festinating-freezing occurs more frequently in individuals who also experience FOG[37–39], both have a paroxysmal onset and are episodic in nature, and both substantially impair gait mobility and increase the risk of falls[16,32]. From our own experience and in line with the viewpoints of experienced FOG assessors with whom we consulted, the working group agreed that moments of festinating-freezing can be challenging to visually delineate from paroxysmal shuffling, both clinically and based on video recordings, because both present with a paroxysmal and ineffective reduction in step length[27]. This difficulty is illustrated by Zoetewei et al., who set out to score festination as a separate manifestation from other kinetic FOG episodes[28]. The study found that festination accounted for just 4.24% of the total %TF, resulting in a low inter-rater reliability of %TF for festinating FOG (ICC with 95% confidence intervals: 0.53 (−0.16, 0.86)) and suboptimal agreement for %TF of other kinetic FOG (0.81 (0.38, 0.95)). Given the low agreements, the authors decided to merge festinating FOG with kinetic FOG, which improved inter-rater reliability of %TF of all kinetic FOG to 0.93 (0.76, 0.98)[28]. Therefore, the working group consensus is to pragmatically include all

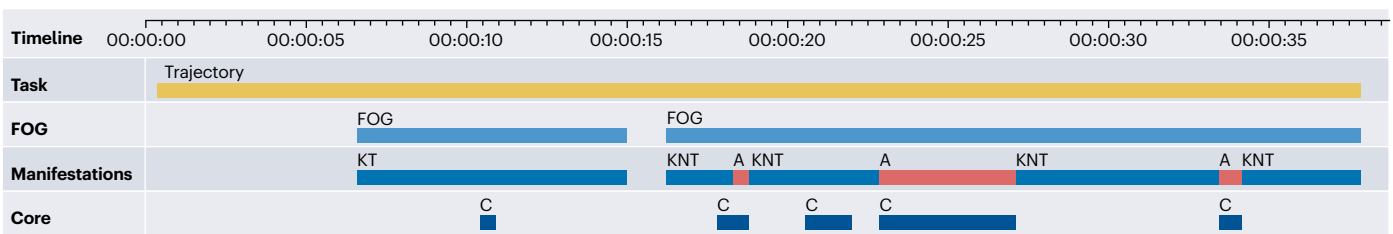

Fig. 2 | Freezing of gait annotation example. Example of annotations made for the total duration of two freezing of gait (FOG) episodes, the first with a single manifestation — kinetic-trembling (KT) — and a single core (C), and the second with two manifestations — kinetic-no-trembling (KNT) and akinetic (A) — and multiple cores. Note that akinetic FOG always coincides with a core, but a core does not always coincide with akinetic FOG.

Box 1 | Definitions of the three manifestations of freezing of gait

Akinetic
No clinically observable movements in the lower limbs.

Kinetic-trembling
Fast oscillatory movements observable in the lower limbs.

Kinetic-no-trembling
All other ineffective movements visible in the legs and feet that are not clearly trembling, including paroxysmal shuffling and festinating-freezing.

festinating-freezing as kinetic-no-trembling FOG to reach the highest level of consistency when scoring FOG from video.

Although examples of festinating-freezing exist (for example, Supplementary Video 9), the expectation is that this phenomenon is rare and will have limited impact on the scoring of FOG from video for most individuals. Therefore, the working group proposes the following FOG manifestations: akinetic FOG, kinetic-trembling FOG and kinetic-no-trembling FOG, as defined in Box 1 and illustrated in Supplementary Videos 4, 5 and 6. Taking all the above into consideration, a detailed account of the technical definition of FOG is presented in Box 2. Additional notes regarding this technical definition are shown in Box 3. Template files have also been created that incorporate the labels of the updated technical definition of FOG. These template files can be used in combination with the open-source ELAN annotation software (licensed under CC BY 4.0) and can be downloaded from the ICFOG website. See ref. 17 for guidelines on how to use the ELAN software for FOG annotation.

Classification of FOG or non-FOG in people with PD

The working group also reached consensus on the classification of of people with PD as FOG or non-FOG, while recognizing that the emergence and progressive interference of FOG in daily life might be best conceptualized as a continuum, rather than as having a discrete onset[31,40,41]. Evidence for this gradual emergence of FOG comes from a number of observations. First, the majority of people with PD will eventually experience some degree of FOG as the disease advances[42]. Second, FOG can be masked by pharmaceutical interventions[5]. Third, FOG-related gait impairments also seem to worsen gradually over time[31,41]. Fourth, longitudinal studies have indicated that several clinical and objective biomarkers together have predictive value for the conversion to FOG[43–45]. Last, for many individuals, the emergence and/or presence of mild FOG does not yet interfere with everyday ambulation and, thus, remains unnoticed[11].

Regardless of the insights above, for certain research and clinical purposes, there is still value in categorizing individuals into subgroups of those who, at the moment of evaluation, do or do not experience any degree of FOG[3]. The working group hereby presents a method to categorize people with FOG versus non-FOG, as well as assigning levels of certainty to this classification (Table 1). Given that self-reported outcomes can be biased by recollection errors[11,13], a classification on the sole basis of self-report provides the lowest level of certainty and receives the lowest classification level, referred to as level 1 (ref. 13). This coincides with the labels 'possible FOG' and 'possible non-FOG',

Box 2 | The International Consortium for Freezing of Gait technical definition for scoring FOG episodes from video recordings

A freezing of gait (FOG) episode
A period of paroxysmal inability to take an effective step towards the direction of attempted travel, which does not resemble the typical or quasi-normal step performance exhibited in the same individual when performing a similar gait task under similar conditions.

The FOG onset
The first moment that any part of the foot is lifted off the ground as part of the first ineffective step or the first moment when a visible, self-reported or objectively documented attempt to take a step is noted.

The FOG termination
The first moment that any part of the foot is lifted off the ground as part of the first of two steps that resemble typical or quasi-normal stepping performance in the same individual under similar task conditions or when there is no longer a visible, self-reported or objectively documented attempt to take a step. Termination of FOG on the basis of an absence of an attempt typically occurs at the end of the gait trajectory or following a near-fall event to regain balance control. A FOG episode also terminates at an actual fall; the end of the FOG episode in this circumstance is the first moment that any part of the foot leaves the ground, triggering the fall[34].

The FOG core
A period of the FOG episode from the first moment of cessation in foot progression until visible progression of the feet resumes in any horizontal direction. However, the steps taken after a core do not necessarily have to resemble typical or quasi-normal performance. When the individual is able to take two steps that resemble typical or quasi-normal performance, then the end of the core coincides with the end of the entire FOG episode. Thus, note that a single FOG episode can have zero, one or multiple cores.

The FOG manifestations
Manifestations are split into moments with (kinetic) or without (akinetic) clinically observable movement in the lower limbs. Kinetic freezing can present as fast oscillatory movements in the lower limbs (kinetic-trembling), or as any other ineffective movement visible in the lower limbs, including slow irregular oscillatory movements, paroxysmal shuffling with poor clearance of the feet, often with reduced step length, and festinating-freezing with an abnormally accelerated pace accompanied by a progressive increase in cadence and decrease in step length (kinetic-no-trembling).

Box 3 | Additional notes regarding the ICFOG technical definition for scoring FOG

- The intended use of the International Consortium for Freezing of Gait (ICFOG) technical definition is to consistently score freezing of gait (FOG) episodes from video recording on a frame-by-frame basis. The investigator is free to decide whether or not to annotate cores and manifestations, depending on the clinical or research interest.
- To end a FOG episode, the patient must take two 'effective' consecutive steps that resemble typical or quasi-normal step performance. Exactly what constitutes a typical or quasi-normal step for a particular individual is left to the opinion of an expert.
- A visible attempt is, for example, observable motion of body parts towards the direction of intended travel or visible anticipatory postural adjustments made to unload the stepping leg. Self-reported attempts can be verified by asking the patient after task completion whether or not they had attempted to step. Although a consensus or guideline on how to objectively document an attempt currently does not exist, in the future, verification might be possible with physiological and/or motion sensor data. Effort to ascertain whether movement was attempted is required to differentiate FOG from voluntary gait termination. Examples of voluntary stops include an individual stopping the attempt to step and subsequently giving up, or when an individual is distracted and stops walking to cope with the performance of a dual-task or commences a functional task in stance.
- Steps that align with a task requirement should not be scored as FOG unless they are considered to be ineffective and deviating from the typical behaviour of a patient under similar task conditions. For example, taking a shorter step in the transition from walking to turning is considered task-relevant and is, therefore, in line with the task requirement and should not necessarily be scored as FOG.
- FOG can be provoked or made worse by certain task requirements (for example, gait initiation, approaching a destination or turning), cognitive or limbic demands (for example, dual-tasking or balance threat), and environmental constraints (for example, a doorway), and it can be temporarily alleviated by compensatory strategies. The working group posits that for studies interested in FOG triggers and alleviators, the circumstance that the FOG episode was evoked or relieved by is best quantified by a customized label that explains the most probable reason for FOG to occur or subside at that moment.
- This technical definition applies only to FOG, not to freezing that occurs in other effectors, such as upper-limb freezing or freezing of speech.

as previously reported[3]. In line with the NFOGQ[9], when classifying on the basis of self-report, the working group recommends asking about the occurrence of FOG in the previous month. When determining the classification of FOG on the basis of clinical judgement or performance of a FOG-provoking protocol, the ground rule is that when any FOG episode is observed by the examiner, the patient can be classified into the 'definite FOG' subgroup, regardless of the level of certainty and whether or not this is accompanied by a negative self-report of the patient or caregiver[11]. Obviously, these categorizations apply to the period in which the assessments are performed and are intended to help enrich appropriate inclusion within future clinical trials and research studies.

Given that the presence or absence of levodopa can differentially influence the emergence of FOG between individuals[5,28,46,47], performing the walking tasks solely in the clinically defined ON state — approximately 1 h after usual dopaminergic medication intake — or practically defined OFF state — after >12 h of overnight withdrawal of dopaminergic medications — provides less classification certainty than undergoing the protocol in both medication states[15]. Thus, assessment in both OFF and ON states offers the highest level of certainty, referred to as level 3 classification. A level 3 classification also accommodates repetitive testing, which can increase the likelihood of eliciting FOG. Furthermore, for most individuals, FOG is worse in the OFF state than in the ON state[28]. Therefore, a single assessment in the practically defined OFF state would provide greater classification certainty (level 2B classification) than a single assessment performed in the practical ON state (level 2A classification). The order by which OFF or ON testing is performed is not considered important. However, testing in the morning after overnight (>12 h) levodopa withdrawal, or longer if possible for individuals on a dopamine receptor agonist, followed by a typical levodopa intake and incubation time is in most instances the most practical approach for cross-sectional diagnostic studies, allowing testing on the same day[15].

An individual with PD who does not self-report FOG and also does not show any FOG during the walking tasks can be allocated to either 'possible', 'probable' or 'definite' non-FOG subgroups, depending on whether the tasks were conducted solely in the ON state (possible), only in the OFF state (probable), or in both medication states (definite) (see Table 1). This distinction is made because of the likelihood that individuals who do not show FOG when ON might experience FOG when OFF. Moreover, individuals who do not show FOG in the OFF state might, in rare occasions, show FOG in the ON state. Evaluation of FOG in both OFF and ON states is the recommended practice[5], and given the high sensitivity of current gait protocols to elicit FOG[3,11,15], the likelihood that an individual who does not self-report FOG and also does not show any FOG during both assessments is in fact experiencing FOG at that time is slim. Hence, these individuals can be allocated to the definite non-FOG subgroup for the purpose of that study. An individual who reports experiencing FOG but shows no FOG during repeated testing in both medication states retains the possible FOG classification. Similar to the MDS-UPDRS part III, the examiner can rate what they observe during the task performance. However, the working group advises performance of post hoc video verification of the labels, preferably by a second examiner. Although an individual with definite FOG does not tend to revert to definite non-FOG, FOG can be temporarily alleviated by therapeutic interventions[5].

Classification of subtypes in PD with FOG

A previous study attempted to classify 41 individuals with PD who experienced FOG into further 'subtypes' based on cluster analyses of clinical and gait characteristics, such as anxiety-dominant, cognitive-dominant or motor-dominant FOG subtypes[48]. Although such attempts enhance our understanding of the complexities of FOG, that study revealed a high degree of overlap in features between subtypes. Moreover, the accuracy and replicability of subtyping is

Table 1 | Freezing of gait classification scheme

Certainty level	Measurement	FOG self-reported in past month?	FOG observed?	Classification label
1	Self-report only	No	NA	Possible non-FOG
		Yes		Possible FOG
2A	ON assessment	No	No	Possible non-FOG
		Yes	No	Possible FOG
		No	Yes	Definite FOG
		Yes	Yes	Definite FOG
2B	OFF assessment	No	No	Probable non-FOG
		Yes	No	Possible FOG
		No	Yes	Definite FOG
		Yes	Yes	Definite FOG
3	OFF+ON assessment	No	No	Definite non-FOG
		Yes	No	Possible FOG
		No	Yes	Definite FOG
		Yes	Yes	Definite FOG

The higher the certainty level, the higher the certainty of a correct classification. FOG, freezing of gait; NA, not applicable; OFF, practically defined OFF after >12 h of dopaminergic withdrawal; ON, clinically defined ON after intake of dopaminergic medications.

limited by the lack of a standardized classification protocol. As such, the working group concluded not to recommend further subtyping of people with PD who experience FOG, except for a classification on levodopa responsiveness.

People with FOG can respond differentially to dopaminergic medication intake. For most individuals, FOG severity evaluated from video recording is worse when dopaminergic medications are wearing off[2,15]. However, others will experience similar levels of FOG despite optimal pharmacotherapy[15,47]. Furthermore, in a limited number of individuals, FOG has been reported to only emerge or become worse with dopaminergic intake[46], and FOG can affect people with de novo PD[49,50]. Several classification methodologies and labels have been applied in the literature to help characterize these FOG subtypes (for example, ON, OFF, ON–OFF, pseudo-ON and untreated), but to date, there is no consensus. The working group came to the consensus that for a pragmatic classification of dopamine responsiveness, further studies are required, using the newly proposed clinical and technical definitions of FOG in combination with a standardized dopamine challenge protocol as was proposed in 2025 (ref. 5).

Conclusions

Although inter-rater variability cannot be fully eliminated, the proposed definitions represent substantial advancement towards standardization of FOG assessment. This standardization is critically needed to enhance consistency, support the development of targeted interventions, and ultimately improve clinical outcomes for individuals affected by FOG. The current framework is based on consensus between clinical and research experts and has gone through a thorough process of observational analysis of FOG using many heterogeneous FOG videos. It is clear that the field requires both a practical definition of FOG that can be adopted in everyday clinical practice, as well as a more detailed, technical definition to support the precise annotation of video-recorded data. The latter is essential for applications in both discovery science and clinical trial settings, with flexibility to select the outcomes of interest, such as FOG core or manifestations, depending on the specific context of use.

As a next step, the ICFOG is developing a training and certification programme on how to assess FOG from video recordings using the new technical definition with the aim of ensuring consistency across ratings. Currently, studies are also ongoing to develop new clinical, patient-reported and fully objective outcomes of FOG that can now be validated against a unified gold-standard outcome using the updated definition (for example, NCT06519279). We predict that by reducing uncertainties when scoring FOG from video, this standardization will result in faster scoring times and improved inter-rater reliability to a degree that a second human rater might no longer be required.

These proposals and the psychometric properties of the updated definitions now need to be evaluated in future prospective studies on PD and other patient populations affected by FOG. Until further evidence is provided, the working group recommends considering the presence of FOG for eligibility and the %TF as the primary outcome in clinical and research trials, with the core and manifestations of FOG as secondary optional outcomes of interest. Although the classification system presented in Table 1 is evidence-based, future external validation is warranted. Moreover, as our understanding of the neurophysiology and phenomenology of FOG continues to grow, revision of our current conceptual frameworks that still rely on expert human interpretation could become necessary. However, we project that the current unified definition will lead to improved outcomes for people affected by this devastating symptom.

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All authors were involved in conceptualizing the article. M.G. curated the data. M.G. and J.N. conducted the investigation. M.G., J.N. and S.A.F. were responsible for project administration. N.G., B.R.B., A.N., A.F. and S.J.G.L. supervised the work. M.G. was responsible for visualization and wrote the original draft. All authors reviewed and/or edited the manuscript before submission.

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