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ABSTRACT

Purpose: This study sought to characterize the way patients with Parkinson’s disease consciously perceive and respond to their surroundings while walking in everyday situations.

Method: A qualitative research program designed around an ecological data collection protocol was employed. A convenience sample of 14 patients with a diagnosis of Parkinson’s disease and a history of gait difficulties were recruited. Details regarding patients’ subjective experience of walking in everyday environments were obtained using first person interviewing techniques with the support of video footage from their daily-life activity. Interview transcripts were analyzed using an interpretive phenomenological approach in order to derive key themes.

Results: The sense of proximity and the way in which an individual perceived themselves with respect to their surroundings appeared central to the way patients organized their locomotor behavior. Further to this, the patient relationship to different features and obstacles appeared conditioned by prior experiences in those circumstances. Patients described managing gait difficulties by consciously regulating their walking trajectory and gaze with respect to their environment.

Conclusion: Perceptual challenges, visual flow and the dynamic valence of features in the patient’s surroundings may have important effects upon the gait stability of patients with Parkinson’s disease and warrant further attention in planning rehabilitation interventions.

Implications for rehabilitation

- Walking abilities of patients with Parkinson’s disease should be conceptualized in terms of perceptuomotor coupling to a given environment.
- The functional significance of a patient’s environment is dynamic and might be seen to vary in accordance with their physical capacities.
- Valency, or the subjective relationship between a patient and their surrounds, appears to be an important component of the “fit” between a person and their environment.
- Novel rehabilitation strategies for the management of parkinsonian gait disturbances might seek to integrate psychological, sensorimotor and environmental elements in order to have individually tailored, ecologically valid home assessment and community rehabilitation programs.

KEYWORDS Parkinson’s disease; gait; phenomenological analysis; ecological; valence; qualitative; environment

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Introduction

The walking abilities of people with Parkinson's disease (PD) fluctuate and specific disturbances, such as freezing of gait, have been found to affect the majority of patients [1–3]. Locomotor dysfunction often occurs in the context of daily-life activities, thus leading to a loss of independence and impaired quality of life [3,4]. At this point in time, the precise mechanisms responsible for such episodic walking difficulties remain poorly understood [3,5]. Furthermore, the gait and postural instability problems experienced by patients with PD prove resistant to current surgical and pharmaceutical interventions [6]. Physical rehabilitation and gait retraining programs thus remain a central element in PD patient care. But while numerous approaches to PD gait management have been explored, no consensus regarding an optimal approach to the locomotor rehabilitation of patients with PD exists [7]. Broadly speaking, contemporary rehabilitation interventions result in short-term gains in gait and postural abilities (e.g., walking speed, motor performance testing) with a limited overall effect on the incidence of falls or patient quality of life [8]. A growing body of neurorehabilitation literature underscores the importance of context-specific training, taking into account the patient activity within their natural environment [9–11].

At the same time, recent qualitative studies demonstrate that PD patients themselves identify environmental factors as a principal barrier to their walking abilities – an issue which has been dubbed the "walking-in" problem [12,13]. But in order to appreciate how PD gait problems emerge or tailor ecologically valid rehabilitation programs, ongoing work is required to delineate these relationships between PD patients and their surroundings.

Given their episodic and context-sensitive nature, PD gait problems prove difficult to assess in hospital and laboratory settings [3,14]. Ambulatory monitoring systems do provide the possibility of evaluating gait parameters during daily-life activity. Still, these measures are not capable of deciphering the perceptions, emotions or thought processes which determine the way a person behaves in a given circumstance. The aim of the present study was to identify factors which characterize the way PD patients perceive their gait abilities and consciously engage with their environment when walking in everyday environments. In doing so, it sought to consider PD gait as an embodied and situated activity [15].

Methods

Study design

An ecological study design was used in order to examine the patient experience of walking with respect to their course of action [16]. An interpretive phenomenological approach was employed through this research [17]. This implies the use of first person accounts to analyze people's perspectives of events, processes and activities in which they participate. Emphasis is placed on how people experienced their "lived body" and "being in the world" [18]. In particular, phenomenological interviewing techniques may provide a "granularity" that is not possible with other research methods. As such, they may be used to identify specific micro-actions involved in choice processes occurring in limited time frames [19]. This type of approach has proven to be an effective means for "making sense" of people's experience with complex health conditions. It may thus be valuable for generating research hypotheses, generating new knowledge and developing therapeutic strategies [20–24].

Participants

Patients were recruited from the outpatient neurology service of the Salpêtrière Hospital in Paris, France. Inclusion criteria were as follows: (1) aged between 18 and 70 years; (2) confirmed diagnosis of PD for more than 5 years; and (3) motor fluctuations, postural instability, and/or gait disturbances challenging functional mobility. Contraindications

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Supplemental data for this article can be accessed here.

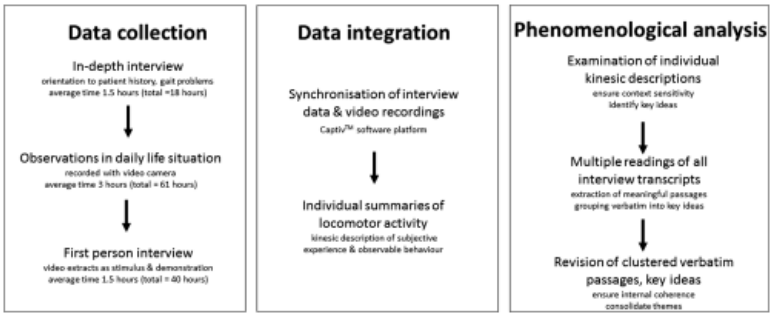
for participation were as follows: (1) cognitive dysfunction with a Mini-Mental State Examination score under 24; (2) unstable psychiatric pathology; or (3) other medical problems causing potential risk during the protocol (e.g., recent trauma, orthopedic, or cardiorespiratory complications). A detailed clinical evaluation was carried out by an experienced neurologist to verify selection criteria prior to inclusion to the study. In total, 14 PD patients (11 male, 3 female) participated. The mean age was 61 years (range 29–69 years). All were identified as having freezing of gait. Clinical characteristics are provided in Supplementary Table S1. This study was approved by the local ethics committee. Patients provided written consent prior to commencement.

Data collection

Data collection consisted of three stages. First, in-depth interviews [25] were conducted to understand each patient's experience of living with PD and identify situations which provoked gait disturbances. Each was structured around a predefined series of questions elaborated in a previous methodological study of human gait in real-life situations [26]. Typical duration was 1 h (total = 18 h). Second, researchers met with patients in their homes, following them for up to 4 h. Where possible, this included observations during situations identified as challenging to patient gait (e.g., meal preparation, cleaning, going to the supermarket). During this time, each person instructed to use walking aids as and when they were appropriate. Patient activity was filmed using a digital action camera. For patients 1–8, this process was carried out on two occasions, at a 6-month interval (i.e., there were 22 observations carried out with the 14 patients recruited). Total recorded observation time was 61 h. Finally, researchers presented patients with video sequences of walking situations from the day of observations. This included walking at different stages of the medication cycle, through different environments, and during notable gait events (e.g., freezing of gait). Using first person interviewing techniques, non-inductive questions assisted to gain detail regarding patient subjective experience through these situations and how they adjusted their gait in that environment. This method permits a researcher to gain perspective regarding an individual's conscious and pre-reflective activity [16,27]. The average duration for first person interviews was 1 h 30 min (total = 41 h). The Supplementary Interview Guide S1 and Supplementary Interview Guide S2 provide examples of the leading questions for the in-depth interview and a list of sample questions used as part of the first person interviewing methodology.

All interviews were transcribed verbatim (Supplementary Interview S1 and Supplementary Interview S2 for examples). Patient commentary was synchronized with video observations using Captiv™ software (TEA Ergonomics, Vandoeuvre, France). Activity summaries using kinesic descriptions [28] and the accompanying subjective experience were generated for each participant (example provided in Supplementary Material S1). Figure 1 presents an overview of the study design.

Figure 1. Study design for analysis of patient experience of walking in everyday environments. Data collection was conducted over three separate stages involving two interviews and observations during daily-life activity. In the data integration phase, patient commentary was synchronized with video data to support concurrent analysis of patient subjective experience and observable locomotor behavior. A method of phenomenological reduction was used to extract meaningful themes relative to the patients' conscious experience of walking in everyday environments.



Data analysis

Using an interpretative phenomenological approach, data reduction commenced by revising patient activity summaries to examine specific behaviors and experiences. Focus was placed primarily on subjective accounts from kinesic

descriptions, and secondly on the broader elements of the situation (e.g., medication effects, layout of physical environment). Parallel notes were made to generate a provisional list of key ideas relative to patients' perspectives of walking in these situations. Next, individual transcripts were scrutinized through multiple readings to generate a comprehensive understanding of patient discourse within the context of each situation. Details which appeared particularly meaningful were identified and cross-referenced with key ideas. In doing so, each key idea was progressively modified/expanded and important verbatim passages from patient accounts were clustered. Each cluster was examined to ensure internal coherence and verify that sufficient data were present to support interpretation. This iterative process was carried out in an ongoing manner through the data collection process to a point where theoretical saturation was reached and no further insights were forthcoming. The final set of themes was derived as the content for each cluster was stabilized. All stages of the qualitative analysis were conducted by the first author, an experienced occupational therapist with a doctorate in cognitive science.

Results

Five themes emerged as characteristic of the patient relationship to their environment during walking (Figure 2). Of these, sensing the space between one's self and the surroundings appeared most crucial. Four other themes presented as being an extension of this central concern. Thus, while the five themes are presented separately in this section, all comprise interrelated elements. Table 1 provides a summary of the key points for each theme while Supplementary Material S2 provides further examples of patient verbatim.

Figure 2. Themes characterizing patient walking experience in everyday environments. Using interpretive phenomenological analysis, five contiguous themes were identified as characteristic of PD patient experience of walking in everyday environments. "Sense of proximity" was found to be the central theme of patient discourse.

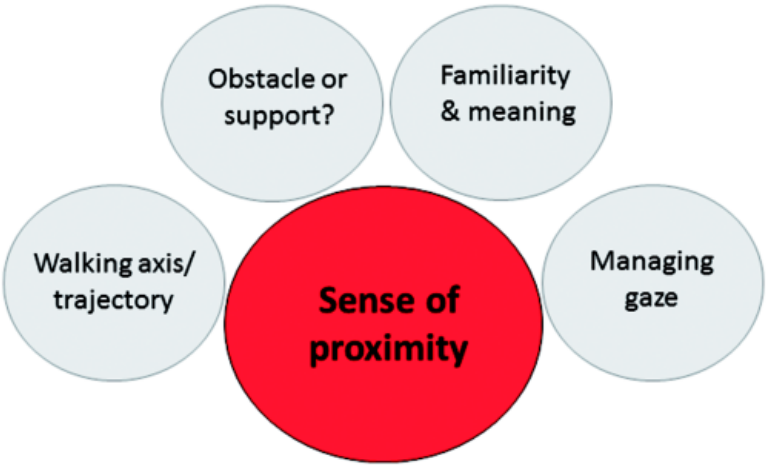


Table 1. Summary of key points for factors characterizing patient experience of walking in daily-life environments.Table Layout

Theme	Key points from patient experience
Altered sense of proximity	• Heightened sensitivity to distance between self and features in environment • Congested environments brought about sensations of being "uncomfortable," "jammed up," or "suffocated" • Walking in confined spaces associated with involuntary reduction in step length, walking speed

Theme	Key points from patient experience
Managing the walking trajectory	• Tendency to manage heading with respect to open or "neutral" space • Difficulty coordinating movement when turning, walking no longer "instinctive," causes "dragging" of leg or "shuffling" • Awareness of "perimeter" or "boundary" around obstacles, seek to accommodate for this • Difficulty to adjust gait to rapid change in disposition of features in surroundings
Surroundings as both obstacle and support	• Potential obstructions to walking may be perceived as aids during blockade or loss of stability • Change in perceived stability influences heading to enable access to surroundings in case of balance loss (furniture walking)
Familiarity and meaning in the environment	• Familiarity with environment may generate "schemas" assisting to organize movement in those surroundings • Unfamiliar situations induce "apprehension" and affect heading • Prior negative experience in a situation may lead to increased apprehension, avoidance, or exacerbation of walking problems, some attempts to counter with conscious relaxation
Intentional gaze control when walking	• Problems to appreciate distance • Increased attention to focus on intended walking path • Conscious efforts to "block out" features in the surroundings

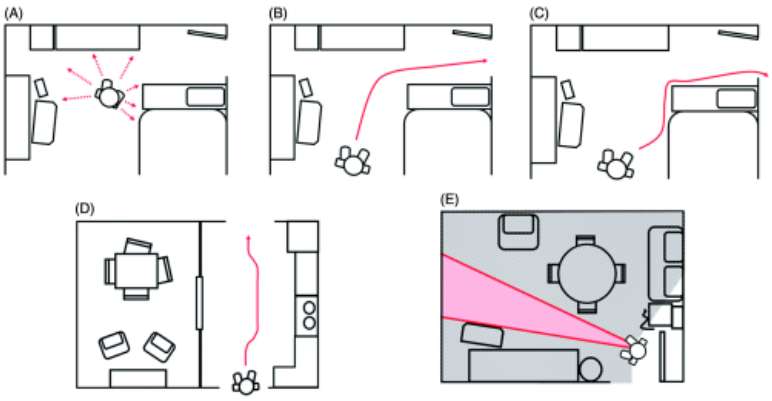
Altered sense of proximity

The distance between the person and their physical surroundings was a principal focus of attention when describing walking activity. Patients generally associated walking well with open spaces. Conversely, indoor environments or places "lacking in volume" were associated with smaller step length (e.g., patients 5, 7, 9, 11, 13, and 14). Nine patients (1, 4, 5, 7, 8, 9, 11, 12, and 14) attributed freezing of gait to having less space when passing through doorways. As an example, patient 11 was observed to have particular difficulty when moving in his bathroom and kitchen. In one instance, he noted being unable to turn as desired and walked backwards to leave the room.

> Wherever it's encumbered, it's more difficult. As soon as I cross a doorway, I start to shuffle with tiny little steps. (patient 4)
>
> I'm jammed up beside the sink. I need to get out. But I have to reverse to get space to turn. When I walk to the door, there's no straight path ahead. It's a wall straight away. It bothers me. I have to walk between two solid things. (patient 11)

This increased awareness to the proximity of elements in the environment appeared particularly marked for six patients (4, 5, 7, 8, 11, and 12), as if the presence of features in their surroundings imposed upon their ability to move (Figure 3(A)). Patient 12 stated feeling "uncomfortable" when in "tight" spaces. Patient 4 associated being in small, congested environments with a sense of being "constrained." For patient 5, who lived in a small inner city apartment, the impact of her immediate surroundings appeared overwhelming. She described a sense of being "suffocated" as she moved within this space.

Figure 3. Demonstrative examples for themes characterizing patient walking experience. (A) “Altered sense of proximity”: patients described altered perception and increased sensitivity to the distance between themselves and obstacles around them during locomotion. (B) “Managing the walking axis”: patients described habitually adjusting walking trajectory to accommodate for obstacles, being particularly conscious of the perimeter around features encountered along their paths. (C) “Surroundings as both obstacle and support”: if feeling particularly unstable, patients described altering their walking trajectory. This often involved approaching features in their surroundings which may have previously been perceived as barriers to their safe passage. Under these circumstances, certain objects were perceived as potential balance aids. (D) “Familiarity and meaning in the environment”: prior experience in certain environments was noted to affect walking behaviors. For example, prior falls at a particular doorway might lead to conscious/subconscious adjustments of walking paths or intentional avoidance. (E) “Intentional gaze control when walking”: patients reported focusing visual attention on intended walking paths while blocking out other visual stimulus. Key: arrows with dashed lines represent perception of distance between patient and surroundings; solid arrows indicate walking trajectories; light shaded region indicates region of focused visual attention; and dark shaded region indicates area which patient attempts to block out.



> It’s a question of space. Inside I walk one way, outside another way. Straight away I feel different. It’s incredible, I’m more at ease. Inside I feel suffocated. I have too many things. I feel completely suffocated here. (patient 5)

Managing the walking trajectory

Navigating around features in an environment was a prominent concern for this cohort. Whereas spaces like corridors were identified as conducive to walking well, rooms with furniture were perceived as challenging. Patient 5 used the term “neutral” to describe the space in the corridor compared to that of her apartment. Six patients frequently used the term “obstacle” when describing walking in daily environments (patients 1, 3, 9, 11, 13, and 14). For example, patient 1 reported feeling unstable when walking through his living room. He found moving about an “angle” and “passing between” chairs and plants particularly challenging. Patients regularly described managing their walking paths to provide sufficient berth for different obstacles (Figure 3(B)), concerned that being too close would cause them to stop walking. Turning while walking appeared a problem globally for these patients. Many (patients 1, 5, 7, 8, 9, 11, 12, and 13) identified specific changes to their gait patterns upon turns. For example, patient 13 felt “limited support” from her leg when turning, stating that she needed to “shuffle” to “compensate.”

> When I’m around a chair, it’s like the whole perimeter is difficult. I look exactly where I’m going. I need to position myself on the right axis and stick to it. (patient 7)

> I drag the leg but not all the time. When I turn, walking is no longer instinctive. I need to control it, I need to give the orders. (patient 12)

Environments with moving features were cited as stressful by six patients (patient 1, 5, 8, 9, 12, and 14). Responding to these ongoing changes was invariably linked to a breakdown of the gait pattern. Walking across the street (patients 6, 8, 9, and 14), along a pedestrian footpath (patients 5, 6, 8, 9, 12, 13, and 14) or among people at supermarkets (patients 1, 3, 8, 9, 10, and 12) were observed to provoke walking difficulties and patients often needed to stop walking and recommence.

> Sometimes in the supermarket, I've got everything under control and then someone barges up beside me. That stops me completely. I have to start over. (patient 8)

Surroundings as both obstacle and support

Features of the surroundings were not, however, considered obstacles under all situations. Patients identified how objects were sometimes co-opted in order to facilitate walking. Hence, certain factors were found to have paradoxical effects according to the circumstance. Patient 5, for instance, felt that while furniture in her bedroom often hampered her movement, it also served as a support when she felt unsteady (Figure 3(C)). In another situation, she noted "unconsciously" moving toward the wall of a corridor, a precautionary measure when sensing a fall was imminent. Similarly, while patients identified fixtures in their surroundings (walls, beds, tables) as causes of motor blockades, they also sought them for stability and thus assist them to walk. For example, patient 9 noted how, when passing a doorway, his feet did not move forward a sufficient distance and sensed a risk of falling. He reported reaching forward onto the frame of the doorway to free up his leg. Similar events were observed for patients 1, 11, 13, and 14.

> I'm too close to the bed and I can't get my left leg to move. It's a loss of balance—but not a real one. When I fall forward towards the bed, I can turn using it as a support. It's that movement which helps me get my leg in front. (patient 13)

Familiarity and meaning in the environment

Familiarity with the surroundings also appeared important to patient gait. Being at home, for instance, tended to reassure patients. Several described "knowing how to move" in their own homes (patients 3, 5, 7, 8, 9, 12, and 14).

> When I'm at home I have schemas. I know the stool is there, the chair is there. I know where to place my feet and where to put my hands. I know positions which can make me more comfortable. (patient 5)

Unfamiliar environments, however, were typically associated with feelings of apprehension.

> Here I see the drainpipe painted red. It distracts me from my path. I don't know why. It seems like nothing but if it's something unusual, it can perturb me. (patient 5)

The "meaning" of an environment also seemed to influence walking abilities. Prior negative experiences appeared to have lasting effects on motor behavior. Patient 14 spoke of "bad memories" from certain places in his home (doorways, staircases). He described increased caution and even avoidance behaviors around these areas (Figure 3(D)). Similarly, patient 7 reported regular falls along a pathway in his garden. He believed this was now "psychological" in nature. Others found recognizing problematic situations in itself evoked apprehension and thus exacerbated gait dysfunction.

> I find myself in situations I've already lived. I remember having problems and that makes me afraid. I tell myself, 'look out', 'don't freeze'—and then it happens. I bring it upon myself. If I don't think about it, sometimes I walk better. (patient 9)

> I become apprehensive when I see the door. My legs go weak, it's a sense of fear. I know it's unreasonable. (patient 8)

Interestingly, both patients 8 and 9 reported intentionally trying to use relaxation strategies to diminish the effects of apprehension in complex walking situations.

> I tell myself 'wooooooo, breath, need to relax', then I can go. (patient 9)

> When I freeze at the door, I try to think 'zen', I try to relax myself. Just for a second. And then I try to set off again. (patient 8)

Intentional gaze control when walking

Six patients highlighted the importance of vision on their walking abilities (patients 5, 7, 8, 9, 12, and 14). Patient 14 was particularly concerned about his ability to appreciate distances, conscious of where he was in relation to other people and obstacles. He described feeling a constant risk of "bumping into things" located within the "boundary" he sensed around him. Several patients reported focusing visual attention on their feet as they walked to improve gait control (patients 1, 5, 7, 8, 9, and 14).

> I look where I want to go and I then I set off. Once I'm moving I watch my feet. My eyes are always on my feet. (patient 7)

Furthermore, patients also spoke of trying to "block out" certain features in the environment (Figure 3(E)). Patient 8 referred to this as "abstraction." He gave the example of passing through doorways or narrow passages, and the need to "look straight in front" then "force" his way though. Patient 12 likened this to being in a car – he was aware of certain features, similar to the way he observed "road signs" but otherwise tried to "eliminate the surroundings."

> I look straight in front. I try to make an abstraction, to forget what's around. (patient 8)

> It's like you were in a car. You look at the road signs and then at the road. Everything else disappears. You block it out. (patient 12)

Discussion

This study has detailed how PD patients experience walking in complex daily environments. Patients described a heightened awareness of their walking with respect to the layout of the environment. Their walking abilities appeared further conditioned by fluctuations in their physical state and prior experience of the present circumstances. Several reported regulating their gaze in order to improve gait stability. These findings provide insight into how PD patients organize their locomotor behavior in complex situations and may thus serve to inform ecologically valid rehabilitation strategies.

The patient preference for walking in open spaces echoes sentiments described in earlier studies [12,13]. Further to this, the apparent "altered sense of proximity" reflects research findings where PD patients have exhibited visuoperceptual problems including issues with judging size/shape [29], distances to a target [30], and changes to the egocentric reference frame (i.e., midline perception) [31]. The reported problems of reduced gait speed and stride length in congested spaces are consistent with clinical observations and may correspond with what is sometimes referred to as "tight quarters hesitation" [2,14].

The theme of "managing walking trajectory" evoked here is further supported by accounts from previous reports where PD patients talked of trying to stay "on the straight and narrow" [13] or to "get a straight run" [12] when walking indoors. The specific problem of gait stability on turning has already been the subject of several studies. For example, step time variability of PD patients is observed to change in proportion to the angle of the turn [32]. The results of the present study signal how PD patients actively attend to desired trajectories during everyday walking, regularly selecting paths that provide sufficient berth for obstacles. Used in an efficient manner, this strategy might serve first to limit proximity effects, and second, reduce the acuity of turning angles.

The adjustment of walking trajectories as described by patients appears consistent with basic principles of visually guided locomotion. As we move about, the relative motion between a person and generates patterns of apparent motion of the objects in our surroundings, a phenomenon which is known as visual flow [33] AQ3. In effect, approaching an obstacle results in the increased speed of visual flow. Heading direction (orientation of the body for the purposes of locomotion) may thus be managed by equating the speed of visual flow in the lateral portions of the visual field, and this basic form of perceptuomotor coupling appears to be a key factor in human locomotion [34]. Under experimental conditions, PD patients prove to be highly sensitive to variations in visual flow, provoking measurable deviations to their gait trajectory [35]. As an extension to this, we posit that in real-life situations, changes to visual flow, consequent to the proximity effects described in the present study, may modulate PD patient gait parameters (i.e., speed, cadence) and guide their walking trajectory.

Importantly though, patients identified that the tendency to maintain walking trajectories by regulating their distance from obstacles was at times, controverted. When walking abilities were diminished, patients acknowledged seeking out features in their surroundings to support walking. The theme "surroundings as both obstacle and support" encapsulated this dichotomy. It conveys how the functional significance of the environment changes according to walking ability. In addition, patients found that previous experience under given circumstances conditioned their locomotor behavior such that "schemas" for moving through a familiar environment could facilitate walking while negative associations (prior freezing, falls) could invoke gait dysfunction. The "familiarity and meaning of the environment" may thus be an important mediator of gait stability.

While facilitators, barriers and strategies used by PD patients in everyday walking have been considered in the literature [12,13], this variability in the subjective relationship to the environment has received limited previous attention. In psychology, the way in which a person is attracted or repelled by an object or situation is referred to as valence [36]. Pleasantness and goal conduciveness are generally associated with positive valence while the contrary implies negative valence. Valency has proven a useful concept for predicting emotion and action tendencies in complex scenarios [36]. Following this idea, recent studies demonstrate that the presentation of emotionally charged images influences postural and locomotor performance. People move toward positive visual stimuli while aversive images may diminish step length and velocity [37,38]. This paradigm was recently used to modulate anticipatory postural adjustments and gait initiation in PD [39]. Building upon the observations of the present study, the subjective meaning that patients associate with different features in their environment might thus be seen to "attract" or "repel" patients. As such, the shifting valence of patient surroundings may be an important factor in shaping their locomotor behavior.

The way in which patients described "controlling gaze when walking" might reflect several factors. Concerns of "bumping into things" suggest an awareness of visuospatial processing problems, a known factor associated with PD gait dysfunction [40]. Similarly, the conscious attention to foot placement described by patients of this study might be seen as a means of compensating for issues with working memory or motor planning and limit the effect of distractions along a pathway [41]. While several prior papers suggest that changes to visual sampling during PD gait are primarily due to pathological dysfunction [42,43], findings from this phenomenological research suggest these modification are, at least in certain instances, highly regulated through voluntary motor control.

In conclusion, the results of the present study suggest that the emergence of PD gait difficulties was characterized most notably by issues of perceptuomotor coupling and the variable meaning attributed to environmental features. This perspective provides a certain contrast to recent models of understanding PD gait disturbance which have tended to focus upon the breakdown of automaticity and cognitive control mechanisms [44,45]. Nonetheless, as we have outlined through this discussion, the themes derived from the phenomenological accounts of this PD patient cohort appear somewhat consistent with certain psychological and neurophysiological findings from experimental studies. We would thus venture that these principles may serve to inform frameworks for scientifically driven, ecologically valid rehabilitation programs. Greater attention to the perceptuomotor coupling and valence in the patient environment may assist to consolidate long-term positive effects of rehabilitation as opposed to the short-term effects that are observed with principally exercise-based programs.

In particular, the apparent perceptual challenges experienced in real-life situations indicate the need for future research on the effects of specific visuospatial retraining and the implementation of compensatory visual behavioral strategies on PD gait stability. Also, while home assessments already represent a key tool in patient care planning, the results of this study may have important implications for the clinical reasoning of therapists during such evaluations [46,47]. The observation that the functional significance of features in the environment varied according to a patient's physical state highlights how the "environmental fit" between the patient and their home must be considered as a dynamic relationship. For example, detailed analysis of the way a patient moves through space and their conscious experience of this process has indeed provided interesting insights in the present report and may be adapted for clinical evaluation purposes. Ways of exploiting visual flow concepts might also be considered in adapting patient environments. For example, the effect of splay angles, textures, and other visual features could potentially be exploited [34]. Similarly, the interest of mindfulness-based techniques has recently been proposed as an adjunct to the management of PD [48,49]. Used in combination with gait retraining, working directly upon a patient's conscious experience and perception of their environment may assist to negate certain emotionally driven valency effects upon PD patient motor control.

We propose that the systematic manner in which the ecological data collection and phenomenological analysis were carried out constitutes the main strength of this article. Nonetheless, the interpretive phenomenological approach used in the analysis of patient discourse also entails certain limitations. The method itself implies that the researchers' own experience and preconceptions determine, at least in some respects, the course of the interview and analysis phases [20]. Findings of interpretive phenomenological analysis should thus be considered as indicative rather than absolute. Also, while the inductive research program used in this study proves valuable in the development of theoretical models and research hypotheses, further experimental and clinical research will be needed in order to consolidate evidence-based methods specifically focused upon exploiting perceptuomotor coupling strategies in the rehabilitation of parkinsonian gait disorders.

Disclosure statement

The authors report no conflicts of interest for the work undertaken as part of this research.

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