Supplementary Material

A Patient-Centered Conceptual Model of Symptoms and Their Impact in Early Parkinson's Disease: A Qualitative Study

Supplementary Table 1. Clinical expert feedback and rationale for modifications to final conceptual model

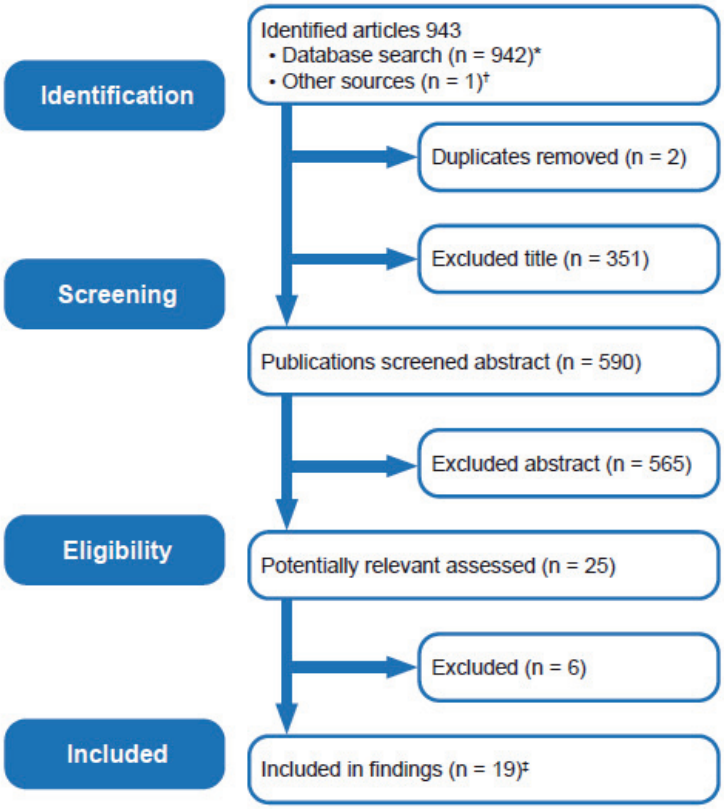
Feedback/suggestion	Action taken	Rationale for action taken
Motor Symptoms		
Move "excess saliva/drooling" to "motor symptoms" domain.	Concept moved to motor domain.	It was agreed that this is primarily caused by decreased facial muscle movement and is better characterized as motor in the model.
Move "postural issues" to "motor symptoms" domain.	"Postural issues" moved to motor domain.	It was agreed that clinically, postural symptoms are motor symptoms. Further, this concept was refined to focus on aspects of stooped posture, bending forward etc. in order to separate it from postural instability, which is now fully captured under poor balance.
Reconceptualize "balance" as "poor balance" to distinguish between "loss of balance" and "loss of coordination" as well as better describe it using participant language.	"Poor balance" was created in the motor domain.	A loss of balance and postural instability are better captured by "poor balance" and refer to patients having difficulty finding their center of gravity and experiencing instability when in movement. This differs from "postural issues", which refers more to being stooped or having a bent-over posture and can occur when movement is not occurring (i.e. when sitting). Thus, separation of these concepts was agreed. Additionally, to more accurately capture loss of balance issues, it was agreed that "loss of coordination and balance" should be separated, and hence the "poor balance" concept was created.
Move "changes in voice" to "motor symptoms" domain.	Concept moved to motor domain.	It was agreed that changes in voice are a result of muscle function.
Remove "coordination" as it may be too ambiguous a term.	None – concept refers only to "loss of coordination" in final model as "poor balance" has been separated as a standalone concept.	It was agreed to retain this concept since participants in this study described loss of coordination of their hands, feet, and body in general as an important area of concern and a symptom that many experience early in the disease.
Reconceptualize "involuntary movements" as US and European patients may interpret this to reflect different kinds of symptoms and problems.	None.	It was agreed to retain this concept since both US and European participants in this study described "jerking" (n=3), "swaying" (n=2), "twitching" (n=2), and "jumping" (n=1), which are considered well captured by the concept.
Remove "freezing of gait" as it is not a symptom of early-stage PD.	Concept removed from model.	It was agreed to remove this concept as clinically it is a symptom most often associated with later stages of the illness. In this study, only four participants reported it, and all of these were in the US.

Remove "uncontrollable muscle contractions".	Concept removed from the model.	It was agreed that "uncontrollable muscle contractions" is adequately captured under "rigidity/stiffness" or "involuntary movements", as suggested by the clinical experts, and thus not necessary for the model as a separate concept.
Reconceptualize "speech and language difficulties" into two concepts: "speech difficulties" – motor and "language difficulties" non-motor – cognitive.	"Speech and language difficulties" was split into two concepts: "speech difficulties" (motor symptoms) and "language difficulties", placed in the non-motor – cognitive symptoms domain.	It was agreed that "speech difficulties" is a motor function and as such was moved to this domain to more accurately reflect this.
Non-motor symptoms		
Reconceptualize "sleep disturbances" as "sleep behavior disorders" to better characterize it and distinguish it from insomnia-related issues.	Concept renamed "sleep behavior disorders"	It was agreed that "insomnia" captures the inability to fall asleep and difficulty staying asleep at night. Therefore, it was agreed that "sleep disturbances" does not adequately capture different sleep experiences. The term "sleep behavior disorders", as suggested by the experts, was felt to incorporate REM sleep behavior disorder, nightmares, and sleep walking, which are clinically important symptoms of early-stage PD.
Reconceptualize "fatigue" as distinct from daytime sleepiness or overall tiredness, for example "peripheral fatigue".	None.	It was agreed that, since the majority of clinical experts felt that "fatigue" as currently conceptualized was adequate, and study participants used this term to describe an experience distinct from general sleepiness/tiredness, the concept should be retained as is. Moreover, the term "peripheral fatigue" is vague and unlikely to be consistently understood by patients.
Reconceptualize "vision problems" to include diplopia (double vision).	None.	It was agreed that, while double vision is a clinically relevant symptom, only one participant reported it in this study. Additionally, final feedback from the clinical experts noted that, because double vision is just one of the vision issues (there are many others including color vision issues, sensitivity to light etc.), this concept name should be left as is.
Split "speech and language difficulties" into two concepts: 1: "speech difficulties" and 2: "language difficulties" and put language in the non-motor	"Speech and language difficulties" was split into two concepts; one of these, language difficulties, was moved to the non-motor – cognitive symptom domain	It was agreed that these two categories better reflect the ways in which speech and language were described by participants. Further, "language difficulties" as a concept in the cognitive domain captures the difficulty finding words and phrases described by participants in this study.

symptoms – cognitive domain category.	(the other, speech difficulties, to the motor symptoms domain).	
Conceptualize "dizziness" as a unique concept alongside "feeling lightheaded" and attribute both to "standing".	A new non-motor concept "feeling dizzy or light-headed on standing" was created in the non-motor domain.	Since eight participants reported feeling dizzy/lightheaded, it was agreed that it should be more clearly delineated in the model.
Impacts – emotional and psychological		
Reconceptualize "anxiety and fear" as separate concepts: "anxiety" as a symptom and "fear of the future."	Concept separated into "fear of the future" and "anxiety". Both retained as impact concepts.	It was agreed to separate these concepts to better differentiate between them; participants in this study overwhelmingly (n=18) described a fear of the future. However, both concepts are retained as impacts in the final model. In this study, participants described anxiety as an emotional consequence of PD and its symptoms, therefore it remains as an impact.
Remove "annoyance and bother" from the final model as they are vague concepts.	Concept removed from final model.	It was agreed to exclude this impact on the basis that three participants described a general sense of annoyance about PD, and all other mentions of feeling annoyed or bothered were in the context of other highly related impacts.

PD, Parkinson's disease; REM, rapid eye movement.

Supplementary Figure 1. Published literature review search Prisma diagram



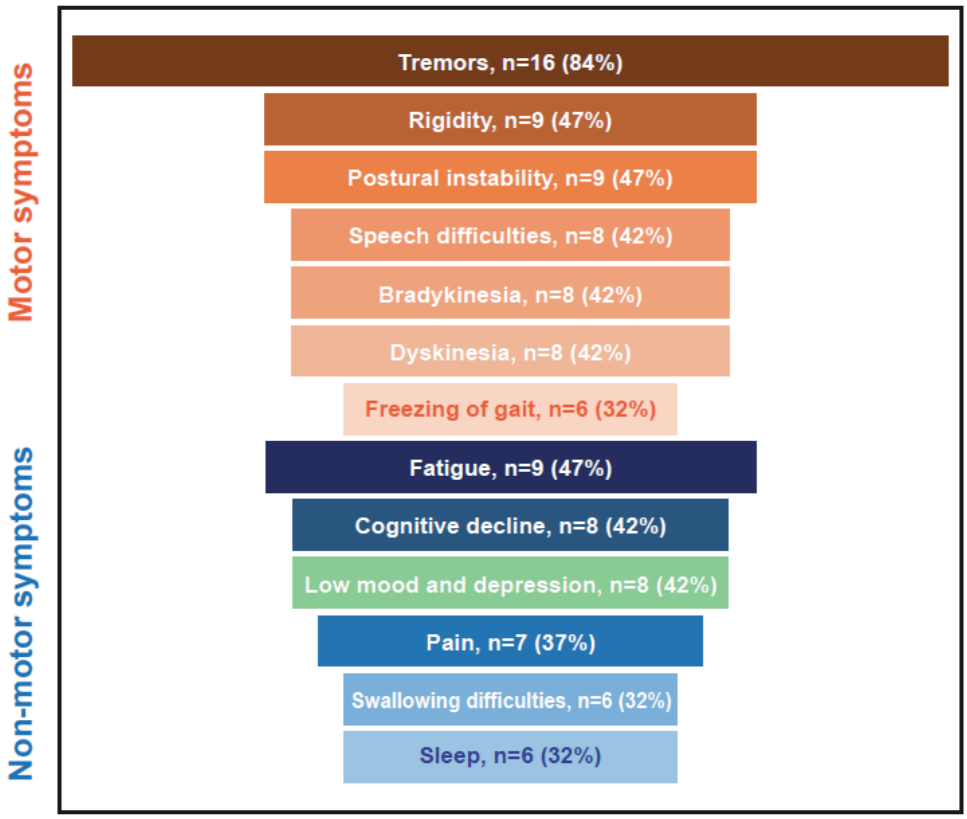
*Final number of articles returned after limitations applied and duplicates eliminated as described in the methods section.
†Other source refers to US Food and Drug Administration (2015) The Voice of the Patient. Parkinson's Disease.
‡Politis et al. 2010 was reviewed following expert input.

REFERENCE

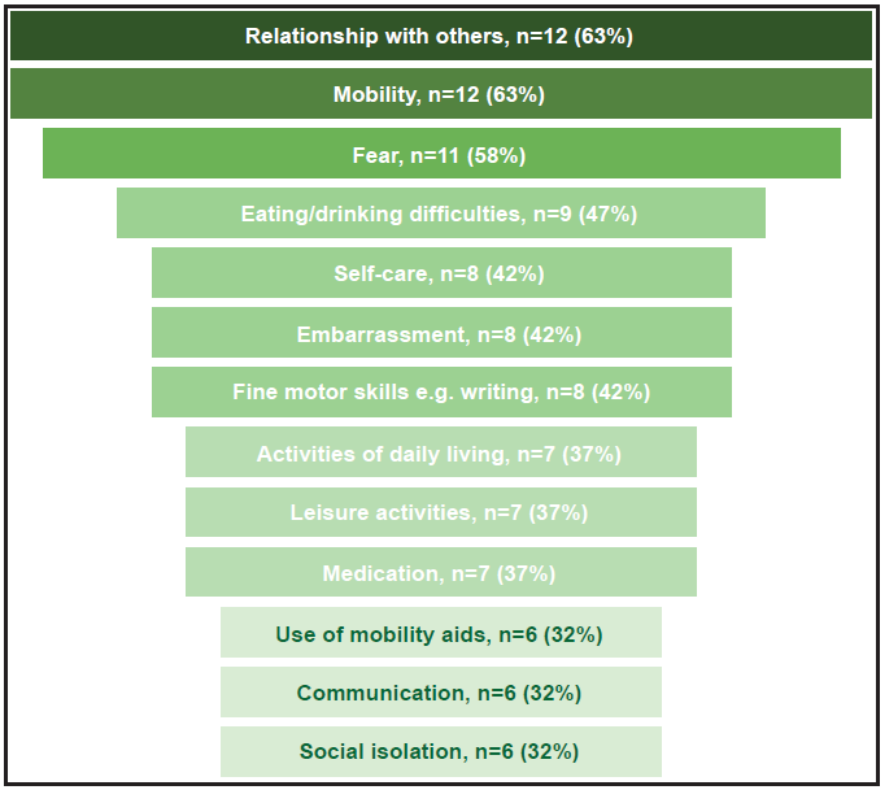
[1] Politis, M., Wu, K., Molloy, S., G. Bain, P., Chaudhuri, K.R. and Piccini, P. (2010), Parkinson's disease symptoms: The patient's perspective. Mov. Disord., 25: 1646-1651. https://doi.org/10.1002/mds.23135.

Supplementary Figure 2. Most frequently PD reported symptoms (A) and impacts (B) in published literature across all PD stages

A) Number and percentage of published articles (19 reviewed in total) reporting symptoms



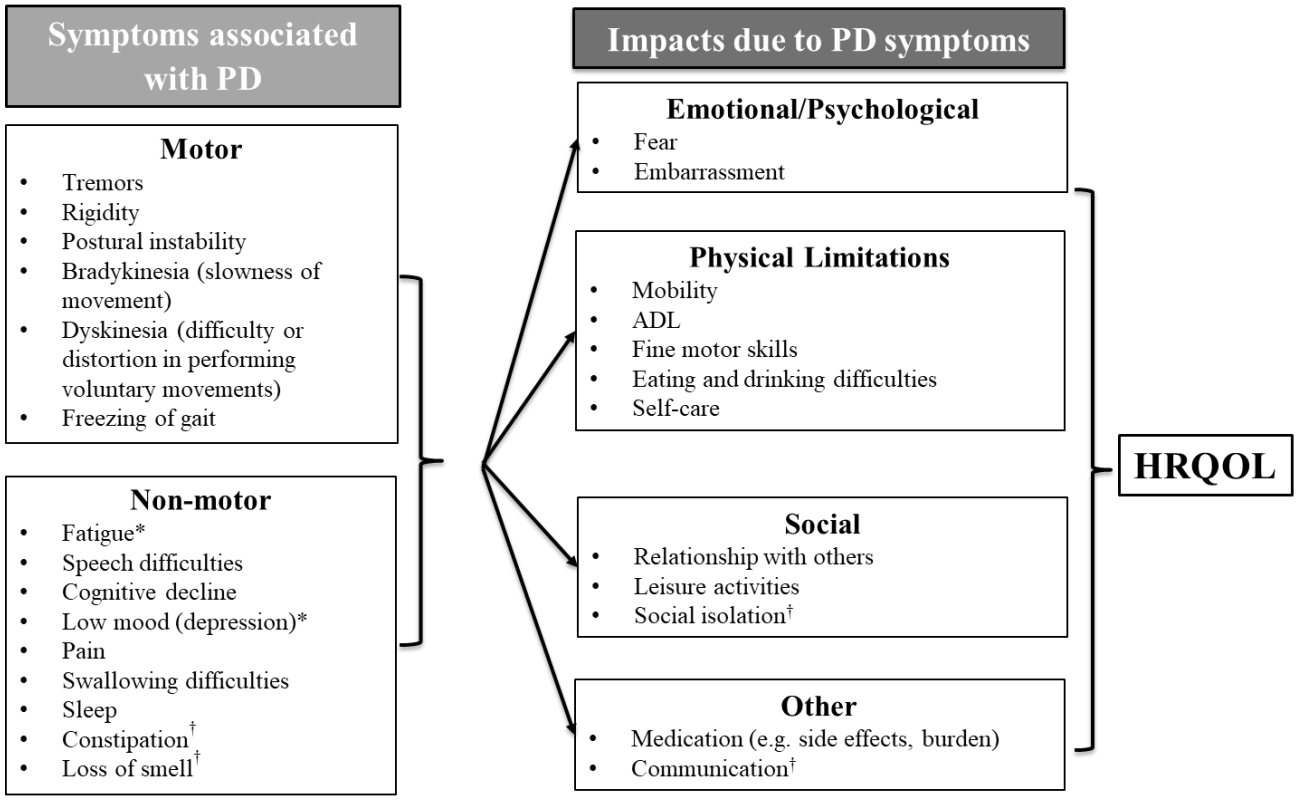
B) Number and percentage of published articles (19 reviewed in total) reporting impacts



PD, Parkinson's disease.

Supplementary Figure 3. Iterations of the conceptual model which include A) version 0.1 based on the published literature, B) version 0.2 based on the published literature and social media listening, and C) version 0.3 based on the CE qualitative interviews

A) Conceptual model version 0.1 based on the published literature

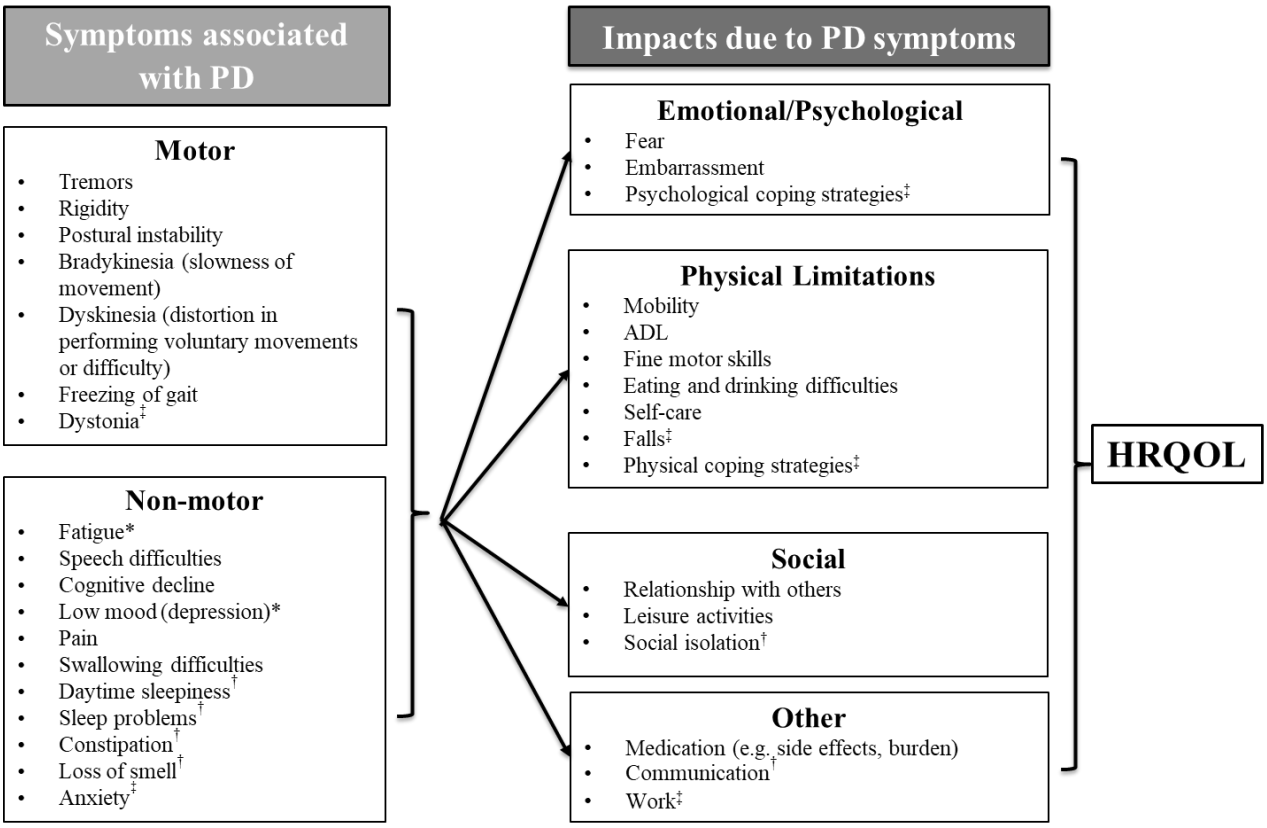


*Concepts which were primarily discussed as a symptom but could also be included as an impact of PD symptoms.

†Concepts were added to the conceptual model following clinical input.

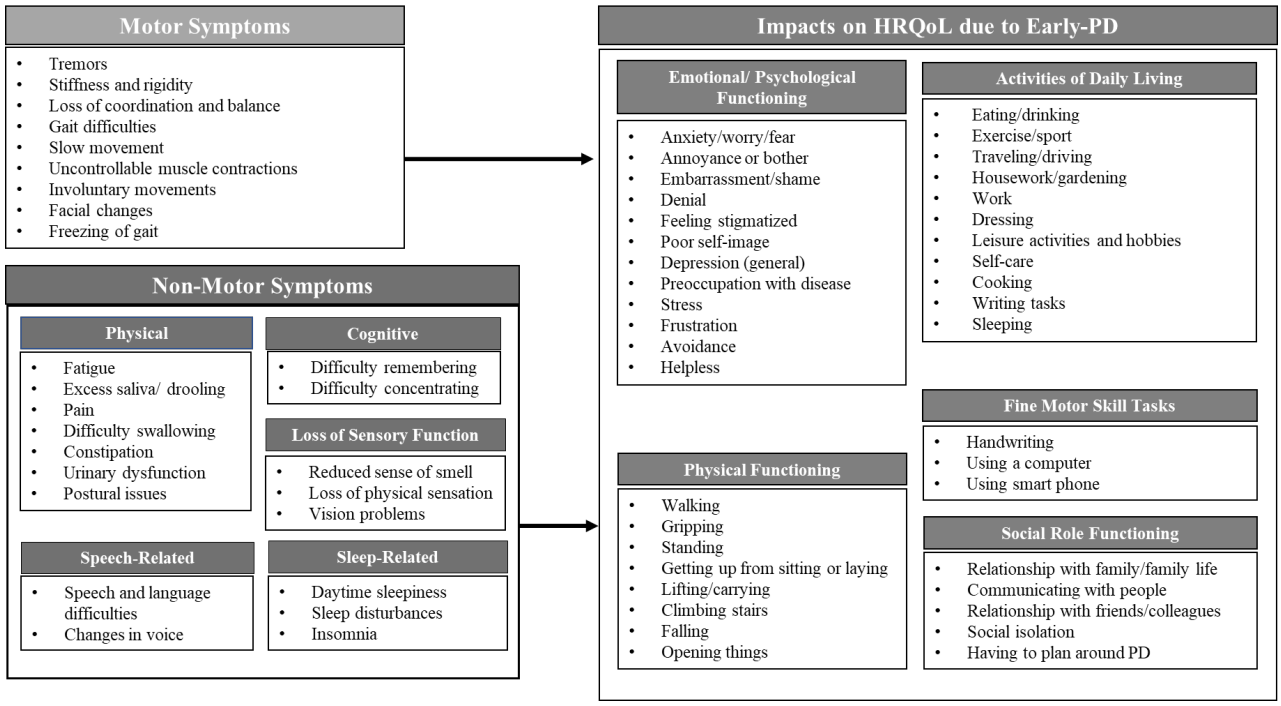
ADL, activities of daily living, HRQOL, health-related quality of life, PD, Parkinson's disease.

B) Conceptual model version 0.2 based on the published literature and social media listening



*These were primarily discussed as a symptom but could also be included as an impact of PD symptoms.
†These concepts were added to the conceptual model following clinical input.
‡These concepts were added to the conceptual model following the social media literature review.
ADL, activities of daily living; HRQOL, health-related quality of life; PD, Parkinson's disease.

C) Conceptual model version 0.3 based on the CE qualitative interviews



CE, concept elicitation; HRQOL, health-related quality of life; PD, Parkinson's disease.