

Supplementary Material

Digital Intervention Promoting Physical Activity in People Newly Diagnosed with Parkinson’s Disease: Feasibility and Acceptability of the Knowledge, Exercise-Efficacy and Participation (KEEP) Intervention

Supplementary Table 1. KEEP Intervention Details Described in Line with the TIDIER Framework for Intervention Description

No	Category	Item	Description
1	NAME	Provide the name or a phrase that describes the intervention.	The Knowledge, Exercise-Efficacy and Participation (KEEP) Intervention
2	WHY	Describe any rationale, theory, or goal of the elements essential to the intervention	The KEEP is a co-designed intervention with people with Parkinson’s (PwP) and healthcare professionals who have an interest and care for PwP, in order to represent the needs, preferences and priorities of PwP around exercise and PA promotion. Informed by the theoretical framework of Capability Opportunity and Motivation model of Behaviour (COM-B) the KEEP intervention aims to facilitate knowledge on the role of exercise and PA in managing motor and non-motor symptoms in Parkinson’s Disease, enable participation, problem solving and goal setting in newly diagnosed people with Parkinson’s PwP.
3	WHAT	Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g., online, Appendix, URL).	<p>The intervention consisted of 2 main components: the online self-directed learning modules and the online live group discussions with other newly diagnosed PwP, facilitated by a specialist neurological physiotherapist.</p> <p>There were six modules in total including Module 1: Taking Control, Module 2: Physical Activity and Exercise- WHY so important in Parkinson’s, Module 3: WHICH exercise is best for me, Module 4: HOW to exercise effectively with Parkinson’s, Module 5: Setting meaningful goals, Module 6: Activity resources around me and moving forward (Appendix 1).</p> <p>The content was text-based and included videos from HCP as well as PwP delivering key messages and concepts on each module. Participants were also able to download activity diaries and goal setting portable document format (PDF) as well as scientific articles mentioned in the module.</p> <p>The virtual sessions were hosted on Zoom. Participants were sent a secure link via email from the study PI, two days ahead of the session with instruction on how to log in. The sessions were held every other week and aimed for a group of up to 8 people to get together for 60 minutes to discuss and ask questions around exercise and physical activity and the modules provided.</p> <p>The Physiotherapist’s facilitated the discussion around the topics covered on the online modules and their role was to promote reflection on exercise habits, problem solving and goal setting within the session as well as discuss potential barriers to participation.</p>
4		Procedures: Describe each of the procedures, activities, and/or processes used in the	Participants had access to self-directed online modules which discussed the role of exercise and PA in the management of Parkinson’s, provided messages from healthcare professionals and people living with Parkinson’s as well as information on resources available around them, such

		intervention, including any enabling or support activities.	as classes, gyms and events. The online modules provided evidence-based information on physical activity and exercise as well as goal setting. Additionally, online, live group discussions were facilitated by a specialist physiotherapist with the aim for people newly diagnosed to get together and discuss their experience, views and questions around exercise and PA. Group interventions have been found beneficial in supporting people not to feel alone in their journey, being comforted by the fact that others might share similar issues but also learn from others by observing and sharing experiences.
5	WHO PROVIDED	For each category of intervention provider (e.g., psychologist, nursing assistant), describe their expertise and background.	The online group discussions were facilitated by a specialist neurological physiotherapist.
		Describe any training given.	The facilitator received training regarding the KEEP Intervention, theory underpinning the intervention and its aims. Access to the online platform was provided and the facilitator completed all 6 modules to familiarize themselves with the content. They also received a 2-hour training session on group facilitation and a manual entailing suggested topics and examples to explore during each online group discussion as well as how to move on from difficult situation should they arise (Appendix).
6	HOW	Describe the modes of delivery (e.g., face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	The KEEP online modules were delivered online. The modules were hosted on the Mantal Platform(www.mantal.co.uk), a cloud-based software utilized in many patients' studies. Participants were sent a link of the study page via email and were advised to create a password protected account to access the intervention. This was self-directed learning they could complete at any time convenient to them. The online live group discussions were hosted on ZOOM and were attended by up to 8 people newly diagnosed with Parkinson's and facilitated by a specialist neurological facilitator and lasted for 60 minutes.
7	WHERE		This was a digital intervention. The participants only attended a clinic appointment to complete their baseline and 6-month follow up assessment.
8	WHEN AND HOW MUCH	Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.	Participants were advised to complete the self-directed modules at their own pace. It was also suggested they complete one module a week. Overall, there were 6 modules in total. Participants had access to the online modules for 1 year. The live group discussions were 4 in total and were completed every other week. The intervention lasted 8 weeks in total.
9	TAILORED	If the intervention was planned to be personalized, titrated or adapted, then describe what, why, when, and how.	The intervention was specifically addressed towards people diagnosed with Parkinson's in the last 12 months. The information provided was addressing issues that people with Parkinson's usually experience around this time. On enrolment to the intervention, participants were asked to complete a section called "About you". This section asked questions around their exercise and physical activity habits, their goals and their comorbidities. Exercise and PA promotion was

			tailored according to answers that participants provided, for example those who were new to exercise received information about how to start being active, setting small goals and choosing activities they enjoy doing.
10	MODIFICATIONS	If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).	The intervention was not modified during the course of the study.
11	HOW WELL	Planned: If intervention participation or fidelity was assessed, describe how and by whom, and if any strategies were used	Intervention participation was monitored in two ways. Firstly, the online platform provided the ability to track progress and completion rate for each module. Secondly attendance to the online live discussion was monitored by the facilitator.
12		Actual: If intervention participation or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	The intervention was delivered as planned and achieved high levels of participation. Data analyzed from the Mantal platformed data it was shown that 9 participants completed all six modules (69.2%), one participant completed half the sessions (3/6) 2 participants completed 5/6 sessions and 1 participant completed 4/6 sessions, giving the online sessions overall a 91% completion rate. All four online group discussions were attended by 9/13 participants, 2 participants attended half of the and two participants attended three out of four sessions, giving the live online sessions a total 88.4% attendance rate. The reasons for the missed online live sessions were hospital appointments, summer holidays and being unwell. 2 participants did not complete the intervention.

Supplementary Table 2. Data completion rate for the performance and participant reported outcomes at each timepoint.

Outcome Measure	Baseline	Post-intervention	6-month post intervention
MiniBESTest	30/30 (100%)	-	28/29 (96.5%)
UPDRS III	30/30 (100%)	-	28/29 (96.5%)
5TSTS	30/30 (100%)	-	28/29 (96.5%)
GDS	29/30 (96.6%)	28/29 (96.5%)	29/29 (100%)
Ox-PAQ	30/30 (100%)	28/29 (96.5%)	29/29 (100%)
SEE	30/30 (100%)	29/29 (100%)	29/29 (100%)
AES	28/30 (93.3%)	29/29 (100%)	29/29 (100%)
KEPA PD	29/30 (96.6%)	29/29 (100%)	29/29 (100%)
Geneactiv Accelerometer	30/30 (100%)	29/29 (100%)	29/29 (100%)
RPAQ	30/30 (100%)	29/29 (100%)	29/29 (100%)
MOEES	30/30 (100%)	29/29 (100%)	29/29 (100%)
G-SAP	30/30 (100%)	29/29 (100%)	28/29 (96.5%)
AoI questionnaire*			
*(intervention group only)	-	12/13 (92%)	-

Mini-BESTest, Balance Evaluation Systems Test; UPDRS III, Unified Parkinson’s Disease Rating Scale, part 3; TUG, Time up and go; 5TSTS, 5 times Sit to Stand; GDS, Geriatric Depression Scale; OX-PAQ, The Oxford Participation Questionnaire; SEE, Self-Efficacy for Exercise; AES, Apathy Evaluation Scale; KEPA PD, Knowledge on Exercise and Physical Activity in PD questionnaire; RPAQ, Recent Physical Activity Questionnaire; MOEES, Multifactorial Outcome Expectation for Exercise Scale; GSAP, Gait-Specific Attentional Profile; AoI questionnaire, Acceptability of Intervention questionnaire

Supplementary Table 3. Acceptability of Intervention

Question	Answers
<p>1. Was there something that you found particularly helpful to you in this education program (online modules and group discussions)? Please provide your answer in the box below.</p>	Not specifically.
	Made me feel more positive, that I can do something to help my Parkinson's as well as medication. I have improved my fitness and strength which I probably wouldn't have done had I not been motivated by being on the trial. I still have some way to go before I'm where I want to be, but I'm working on it. Thank you.
	The program explained the benefits of exercise in reducing the effects of Parkinson's.
	Group discussion
	I found the online exercise classes helpful.
	Really enjoyed discussion with other Parkinson's sufferers.
	I found it particularly helpful to understand the difference between physical activity and physical exercise and to have the online sessions to guide and suggest ideas in the online Mantel. I also found it very helpful to listen to other people's issues relating to PD and to know how they were feeling about their diagnosis, because it made me feel less isolated. Having a professional present to guide discussion, explain and encourage was extremely helpful too.
	Learning of other's experiences
	You tube videos clips exercises
	The Program was extremely encouraging as we learnt of the reasons for exercise. there was a lot of information, sometimes too much to take in during a single session, but overall, really helpful
	The need for a balanced program of exercise. Prior to the program all the exercise I undertook was anaerobic, but I now understand the importance of stretching, balance and strength exercise as well.
	Very useful and informative, thank you.
	<p>2. Were there any topics you wish we had included in the online modules about exercise and physical activity?</p>
Maybe more information on how individual exercises help specific symptoms related to Parkinson's.	
No.	
No	
I cannot think of anything	
No	
No	
no	
The only topic I would like to have had some more information on would be the latest information on diet.	
No	
No, each person has their own status and ability, so the discussion pulling out of the individual some interesting variations was excellent. many ideas from variations spoken.	
None	None
	No

<p>3. Was there something that you found particularly <u>unhelpful</u> to you in this education program (online modules and virtual group discussions)?</p>	Not unhelpful, just would have liked some suggestions on a mix of exercise which would meet the needs I have to improve my condition. I understand that everyone is different and that makes it difficult.
	No.
	None
	No
	None
	No
	Able to share information
	No
	Online modules not intuitive to navigate.
	The online modules could have designed with more sessions, but with less content. The virtual group discussion was extremely good.
	None
<p>4. Where there any topics you wish we had covered in the live group discussions?</p>	No
	More information on specific exercises that benefit Parkinson's symptoms to help confidence that the exercise program chosen is of benefit.
	No.
	No
	No, There was adequate opportunity to raise topics during the sessions
	No
	No
	no
	Possibly the effect on family members.
	No
	Food and diet
No	
<p>5. Thinking back to the time you enrolled for the study, are there any benefits you have gained from this education program (online sessions and live group discussions) that you did not expect you would? Please provide your answer in the box below.</p>	The extra benefits of physical exercise, compared with routine activity
	Motivation to exercise, confidence trying activities, maybe not doing as well as I would like, but accepting that you do as much as you can.
	Information about the relationship between exercise and Parkinson's
	Better understanding of the need for physical activity
	Enthusiasm for exercise
	Made me aware of what I am capable of.
	The need for a balanced exercise program as previously explained.
	Yes
	The huge link between PD and exercise and the benefits it can bring. The need to set small but significant goals to keep myself engaged with exercise, because I'm not a person who naturally engages with exercise

more with physical activity, which doesn't produce the same benefits. The benefit of meeting others on Zoom has been hugely positive too.
	No
	I did not expect such a broad range of exercise (Strength, balance, etc.)
	None
<p>6. Have you made any changes in your everyday activities because of this education program (online modules and virtual group discussions)? Please provide your answer in the box below.</p>	Yes, regular exercise sessions.
	Joined an exercise class, looking to buy some exercise equipment to use at home.
	I am trying to improve my posture and movement throughout the day.
	I have contacted my community physiotherapy team in order to tailored exercise program.
	Joined the gym
	Took up free gym membership offered by Everybody Active and classes therein
	More exercise
	I have purchased a smartwatch to better monitor my exercise program.
	yes
	Yes, I am paying more attention to the type of exercise I am engaging in and I am trying, within those exercises, to ensure that I become aerobic for as long as possible. Having had a busy summer, I plan to devise myself a program of exercise for the winter months ahead.
	No
	Yes, repeating exercises during short periods, several times a day rather than a single long session.
Yes	

Supplementary Table 4A. Results of the repeated measures mixed model for knowledge score in the groups over time.

Term	Estimate	Standard Error	p	Lower 95% CI	Upper 95% CI
(Intercept)	4.53	0.42	<0.001	3.72	5.35
Group intervention	0.07	0.59	0.9101	-1.09	1.22
T2: post intervention	0.47	0.47	0.3289	-0.46	1.40
T3:6-month follow-up	1.07	0.47	0.0284	0.14	2.00
Group intervention *T2	1.07	0.67	0.1171	-0.25	2.38
Group intervention * T3	0.98	0.68	0.1532	-0.35	2.31

Supplementary Table 4B. Results of the repeated measures mixed model for physical activity (ENMO) in the groups over time

Term	Estimate	Standard Error	p	Lower 95% CI	Upper 95% CI
(Intercept)	17.94	2.04	<0.001	13.94	21.94
Group intervention	-1.97	2.89	0.4992	-7.63	3.69
T2: post intervention	-1.3	1.23	0.2944	-3.7	1.11
T3:6-month follow-up	-1.14	1.23	0.3559	-3.55	1.26
Group intervention *T2	2.99	1.73	0.0902	-0.41	6.39
Group intervention * T3	0.74	1.76	0.6765	-2.71	4.18

Supplementary Table 4C. Results of the repeated measures mixed model for self-efficacy score in the groups over time

Term	Estimate	Standard Error	p	Lower 95% CI	Upper 95% CI
(Intercept)	60.67	4.86	<0.001	51.15	70.18
Group intervention	-6.33	6.87	0.3608	-19.79	7.12
T2: post intervention	-2.67	4.45	0.5514	-11.39	6.05
T3:6-month follow-up	0.33	4.45	0.9405	-8.39	9.05
Group intervention *T2	-3.13	6.29	0.6205	-15.46	9.2
Group intervention *T3	8.31	6.37	0.1972	-4.17	20.79