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Title: Factors influencing long-term physical activity maintenance - a qualitative evaluation of a physical activity program for inactive older adults at risk of cognitive decline: the INDIGO follow-up study

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Abstract

Background: Physical inactivity is a modifiable risk factor for dementia, but there remains a research translation gap in effective physical activity (PA) implementation, particularly in the longer-term. The INDIGO trial investigated the effectiveness of a six-month PA intervention for inactive older adults at risk of cognitive decline with subjective cognitive decline or mild cognitive impairment.

Objective: This follow-up study aimed to collect feedback from INDIGO participants about their experience of involvement in the trial, including barriers and enablers to longer-term maintenance of PA.

Methods: A qualitative study using semi-structured individual interviews was conducted and transcripts analysed thematically. All INDIGO trial completers were invited, with 29 participating (follow-up period 27-66 months post-baseline).

Results: At long-term follow-up, participants described INDIGO trial participation as beneficial. The theme of “Motivation” (subthemes: structure and accountability, knowledge and expected benefits, preferences and motivation, tools) followed by “Situation” (subthemes: environment and time, social aspects, ageing and physical health) appeared to be critical to PA “Action". Most participants had a positive view of goal-setting and peer mentoring/support, but there was some polarization of opinion. Key factors to longer-term “Maintenance” of PA were self-efficacy and perceived benefits, habit formation and for some participants, enjoyment.

Conclusion: PA interventions for older adults at risk of cognitive decline should include behavior change techniques tailored to the individual. Effective techniques should focus on “Motivation” (particularly structure and accountability) and “Situation” factors relevant to

individuals with the aim of developing self-efficacy, habit formation and enjoyment to increase the likelihood of longer-term PA maintenance.

Keywords: exercise, physical activity, cognition, late-life, older adults, goal setting, peer mentors

Running Title: Long-term physical activity maintenance

Main Text

INTRODUCTION

The global prevalence of dementia continues to increase, with significant effects on quality of life, morbidity, mortality and economic cost. Approximately 40% of dementia risk is potentially modifiable [1], and an increased focus on dementia risk reduction is a key part of addressing this challenge [2]. The World Health Organization has recognised the importance of risk reduction, and published guidelines for "risk reduction of cognitive decline and dementia" [3]. In Australia, Europe, the UK and US, physical inactivity is the single largest modifiable risk factor for dementia, and accounts for 17.9% of the population attributable risk of dementia in Australia [4, 5]. In addition, there is increasing evidence of the benefits of physical activity (PA) for older adults with subjective cognitive decline (SCD) or mild cognitive impairment (MCI) [6].

High levels of awareness of the benefits of PA for cognition have been shown in older adults with and without cognitive impairment, as well as caregivers of older adults with cognitive impairment [7, 8]. Despite evidence and community awareness of the benefit of PA for risk reduction of cognitive decline and dementia and their myriad general health benefits, there remains a significant research translation gap with 72% of Australian older adults not meeting national PA guidelines of undertaking 30 minutes of PA per day on at least five days in the last week [9]. In addition, increases in PA during interventions are often not maintained, with limited evidence relating to the optimal ways to persist with PA in the longer-term [10, 11]. A systematic review of reviews found that for short-term uptake of PA, the key facilitators included "enjoyable activities and convenient scheduling" while key barriers included "health status, previous PA habits and experiences, and cultural sensitivity"[11]. Health status typically relates to health problems that make it difficult or painful for the older adult to undertake PA, while established habits influenced by past

experience can be challenging to change, and all of this occurs in the context of culture and beliefs about whether it is appropriate to engage in PA.

One study that did examine longer-term PA maintenance was a follow-up study three years after a randomized controlled trial (RCT) of a walking intervention for insufficiently active adults aged 45-75 years in the UK, found that facilitators of maintaining PA included use of a pedometer, good health, self-motivation, social support and good weather [12]. Of note, participants also suggested that intervention "top-ups" would be helpful for maintenance, including annual nurse appointments, walking groups and text messages[12]. Barriers included lack of time and the opposite of the facilitators, including bad weather, poor health, ageing, lack of self-motivation and lack of social supports. These reported barriers are consistent with those reported in trials with shorter follow-up and act as barriers to engaging in PA due to the older adults reporting insufficient time to undertake PA and also being hampered by inclement weather such as hot, cold or wet weather, physical health problems and difficulties related to ageing, such as visual impairment and mobility difficulties. Other barriers related to insufficient internal drive or motivation to engage in PA as well as not having family or friends to support them for reasons such as motivation, companionship or safety. These barriers are even more pronounced in older adults with cognitive impairment who specifically noted that memory impairment was a barrier to remembering how to do exercise, such as a prescribed program, and that lacking a companion for support and safety was a barrier to engaging in PA [7]. A related finding is that many support persons or caregivers for older adults with cognitive impairment wanted to participate in PA with the loved one that they were supporting [8]

Another study examining longer-term PA maintenance was a UK study four to six years after completing a PA program for adults aged 65 years and older, found a number of factors that influenced continuation of PA[13]. These factors included "physical autonomy, enjoyment, positive evaluation of the activity and physical benefits, importance of social interaction,

positive feedback, development of behaviour considered normal or habitual, motivation and self-efficacy"[13]. We are not aware of any studies of longer-term PA maintenance specifically in older adults at risk of cognitive decline who have SCD or MCI.

A systematic review of general population participants' attitudes and knowledge relating to dementia risk reduction emphasised the importance of tailored education, support of the individual and their social context, and co-design [14]. In addition, a systematic review of reviews found that PA interventions were generally effective over the study duration which was typically 12 months, however, it was unclear which interventions were effective in achieving maintenance beyond 12 months [10]. Qualitative research is therefore needed to investigate the most useful PA interventions for older adults at risk of cognitive decline with SCD or MCI, particularly to maintain PA beyond 12 months. This type of research can also provide valuable insight into participants' experiences and perceptions of the usefulness of different components of interventions being investigated in RCTs.

The aim of the INDIGO follow-up study was to collect feedback from INDIGO trial participants about their opinions regarding their involvement in the trial, barriers and enablers of PA, including longer-term maintenance, as well as perspectives about the key behavior change techniques (BCTs) used: goal-setting and mentoring. This data will provide deeper understanding of the important factors that facilitate uptake and longer-term maintenance of PA in inactive older adults with memory concerns, which will help inform future research, knowledge translation and public health and clinical practice.

METHODS

Parent RCT (INDIGO)

The INDIGO trial has been described in detail elsewhere through publication of the protocol [15] and findings [16]. In summary, the INDIGO trial was an RCT (Australia New Zealand Clinical Trials Registry ACTRN12613001181796) of a 6-month home-based PA intervention for independent-living adults aged 60-85 years with memory concerns but not dementia, who were undertaking less than 60 minutes of moderate or higher intensity PA per week [16]. At baseline in the parent trial, participants had either SCD or MCI [16]. The intervention group received goal-setting and telephone peer mentor support, while the control group received standard education and telephone peer contact. Goals related to physical function such as fitness level, as well as type, duration and frequency of PA. Both groups received 150 minutes of moderate intensity PA per week.

The INDIGO trial results did not show any significant between group differences for the primary outcome of increase in PA. Post-hoc analysis of combined group data showed a significant mean increase in PA measured objectively by pedometer of 1,662 steps/day (95% CI:943-2383) at six months ($p<0.001$). Self-reported PA also increased at six months by a mean of 165 min/week (95% CI:125-210). At six months, there was also a high level of retention in the trial with 88.5%, and high level of median adherence to prescribed PA of 88.9% (IQR 74.4–95.7) [16].

INDIGO follow-up study

All participants from the parent INDIGO trial who commenced the PA intervention program and completed their 6-month assessment (n=43) were invited by telephone, postal mail and/or email to participate in the INDIGO follow-up study 2-6 years after entering the parent

trial. The group of INDIGO trial completers were treated as a single group for this follow-up study given that the intervention and control groups did not differ on the primary outcome measure.

At the follow-up visit, participants completed a qualitative face-to-face semi-structured interview asking about their experience of the INDIGO trial, as well as specific questions about barriers and enablers to PA and the BCTs of goal-setting and peer mentoring/support as shown in Figure 1. Overall, interview questions were designed to address the research questions of this study. The study team, consisting of researchers and clinicians with expertise in psychiatry, psychology, exercise physiology and health promotion, developed these questions based on their expertise and experience conducting qualitative research. The interview schedule started with broad open-ended questions and was flexible in that the interviewer was then able to follow-up with more specific, detailed or clarifying questions. Two question categories relating to anxiety and technology were not specifically related to the INDIGO trial, but were added with the aim to inform future implementation intervention design. Reporting on these two question categories was beyond the scope and aims of this manuscript and will be reported separately. Interviews were audio-recorded and transcribed verbatim by a professional transcription service. The interviewer (TC) was an Australian psychiatrist of old age clinician researcher who identified as male gender, had experience in conducting qualitative research and had no prior relationship with the participants.

Figure 1: INDIGO Follow-up Qualitative Feedback Semi-Structured Interview Guide

1a. Can you please tell me about your experience of the INDIGO project?
1b. What did you find helpful about the INDIGO project?
1c. What did you find unhelpful about the INDIGO project?
1d. What suggestions would you make to improve the INDIGO project?
2a. Can you please tell me about your experience of being involved in physical activity as part of the INDIGO project?

2b. What were some of the barriers that made it harder for you to be involved in physical activity?

2c. What were some of the enablers that made it easier for you to be involved in physical activity?

3a. Can you please tell me about your experience of setting goals in the INDIGO project?

3b. Did you find goal-setting helpful or unhelpful for you? And why?

3c. Can you please tell me about your experience of having a mentor or PAL (peer volunteer) supporting you in the INDIGO project?

3d. Did you find having a mentor or PAL helpful or unhelpful to you? And why?

4a. Can you please tell me about what you understand about "stress and anxiety"?

4b. Do you think that the INDIGO physical activity program might be helpful or unhelpful to "stress and anxiety"? And why?

5. Can you please tell me about whether you think that technology could be used to make the INDIGO project more helpful to you?

Participants provided written informed consent to participate, and the Melbourne Health Human Research Ethics Committee (HREC/13/MH/25; 2013.020) approved the trial. The study took place at the National Ageing Research Institute, Parkville, Victoria, Australia. Research was undertaken in accordance with the Helsinki declaration of 1975.

The participants also completed a selection of the demographic and outcome measures that they had previously completed in the parent INDIGO trial at baseline and six months as shown in Table 1 [16].

Table 1: Demographic and Outcome Measures collected at INDIGO Follow-up Visit

Demographic and Outcome Measures
Demographic and lifestyle questionnaire
Height, weight, body composition, girths, body mass index (BMI)
CHAMPS PA questionnaire for older adults [17]
Stage of Change questionnaire [18]

Barrier Self-Efficacy questionnaire (SEQ) [19]
Balance Step test [20]
Sit-to-Stand test [21]
Timed Up and Go test (TUG) [22]
Standardised Mini-Mental State Examination (MMSE) [23]
Clinical Dementia Rating Scale (CDR) [24]
Memory Complaint Questionnaire (MAC-Q) [25]
Hospital Anxiety and Depression Scale (HADS) [26]
Short Form-36 Version 2 (SF3-6v2) [27]
Attitudes to Ageing Questionnaire (AAQ) [28]

Data Analysis

Transcripts of the qualitative semi-structured interviews were analysed using inductive thematic analysis [29]. Qualitative thematic coding was completed with the aid of NVivo 12 software for data storage and management. Two researchers (TC and EC) coded a random selection of 20% of the interview transcripts (n=6) to develop consensus thematic nodes. One researcher (TC) then coded the remaining transcripts, after which another member of the research team (EC) checked this coding and any disagreements were resolved via consensus. The second coder (EC) was an Australian old age psychiatrist clinician researcher who identified as female gender, had experience in conducting qualitative research and had no prior relationship with the participants. The research team then discussed the themes that emerged from the coded transcripts to formulate the final thematic model. Exemplar quotes for themes and subthemes were used to support the findings.

Demographic and outcome measures collected at the INDIGO follow-up visit were analysed descriptively using SPSS to provide a description of the participants and also to determine the level of PA they were still undertaking using the self-report CHAMPS questionnaire. As the focus of this study was the qualitative interview, and to reduce participant burden, an objective PA measurement via pedometer was not undertaken.

RESULTS

Participant characteristics

Of the 43 INDIGO trial completers invited to participate, 29 completed the follow-up study (Table 2).

Table 2: INDIGO Trial Completers' Follow-up Visit Status

Status	Number	% of INDIGO completers invited
Attended INDIGO Trial Follow-Up	29	67
Unable to consent	1	2
Declined or deceased	8	19
Unable to be contacted	5	12
Total INDIGO trial completers invited	43	100

Demographic and outcome data are summarised in Table 3. More participants identified as female (65%) compared to male (35%), the mean age was 74 years, had relatively high levels of education with a mean of 15 years, and 41% were from the intervention group of the RCT. Interviews were conducted on average, 44 months post baseline (range 27-66 months). This wide range reflected recruitment for the parent trial having occurred over several years. Consistent with the inclusion and exclusion criteria of the parent trial, participants self-reported memory complaints without significant cognitive impairment and had low levels of anxiety and depression.

Table 3: INDIGO Follow-up Participants' Demographic and Outcome Measures

Variable	Result	Range
DEMOGRAPHICS AT FOLLOW-UP VISIT		
Sex - Male, % (n)	35 (10)	
Age (years) – mean (SD)	74 (6.7)	63-86
Education (years) – mean (SD)	15 (3.6)	8-21
Group of Initial Randomisation - Intervention, % (n)	41 (12)	
Duration from Baseline to Follow-Up Visit (months) – mean (SD)	44 (12)	27-66

PHYSICAL ACTIVITY AND FITNESS OUTCOMES AT FOLLOW-UP VISIT		
Moderate or Vigorous Intensity PA (mins/week) – mean (SD)	203 (172)	0-690
Stage of Change questionnaire score – median (IQR)	3 (3.0)	1-5
Barrier Self-Efficacy questionnaire score – mean (SD)	16 (4.3)	6-23
BMI (kg/m^2) - mean (SD)	28 (4.2)	20-36
Timed Up and Go (seconds) – median (IQR)*	6.4 (1.5)	4.3-15
Sit to Stand (seconds) – mean (SD)*	8.8 (1.9)	5.2-14
Balance Step Test (steps) – median (IQR)	16 (5.0)	8-23
MENTAL HEALTH AND COGNITIVE OUTCOMES AT FOLLOW-UP VISIT		
MACQ score – mean (SD)	26 (4.1)	17-33
SMMSE score (spelling world) – median (IQR)	30 (2.0)	27-30
SMMSE score (serial 7s) – median (IQR)	30 (2.0)	24-30
CDR Sum of Boxes – median (IQR)	0.5 (0.5)	0--0.5
AAQ score – mean (SD)	78 (13)	51-104
HADS Anxiety score – median (IQR)	5 (4.0)	1-16
HADS Depression score – median (IQR)	3 (3.5)	0-10

*n = 29 except Timed Up and Go (n=28) and Sit to Stand (n=27)

Based on the CHAMPS questionnaire, participants were still quite physically active at the follow-up study, undertaking a mean of 203 minutes/week of moderate or vigorous intensity PA (MVPA) as shown in Table 4. This was reduced from the mean of 249 minutes/week post trial intervention at the six-month visit, but still above the 54 minutes per week at baseline. Post trial intervention at the six-month visit, 72% of participants were meeting the aerobic PA guidelines undertaking at least 150 minutes/week of MVPA, which reduced to 48% at the follow-up study visit. We compared the selected demographic and outcome measures (baseline and six-month visit) between the 29 INDIGO trial completers who participated in the follow-up study with the 14 who did not participate. The only statistically significant difference was the mean MVPA at the six-month visit - 249 minutes/week for the group that participated in the follow-up study compared to 146 minutes/week for the group that did not (see Table S1).

Table 4: INDIGO Follow-up Participant Level PA Data

Age	Sex	Group	Time Since Baseline	Moderate or Vigorous Intensity Physical Activity					
				Baseline		Post Intervention 6m		Follow-up Visit	
(years)	(M/F)	(I/C)	(months)	mins/ week	≥150 (Y/N)	mins/ week	≥150 (Y/N)	mins/ week	≥150 (Y/N)

72	M	C	62	0	N	225	Y	0	N
75	F	I	62	90	N	255	Y	105	N
79	F	I	66	0	N	165	Y	300	Y
75	M	C	56	225	Y	600	Y	480	Y
76	F	C	59	0	N	225	Y	330	Y
73	F	I	56	240	Y	480	Y	405	Y
76	M	I	55	30	N	330	Y	345	Y
79	F	C	56	60	N	270	Y	135	N
77	F	C	55	0	N	375	Y	0	N
65	F	C	49	30	N	105	N	450	Y
71	F	C	51	105	N	135	N	195	Y
71	F	C	54	30	N	195	Y	690	Y
67	F	C	48	0	N	240	Y	240	Y
76	F	C	47	0	N	105	N	0	N
70	M	I	41	105	N	330	Y	270	Y
67	M	I	41	225	Y	555	Y	345	Y
64	F	C	39	30	N	270	Y	135	N
86	F	I	36	0	N	135	N	105	N
66	F	I	38	105	N	240	Y	210	Y
80	F	I	34	0	N	0	N	0	N
86	M	I	33	0	N	165	Y	135	N
86	M	C	33	0	N	105	N	0	N
68	F	C	35	0	N	225	Y	330	Y
71	M	I	31	0	N	105	N	225	Y
72	M	C	34	0	N	510	Y	0	N
63	M	C	27	105	N	240	Y	30	N
71	F	I	30	0	N	330	Y	135	N
81	F	C	31	0	N	135	N	210	Y
85	F	C	28	135	N	165	Y	90	N
Mean or %	66% F 34% M	59% C 41% I	44	52.2	10.3% (≥150)	249	72.4% (≥150)	203	48.3% (≥150)

Key M = Male, F = Female, I = Intervention group, C = Control group, ≥150 mins/week, <150 mins/week

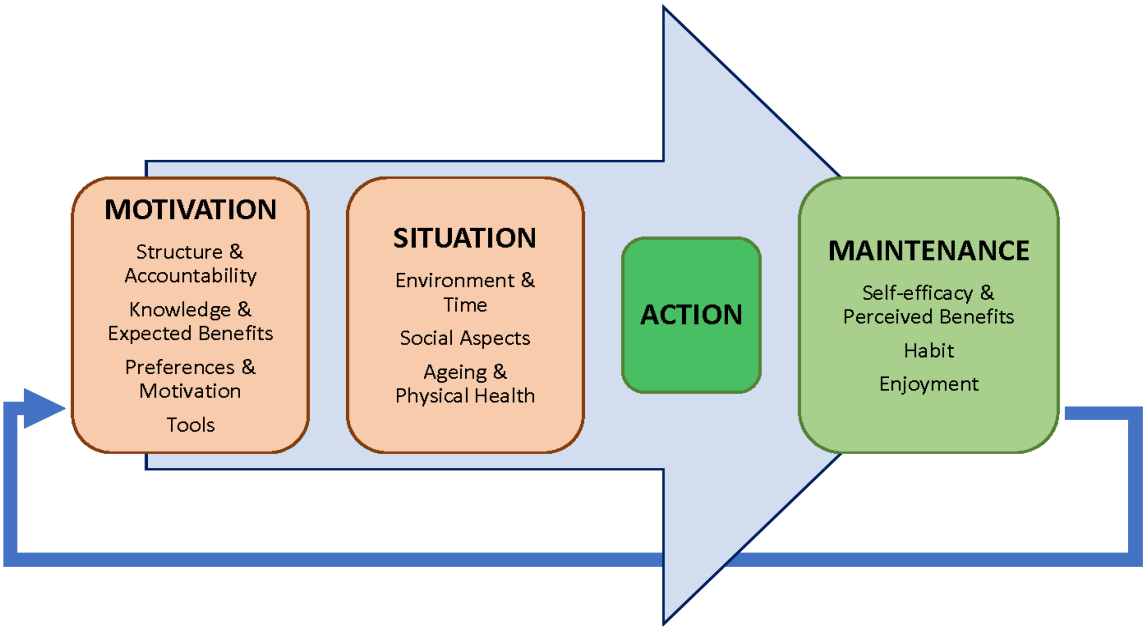
Thematic Analysis Results

The total duration of interviews was approximately 779 minutes, with individual interview mean duration of 27 minutes (range 13-46 minutes).

The thematic analysis identified three major themes illustrated in Figure 2. The "Motivation" theme comprised four subthemes of "Structure and Accountability", "Knowledge and Expected Benefits", "Preferences and Motivation" and "Tools". In our analysis, this theme related to factors that appeared to be critical early influences for participants in

contemplating engaging in the PA program. The "Situation" theme comprised three subthemes of "Environment and Time", "Social Aspects" and "Ageing and Physical Health". In our analysis, these contextual factors appeared to be the next important influence in participants proceeding to "Action" in the PA program. Finally, there were three subthemes that appeared to be influential in the "Maintenance" theme for PA, namely "Self-efficacy and Perceived Benefits", "Habit" and "Enjoyment". Themes will be illustrated by exemplar quotes with some information about the quoted participant in parentheses as follows – age (years), sex (F/M), group (intervention/control), months (m) post-baseline, mins of MVPA/week at time of follow-up interview.

Figure 1: Themes Illustrating the Pathway to Physical Activity Maintenance



Motivation Theme and Subthemes

"Motivation" factors appeared to be a critical first step in participants engaging in the PA program.

Structure and Accountability (described by 25 participants) was the most prominent subtheme described by participants relating to motivation to engage in the PA program. Many participants described the process of enrolling in the trial, clear structure of having a program, attending education and follow-up sessions, and being contacted by researchers, or their peer mentor or volunteer as being instrumental to motivation to engage in PA. The following three quotations from participants refer to their involvement in the INDIGO PA program as providing them with structure and a sense of accountability that helped them to engage in PA.

"So, it gave me a structure…I had to record it all properly, and that was a discipline that was good for me…I kept going because I knew I was accounting for myself as much as anything. It was very well structured and everything was explained very well." (79F, intervention, 66m post-baseline, 300mins MVPA/week)

"Every now and again when I think, oh, I haven't done anything today or I haven't done enough today. It's being part of this that has made me alert to the fact that I do need to do more." (79F, control, 56m post-baseline, 135mins MVPA/week)

"Yeah, the accountability is certainly something because I know with other works I've been involved with, if the accountability is not there, people get a bit lazy and think they can get away with little things. So that's a big part of it, having to report back" (67M, intervention, 41m post-baseline, 345mins MVPA/week)

Knowledge and Expected Benefits (described by 19 participants) appeared to be a significant influence on participants' motivation to engage in PA. Knowledge included an understanding of PA benefits as well as practical aspects of how to engage effectively and safely in PA. Expected benefits were quite diverse and frequently related to goals that were specific to the individual participant. The first participant quotation below relates to not being motivated to be involved in PA when they were younger due to lack of knowledge, and the subsequent impact of their involvement in the INDIGO trial making PA an important and

regular part of their life. The second participant quotation below refers to the expected benefit of PA on cognition as being a motivating factor to engage in PA.

"The fact that exercise is a very important part of doing. It's always in our life. But I never did when I was young because I never was told. So, now then, I know that really made an impact on me." (81F, control, 31m post-baseline, 210mins MVPA/week)

"I knew it was-the aim was to see if the exercise helped with rate of memory loss. I was very aware of, sort of, mental deficiencies which I wasn't very happy about-so I was happy to have a program of walking to address that." (75M, control, 56m since baseline, 480 mins MVPA/week)

Preferences and Motivation (described by 19 participants) referred to concepts such as participants identifying as "Not being the exercise type" and difficulty with internal drive to engage in PA. Some participants felt that exercise and physical activity had never been part of their lives and were not their preferred activities. Other participants discussed their struggle with lacking internal drive to engage in PA, often despite being aware of the potential benefits. The first quotation below relates to lack of internal drive to engage in PA while the second refers to the participant's view of their personality as "not being the exercise type".

"Well, I guess the thing that makes it hard for me is just the motivation or to do it. Intellectually I know it's important to exercise or to move, but it's always hard to actually do it, to get the impetus to get up and do it. Leave the house and do the walk. That's the biggest barrier for me. Yeah. Even with the INDIGO Project helped me get over that, but it still was hard. Sometimes I'd think oh I'm too tired, I'm too…it's too late or oh I haven't got time today. All these excuses still come up and you have, I have to force myself or, yes, be stern with myself to go and do it." (65F, control, 49m post-baseline, 450mins MVPA/week)

"Am I lazy? ...I've never played a lot of sport. Never been-not since I was a child. I've never really been interested in participating in a lot of sport of any kind, so just my own personality." (79F, control, 56m post-baseline, 135mins MVPA/week)

In the Tools subtheme, participants were asked specifically about goal-setting and peer mentoring or support, which were BCTs used in the INDIGO trial. Generally, most participants had a favourable view toward these BCTs. Goal-setting was reported to be helpful as it helped provide structure and accountability, helped with self-efficacy and motivation but quite a few participants found the process difficult. Peer contact was also reported to help provide structure and accountability, support and social benefits, although some felt the process was too scripted, there was insufficient contact, or their personalities were not compatible. Some responses did seem to be polarised with a small number of participants expressing strong dislike of these tools, such as feeling that goal-setting was quite a contrived process, or feeling that having peer support was akin to someone checking on them. Overall, these BCTs did appear to influence "Motivation" positively. The quotations below provide examples of one positive and one negative view from participants relating to the BCTs of goal setting and peer mentoring or support respectively.

"I'm not usually a goal maker. I can see where goals are good. I think you have to go at your own pace, but you do need a little bit of a push sometimes, I guess. The goal making is definitely a good idea. It's not something I would have done before and I think probably that can motivate you too if you've got a goal to work towards, that would be motivating." (66F, intervention, 38m post-baseline, 210mins MVPA/week)

"I can't stand all that psychology stuff about the business plan and goals… As soon as I see the word, it gets me...I hated it...Well, it's like a red rag to a bull. Yes, I don't like setting goals." (73F, intervention, 56m post-baseline, 405mins MVPA/week)

"I can be a bit lazy at times and I probably do need someone to push me sometimes, because it's easy to be lazy, much easier to be lazy than push yourself. There's plenty of excuses you can make… I guess a mentor is there to help you and you probably let them down a little bit if you don't - you've got a mentor, you're lucky to have one, so you should try your best to do your best for yourself and them…Oh, it's helpful because you feel I'd better do that because I know my mentor's going to ring and I'll have to disappoint them if I haven't

done it. It would also be disappointing for me to say no, I haven't done it. So, it's disappointing on two levels…" (66F, intervention, 38m post-baseline, 210mins MVPA/week)
"A mentor …waste of time… Annoying… I didn't need it… If I didn't exercise this day I knew that I hadn't. I knew that I should have. I knew why I didn't. I knew whether I could compensate in some way or not and I didn't need someone ringing me up telling me that. …she was helping me work through it, but I've got my own two feet and I can figure that out myself…" (76M, intervention, 55m post-baseline, 345mins MVPA/week)

Situation Theme and Subthemes

While "Motivation" factors appeared to be an early influence on participants engaging in PA, "Situation" factors related to the participant's context appeared to be the next important step towards "Action" in the PA program. Factors from the three subthemes could all exert positive or negative influences on participants' engagement in PA.

Environment and Time (described by 22 participants) included factors such as accessibility, safety, cost, lack of available supervision, weather and lack of time. These factors acted as both enablers and barriers to engaging in PA. The first two quotations from participants below relate to positive and negative aspects of environment on engaging in PA while the third quotation refers to the subtheme to the challenge of finding time to engage in PA.
"I live in a really hilly area. You can't get to a house without coming up a big hill in any direction. I did do gym for a fair while, and I gave up on that because it was a bit inconvenient to get to and also a bit crowded." (72M, control, 34m post-baseline, 0mins MVPA/week)
"…just going in a different direction, or down different streets, or whatever, to just vary it a bit. That, I found, was helpful, too." (68F, control, 35m post-baseline,330mins MVPA/week)
"Other things tried to interfere with it…but then, in the end, you sort of either find the time to do it or work around it. But in the beginning, it was just sort of juggling–oh, because I think in the beginning I set myself a time every day, a particular time, and then something would

come to interfere with it–and you can move that, you can do it later, do it earlier." (77F, control, 55m post-baseline, 480mins MVPA/week)

Social Aspects (described by 16 participants) related to the social and family relationships and settings of participants which could function both as enablers and barriers to engaging in PA. For example, the first quotation below relates to a participant describing their family and friends helping to motivate them to engage in PA while the second refers to the challenge of not fitting in socially which can be a barrier to engaging in PA.

"Maybe if you tell your family and friends, oh, I did do some exercise today, I did go for a walk and they say, good, your family can motivate you too." (66F, intervention, 38m post-baseline, 210mins MVPA/week)

"I just don't fit into the people that are all healthy. I just think, well, why am I with them? They're all healthy and jumping around and happy and blah, blah, blah. Then I'm not." (73F, intervention, 56m post-baseline, 405mins MVPA/week)

Ageing and Physical Health (described by 20 participants) factors generally exerted their influence as barriers to engaging in PA for participants, although some participants discussed their good health state as being an enabler. The two quotations from participants below express the challenge of ageing and physical health in engaging in PA.

"Certainly the good old arthritis takes a bit of a bite in that as well." (76F, control, 47m post-baseline, 0mins MVPA/week)

"I'm ageing obviously, you can't do the things you did when you were younger, and you can feel that drifting away. You just have to learn to cope with it." (73F, intervention, 56m post-baseline, 405mins MVPA/week)

Maintenance Theme and Subthemes

The theme of "Maintenance" related to factors that appeared to influence participants being able to continue PA in the longer-term post the INDIGO trial. The subtheme label of "Self-

efficacy" related to our qualitative analysis rather than a specific theoretical definition of the term. The analysis showed that participants who gained self-efficacy and an awareness of benefits of the PA they were doing, were more likely to maintain PA in the longer-term. Forming a PA habit so that PA became part of their lifestyle and routine also appeared influential, while for some participants, enjoyment of PA was helpful to continuing PA in the longer-term. Finally, an arrow leading from "Maintenance" back to "Motivation" was added to the "Pathway to Physical Activity Maintenance" (Figure 1) as some participants described ceasing physical activity and then may recommence this pathway.

Self-efficacy and Perceived Benefits (described by 20 participants) included participants' beliefs that they could perform the PA program and their awareness of benefits that were psychological, physical, cognitive or combinations of these. The four quotations below are examples of how developing a sense of self-efficacy and confidence in undertaking PA as well as perceiving some benefits from PA helped them to maintain PA.

"Well, it's helpful in that you're putting down what you're doing and you can see you're doing it properly and that is very satisfying to me. So, that does relieve the…anxiety at the beginning of it because I really didn't know how I was going to cope with it. But that did help. It helped my confidence certainly, both the physical confidence as well as the mental confidence of-yeah, that's all right, it's doable." (79F, intervention, 66m post-baseline, 300mins MVPA/week)

"It enabled me to feel like I'd overcome my negative thoughts about not wanting to do things." (77F, control, 55m post-baseline, 480mins MVPA/week)

"Now, I just, I still doing things, like walking and doing any physical exercise that I need to do, even if it's housework or something, gardening, whatever, that I think that those exercise are good for the rest of my body. So, it made me believe in exercise, and that's why I enjoy doing it." (81F, control, 31m post-baseline, 210mins MVPA/week)

"I impressed myself that I could do it. When I took it on I thought I'll never be able to follow this one through but I did so I was impressed with myself should I say." (86M, control, 33m post-baseline, 0mins MVPA/week)

Habit (described by 6 participants) related to the incorporation of PA into some sort of regular routine to the extent that some participants reported missing PA if they did not do it. This habit formation was reported by a number of participants as important in maintenance of PA, and the quotations below include one participant describing that they miss PA if they do not do it while another participant described that the PA became a habit for them.

"Because now if I don't do my walk, I'm aware of it and I miss it. I know I've missed my walk today or whatever." (65F, control, 49m post-baseline, 450mins MVPA/week)

"It wasn't hard because it was set in place already and it just became more of a habit for me and putting your own spin on what works for you on a daily basis. So I'd encourage anyone to do it because it's different but it's for yourself, you're doing a good thing to improve your own fitness…." (64F, control, 39m post-baseline, 135mins MVPA/week)

Enjoyment of PA (described by 4 participants) appeared to be important for some participants in maintaining PA. Some participants also reported that if their PA programs had been more enjoyable then they would be more likely to continue, as demonstrated by quotations from two participants below.

"But the walking, I actually, now, find I'm sometimes, oh, I'd like to go out. Yeah, so I think I found that I did get into a frame of mind where it was more, I'll go, because I need to, but also, because I enjoy it." (68F, control, 35m post-baseline, 330mins MVPA/week)

"I was enjoying it, so that kept me going... Well, I do like being physical but I'm not a person that's made myself stick to a routine in and out. I mean, I'm fitful. I'll do it and I'll do it for eight months and never miss a beat. Then something will happen, and I won't do it for eight months. So, I'm in and out of things. But every time I do it, I love doing it and then I wonder

when I'm doing it why I ever stopped… Well, once you start doing it and you're disciplined, you so enjoy it." (80F, intervention, 34m post-baseline, 0mins MVPA/week)

DISCUSSION

The aim of this study was to gain an in-depth understanding of the experiences of inactive older adults at risk of cognitive decline with SCD or MCI, who participated in a PA intervention trial. Overall, the 29 INDIGO follow-up participants described that the INDIGO trial was a positive experience and perceived psychological, physical and cognitive benefits from the PA intervention. The process of action in the PA program for participants appeared to involve enablers and barriers, that were reflected in two main themes, relating to "Motivation" and "Situation". Apart from "structure and accountability", these enablers and barriers were consistent with those identified in PA interventions in older adults who are not necessarily at risk of cognitive decline with SCD or MCI [11, 30].

Factors that influenced longer-term continuation of PA formed our "Maintenance" theme. It was noted that this term is also the name of one stage of change in the Transtheoretical Model of Health Behaviour Change [31], however, the term was used in the qualitative analysis to label a theme relating to longer-term engagement in PA by INDIGO trial participants. The "Maintenance" theme was of particular interest given the relatively long duration of time since commencing the PA intervention (27-66 months post-baseline). Key factors that influenced "Maintenance" of PA included "self-efficacy and perceived benefits" and "habit formation", as well as "enjoyment" for some participants. Some of these factors were supported by the results from the parent trial: levels of self-efficacy were high at baseline and increased over time; while enjoyment of the trial intervention, particularly in the initial stages, appeared important for continuing PA for the remainder of the trial [16].

There was some overlap of our findings with other studies of longer-term PA maintenance in the general population of older adults, but were not specific to older adults with SCD or MCI [12, 13]. The qualitative study by Wahlich and colleagues involved interviews of 45-75 year-old participants three years after a PA intervention and identified themes that were similar to

our subthemes of ageing and physical health, preferences and motivation, social aspects, environment and time. However, our maintenance subthemes did not overlap with Wahlich and colleagues' [12] findings and may reflect differences in perspectives with older age as INDIGO follow-up participants were aged 63-86 years, broader range of follow-up duration (up to 5.5 years), being at risk of cognitive decline with SCD or MCI, or relate to specific intervention characteristics and BCTs employed in the INDIGO trial. In contrast, our findings related to maintenance subthemes overlapped with factors identified by the qualitative study of Maula and colleagues [13]; their list of maintenance factors also included additional factors of social interaction and motivation which overlapped with subthemes of our "Motivation" and "Situation" themes, while they also identified positive feedback as an additional maintenance factor [13]. Neither of the above studies identified "structure and accountability" as a key factor, and it is possible that this factor is considered more important to older adults with SCD or MCI as it reduces the need for the individual to remember to engage in their PA program. It has been recognized that older adults with SCD or MCI may face more barriers to engaging in PA programs and benefit from adaptation of programs to their needs and preferences [7, 32].

The BCTs of goal-setting and peer mentoring were specifically investigated in the INDIGO trial. Participants generally found these techniques helpful, although there was some polarization of views, with a small number who expressed quite strong negative opinions towards these techniques. Goal-setting has been found to be the most used BCT in PA interventions for adults aged 55-70 years, although some research indicates that feedback, which overlaps with peer mentoring and support, is even more effective [33]. The polarization of views relating to BCTs is consistent with previous research that identified four different "typologies" of PA participation behavior in older adults, hence the need to tailor programs, offer a variety of activities that have some flexibility in timing [34].

Overall, our results are consistent with the findings of the aforementioned systematic review of qualitative evidence for dementia risk reduction interventions [14]. Their identified key

intervention attributes of tailored education, supporting self-regulation and social processes, co-design and tailoring to context align with our subthemes of knowledge and expected benefits, self-efficacy and perceived benefits, social aspects, preferences and motivation respectively [14].

Strengths and Limitations

To our knowledge, this study is the first that has qualitatively interviewed inactive older adults with SCD or MCI with this long duration of time after commencing a PA intervention trial. The mean duration since baseline was 3 years and 8 months (range 27-66 months). This data is particularly important given that many trials have demonstrated effective engagement in PA interventions in the short-term, but there is less guidance about longer-term engagement in PA and the factors that keep people involved. Moreover, the data are based on a sample with diversity of age, gender and current PA level.

Limitations of this study included participants' relatively high levels of education and the requirement for sufficient English language proficiency to engage in the interviews and complete outcome measures. There was also some attrition with 67% of INDIGO trial completers completing the follow-up, however this was a reasonably expected rate given the duration of time since baseline, and that advancing age is often associated with increasing disability that may make it more difficult for participants to attend. In addition, the INDIGO trial completers who participated in this study were undertaking, on average, more MVPA than those who did not participate. Despite this difference, there was a similar proportion of participants who were sufficiently (≥150 mins MVPA/week) and insufficiently active (<150 mins MVPA/week) at the time of interview.

Clinical Implications and Directions for Future Research

The study findings highlight the importance of developing self-efficacy, habit formation and enjoyment to facilitate longer-term maintenance of PA in inactive older adults at risk of cognitive decline with SCD or MCI. The results support previous findings around motivational and situational enablers and barriers to engaging in PA, with the important addition of "structure and accountability". This difference suggests that PA interventions for older adults at risk of cognitive decline with SCD or MCI will need to specifically address structure and accountability in their design, particularly as this was the most prominent subtheme in the "Motivation" theme.

For clinical practice, the BCTs of goal-setting and peer mentoring or support could be useful to many individuals, however, tailoring of interventions to individuals appeared to be important given there was sometimes polarization of opinion. Important targets for behaviour change include firstly "Motivation" focusing on providing structure and accountability, and knowledge and expected benefits that are tailored to individual preferences and levels of motivation. Once this motivation is present, optimising the "Situation" appears to be key to action on engaging in PA, including environment and time, social aspects and addressing ageing and physical health. "Maintenance" of PA once enacted is dependent on building self-efficacy and appreciation of perceived benefits of PA as well as habit formation, both of which may also be aided by enjoyment. Implicit in these findings is the value of co-design of interventions.

Future research directions include intervention trials that target self-efficacy, habit formation and enjoyment, with a view to longer-term continuation of PA as a key outcome. Research into how to effectively translate the provision of structure and accountability into the real world would also be useful. In addition, it would also be useful to interview participants in PA intervention trials at the end of the intervention and again several years post-trial, use "exit interviews" for participants who drop out trials and investigate the views of participants from culturally and linguistically diverse backgrounds.

Conclusion

To our knowledge, this study is the first to investigate factors influencing longer-term maintenance of PA in previously inactive older adults at risk of cognitive decline with SCD or MCI. It has identified key factors that can be targeted by clinicians and researchers. Overall, these findings help to bridge this important research translation gap of addressing physical inactivity as part of the research priority area of dementia risk reduction.

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Conflict of Interest Declaration:

The authors have no conflict of interest to report.

References

[1] Livingston G, Huntley J, Sommerlad A, Ames D, Ballard C, Banerjee S, Brayne C, Burns A, Cohen-Mansfield J, Cooper C, Costafreda SG, Dias A, Fox N, Gitlin LN, Howard R, Kales HC, Kivimäki M, Larson EB, Ogunniyi A, Orgeta V, Ritchie K, Rockwood K, Sampson EL, Samus Q, Schneider LS, Selbæk G, Teri L, Mukadam N (2020) Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *The Lancet* **396**, 413-446.

[2] Chong TW, Macpherson H, Schaumberg MA, Brown BM, Naismith SL, Steiner GZ, Nhmrc National Institute for Dementia Research DPSIG (2021) Dementia prevention: the time to act is now. *Med J Aust* **214**, 302-304 e301.

[3] WHO (2019) *Risk reduction of cognitive decline and dementia: WHO guidelines*, World Health Organization, Geneva.

[4] Ashby-Mitchell K, Burns R, Shaw J, Anstey KJ (2017) Proportion of dementia in Australia explained by common modifiable risk factors. *Alzheimers Res Ther* **9**, 11.

[5] Norton S, Matthews FE, Barnes DE, Yaffe K, Brayne C (2014) Potential for primary prevention of Alzheimer's disease: an analysis of population-based data. *The Lancet Neurology* **13**, 788-794.

[6] Chong TWH, Curran E, Ellis KA, Southam J, You E, Cox KL, Hill KD, Pond D, Dow B, Anstey KJ, Hosking D, Cyarto E, Lautenschlager NT (2020) Physical activity for older Australians with mild cognitive impairment or subjective cognitive decline - A narrative review to support guideline development. *J Sci Med Sport* **23**, 913-920.

[7] Chong TW, Doyle CJ, Cyarto EV, Cox KL, Ellis KA, Ames D, Lautenschlager NT, Group AR (2014) Physical activity program preferences and perspectives of older adults with and without cognitive impairment. *Asia Pac Psychiatry* **6**, 179-190.

[8] Chong TWH, You E, Ellis KA, Cox KL, Harrington KD, Rainey-Smith SR, Ames D, Lautenschlager NT, Group AR (2021) The Support Person's Preferences and Perspectives of Physical Activity Programs for Older Adults With Cognitive Impairment. *Front Public Health* **9**, 704561.

[9] AIHW, Insufficient physical activity . Cat. no. PHE 248.,Australian Institute of Health and Welfare, https://www.aihw.gov.au/reports/risk-factors/insufficient-physical-activity, Accessed 22 March 2021.

[10] Zubala A, MacGillivray S, Frost H, Kroll T, Skelton DA, Gavine A, Gray NM, Toma M, Morris J (2017) Promotion of physical activity interventions for community dwelling older adults: A systematic review of reviews. *PLoS One* **12**, e0180902.

[11] Olanrewaju O, Kelly S, Cowan A, Brayne C, Lafortune L (2016) Physical Activity in Community Dwelling Older People: A Systematic Review of Reviews of Interventions and Context. *PLoS One* **11**, e0168614.

[12] Wahlich C, Beighton C, Victor C, Normansell R, Cook D, Kerry S, Iliffe S, Ussher M, Whincup P, Fox-Rushby J, Limb E, Furness C, Harris T (2017) 'You started something ... then I continued by myself': a qualitative study of physical activity maintenance. *Prim Health Care Res Dev* **18**, 574-590.

[13] Maula A, LaFond N, Orton E, Iliffe S, Audsley S, Vedhara K, Kendrick D (2019) Use it or lose it: a qualitative study of the maintenance of physical activity in older adults. *BMC Geriatrics* **19**, 349.

[14] Curran E, Chong TWH, Godbee K, Abraham C, Lautenschlager NT, Palmer VJ (2021) General population perspectives of dementia risk reduction and the implications for intervention: A systematic review and thematic synthesis of qualitative evidence. *PLoS One* **16**, e0257540.

[15] Cox KL, Cyarto EV, Etherton-Beer C, Ellis KA, Alfonso H, Clare L, Liew D, Ames D, Flicker L, Almeida OP, LoGiudice D, Lautenschlager NT (2017) A randomized controlled trial of physical activity with individual goal-setting and volunteer mentors to overcome sedentary lifestyle in older adults at risk of cognitive decline: the INDIGO trial protocol. *BMC Geriatr* **17**, 215.

[16] Cox KL, Clare L, Cyarto EV, Ellis KA, Etherton-Beer C, Southam J, Ames D, Flicker L, Almeida OP, LoGiudice D, Liew D, Vlaskovsky P, Lautenschlager NT (2021) A Randomized Controlled

Trial on the Effects of a 6-Month Home-Based Physical Activity Program with Individual Goal-Setting and Volunteer Mentors on Physical Activity, Adherence, and Physical Fitness in Inactive Older Adults at Risk of Cognitive Decline: The INDIGO Study. *J Alzheimers Dis*.

[17] Stewart AL, Mills KM, King AC, Haskell WL, Gillis D, Ritter PL (2001) CHAMPS physical activity questionnaire for older adults: outcomes for interventions. *Med Sci Sports Exerc* **33**, 1126-1141.

[18] Marcus BH, Banspach SW, Lefebvre RC, Rossi JS, Carleton RA, Abrams DB (1992) Using the stages of change model to increase the adoption of physical activity among community participants. *Am J Health Promot* **6**, 424-429.

[19] Marcus BH, Selby VC, Niaura RS, Rossi JS (1992) Self-efficacy and the stages of exercise behavior change. *Res Q Exerc Sport* **63**, 60-66.

[20] Hill KD, Bernhardt J, McGann AM, Maltese D, Berkovits D (1996) A New Test of Dynamic Standing Balance for Stroke Patients: Reliability, Validity and Comparison with Healthy Elderly. *Physiotherapy Canada* **48**, 257-262.

[21] McCarthy EK, Horvat MA, Holtsberg PA, Wisenbaker JM (2004) Repeated chair stands as a measure of lower limb strength in sexagenarian women. *J Gerontol A Biol Sci Med Sci* **59**, 1207-1212.

[22] Podsiadlo D, Richardson S (1991) The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *J Am Geriatr Soc* **39**, 142-148.

[23] Folstein MF, Folstein SE, McHugh PR (1975) "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* **12**, 189-198.

[24] Morris JC (1993) The Clinical Dementia Rating (CDR): current version and scoring rules. *Neurology* **43**, 2412-2414.

[25] Crook TH, 3rd, Feher EP, Larrabee GJ (1992) Assessment of memory complaint in age-associated memory impairment: the MAC-Q. *Int Psychogeriatr* **4**, 165-176.

[26] Zigmond AS, Snaith RP (1983) The hospital anxiety and depression scale. *Acta Psychiatr Scand* **67**, 361-370.

[27] Hawthorne G, Osborne RH, Taylor A, Sansoni J (2007) The SF36 Version 2: critical analyses of population weights, scoring algorithms and population norms. *Quality of Life Research* **16**, 661-673.

[28] Laidlaw K, Power MJ, Schmidt S (2007) The Attitudes to Ageing Questionnaire (AAQ): development and psychometric properties. *Int J Geriatr Psychiatry* **22**, 367-379.

[29] Braun V, Clarke V (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology* **3**, 77-101.

[30] Franco MR, Tong A, Howard K, Sherrington C, Ferreira PH, Pinto RZ, Ferreira ML (2015) Older people's perspectives on participation in physical activity: a systematic review and thematic synthesis of qualitative literature. *Br J Sports Med* **49**, 1268-1276.

[31] Prochaska JO, Velicer WF (1997) The transtheoretical model of health behavior change. *Am J Health Promot* **12**, 38-48.

[32] Lautenschlager NT, Cox KL, Ellis KA (2019) Physical activity for cognitive health: what advice can we give to older adults with subjective cognitive decline and mild cognitive impairment? *Dialogues in Clinical Neuroscience* **21**, 61 - 68.

[33] O'Brien N, McDonald S, Araujo-Soares V, Lara J, Errington L, Godfrey A, Meyer TD, Rochester L, Mathers JC, White M, Sniehotta FF (2015) The features of interventions associated with long-term effectiveness of physical activity interventions in adults aged 55-70 years: a systematic review and meta-analysis. *Health Psychol Rev* **9**, 417-433.

[34] Wichmann F, Brand T, Gansefort D, Darmann-Finck I (2019) Ready to participate? Using qualitative data to typify older adults' reasons for (non-) participation in a physical activity promotion intervention. *BMC Public Health* **19**, 1327.

Supplementary Material

Table S1: Comparison of the 29 INDIGO Trial Completers who attended the follow-up study with the 14 RCT Completers who did not attend the follow-up study – baseline (V1) and 6 month (V2) data

Variable	RCT Completers who attended INDIGO follow-up (n=29)	RCT Completers who did not attend INDIGO follow-up (n=14)	T-Test (#Chi-square)	p
DEMOGRAPHIC				
Gender - Male, % (n)	35 (10)	50 (7)	#0.95	0.51
Age V1 (years) – mean (SD)	70 (6.8)	70 (5.0)	0.031	0.98
Age V2 (years) – mean (SD)	71 (6.9)	71 (5.2)	0.002	1.00
Education (years) – mean (SD)	15 (3.6)	15 (2.8)	0.011	0.99
Group of Initial Randomisation – Intervention, % (n)	41 (12)	50 (7)	#0.29	0.75
COGNITIVE AND MENTAL HEALTH OUTCOMES				
HADS Anxiety score V1 – mean (SD)	5.9 (3.1)	4.4 (3.1)	1.5	0.15
HADS Anxiety score V2 – mean (SD)	5.0 (3.3)	3.1 (2.8)	1.9	0.071
HADS Depression score V1 – mean (SD)	4.2 (3.6)	4.0 (3.5)	0.21	0.84
HADS Depression score V2 – mean (SD)	3.5 (3.0)	2.6 (2.0)	1.1	0.29
MACQ score V1 – mean (SD) (n=28, 1 missing)	28 (3.7)	29 (2.7)	-1.3	0.21
MACQ score V2 – mean (SD)	28 (4.5)	25 (3.7)	2.0	0.057
SMMSE score (spelling world) V1 – mean (SD)	29 (1.4)	29 (1.6)	1.4	0.18
SMMSE score (spelling world) V2 – mean (SD)	29 (1.2)	28 (1.9)	1.9	0.064
SMMSE score (serial 7s) V1 – mean (SD)	29 (1.3)	28 (2.3)	1.6	0.14
SMMSE score (serial 7s) V2 – mean (SD)	29 (1.2)	28 (2.3)	1.7	0.11
AAQ score V1 – mean (SD) (n=28, 1 missing)	84 (8.5)	85 (12)	-0.43	0.67
AAQ score V2 – mean (SD)	89 (11)	87 (13)	0.62	0.51
PHYSICAL FITNESS OUTCOMES				
Stage of Change questionnaire score V1 – mean (SD)	2.2 (0.4)	2.1 (0.4)	0.73	0.47
Stage of Change questionnaire score V2 – mean (SD)	4.6 (0.5)	4.6 (0.5)	0.30	0.76
Barrier Self-Efficacy questionnaire score V1 – mean (SD)	16 (5.3)	15 (5.4)	0.63	0.53
Barrier Self-Efficacy questionnaire score V2 – mean (SD)	19 (3.4)	19 (6.0)	-0.12	0.91
BMI (kg/m^2) – V1 mean (SD)	28 (4.1)	27 (4.6)	0.68	0.50
BMI (kg/m^2) – V2 mean (SD)	28 (4.2)	27 (5.1)	0.61	0.55
MVPA V1 (mins/week) – mean (SD)	52 (75)	51 (64)	0.035	0.97
MVPA V2 (mins/week) – mean (SD)	249 (145)	146 (56)	3.4	0.002*
Timed Up and Go V1 (seconds) – mean (SD)	7.0 (1.5)	6.5 (1.8)	1.0	0.32
Timed Up and Go V2 (seconds) – mean (SD)	6.1 (0.94)	5.9 (1.5)	0.44	0.66
Sit to Stand V1 (seconds) – mean (SD) (n=28, 1 missing)	11 (3.3)	9.8 (3.3)	1.1	0.26
Sit to Stand V2 (seconds) – mean (SD) (n=28, 1 missing)	8.8 (1.9)	7.8 (3.1)	1.29	0.20
Balance Step Test V1 (steps) – mean (SD)	14 (3.5)	15 (4.1)	-1.2	0.24
Balance Step Test V2 (steps) – mean (SD)	17 (2.9)	18 (4.8)	-0.90	0.37

*$p<0.05$