How Does the Understanding, Experience, and Enactment of Self-Regulation Behaviour Change Techniques Vary with Age? A Thematic Analysis

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Background: Self-regulatory behaviour change techniques (BCTs) appear less effective in promoting physical activity amongst older than younger adults. This study aimed to identify reasons for this by examining how participants of different ages understand, experience, and use these BCTs. Methods: Twelve participants (aged 39–75) in a walking intervention study were interviewed twice: immediately post-intervention and 3 months later to examine understanding and enactment of self-regulation BCTs. Thematic analysis was used, organised using the framework approach. Results: Participants acknowledged the importance of setting realistic goals and found pedometers useful. In older adults, the use of goal setting was influenced by previous experience in work settings of this BCT. Occupational status appeared to influence the participants’ responses to action planning, irrespective of age, with retired participants preferring not to restrict themselves to specific times. Self-monitoring with diaries appeared to be more useful in assisting the memory of older adults. For most BCTs, differences in understanding and enactment were apparent according to participant age. Conclusions: Problems with using self-regulation BCTs were apparent, which appeared more common with older adults. Occupational status, cognitive status, or a perceived lack of value of...
Physical activity or of some BCTs are all promising explanations that warrant further investigation.

Keywords: ageing, behaviour change, self-regulation, walking

INTRODUCTION

Physical activity is a key behaviour in preventing the development of frailty and allowing maintenance of physical and mental capability in older age (McPhee et al., 2016). Despite this, the amount of physical activity engaged in, and the desire to perform physical activity, decline with age (Department for Culture, 2011; Scholes & Mindell, 2013). For instance, recent statistics showed that whilst 15 per cent of adults aged 16–24 years in England engaged in less than 30 minutes of physical activity a week, the comparable figures were 31 per cent for adults 65–74 years, and 54 per cent for adults over 75 years (Sport England, 2017, 2017). Therefore, effective and sustainable interventions that promote physical activity are essential to reduce the negative health outcomes associated with low levels of physical activity in older age.

Interventions that include self-regulation approaches are promising candidates for increasing physical activity. Self-regulatory approaches propose that individuals are motivated to achieve a hierarchy of goals (Carver & Scheier, 2006). Self-regulation models incorporate ideas from control theory, specifically a feedback loop consisting of goal setting, recognition of inconsistencies between one’s goals and their present situation, and development of plans to decrease these consistencies (Carver & Scheier, 2006). For instance, an older person might have a goal of engaging in moderate physical activity for 30 minutes three times a week if they believe that this would enable them to achieve a valued higher-order goal, such as maintaining independence. They may then self-monitor their physical activity levels to assess whether they are meeting this goal, and act when they fail to achieve it.

There are a number of Behaviour Change Techniques (BCTs) that address self-regulatory processes, including goal setting, monitoring of behaviour, planning, and receiving feedback on behaviour. BCTs are observable and replicable components of interventions designed to change behaviour (Michie et al., 2013). A number of systematic reviews have provided evidence for the effectiveness of BCTs that address these self-regulatory processes at changing behaviour. For instance, Michie, Abraham, Whittington, McAteer, and Gupta (2009) found that interventions that integrated self-monitoring with at least one other self-regulation BCT showed a significantly higher level of effectiveness in promoting physical activity and healthy eating for non-clinical adults above the age of 18 years compared with interventions that did not consist of such techniques. Similar
results were found in a systematic review of reviews examining BCT effectiveness in dietary and physical activity interventions, with techniques such as action planning and self-monitoring highlighted as being particularly effective (Greaves et al., 2011). Other systematic reviews have similarly produced support for the effectiveness of individual BCTs that address self-regulatory processes in changing health-related behaviours, including setting behavioural goals (Epton, Currie, & Armitage, 2017), action planning (Bélanger-Gravel, Godin, & Amireault, 2011), and coping planning (Kwasnicka, Presseau, White, & Sniehotta, 2013).

Despite the general effectiveness of BCTs that address self-regulatory process, evidence is emerging that suggests that such BCTs are less effective at promoting physical activity in older adults. For instance, a systematic review of interventions to promote physical activity in adults aged 55 years or above found the BCT feedback on behaviour to be associated with increases in physical activity, but no other BCTs or the number of self-regulatory BCTs were associated with change in physical activity (O’Brien et al., 2015). Even more striking are the results of a systematic review of interventions with non-clinical community-dwelling older adults aged 60 years or over. This review showed that interventions based on self-regulatory BCTs, such as goal setting and self-monitoring, resulted in lower rates of self-efficacy and physical activity (French et al., 2014). In contrast, a similar review of BCTs associated with self-efficacy and physical activity in younger adults (Williams & French, 2011) found that the same self-regulatory BCTs were associated with larger increases in physical activity.

There is other indirect evidence that self-regulatory BCTs may be less effective with older people. For instance, a systematic review of implementation intentions on healthy eating found a lower effect in older participants (Carrero et al., 2019). Similarly, a study of implementation intentions to promote healthy eating in older women found that effectiveness was modified by executive function (Hall, Zehr, Paulitzki, & Rhodes, 2014). Executive functioning declines with age, along with many other cognitive abilities including memory, as well as the cognitive processes needed for behavioural regulation and the mental control required for effortful tasks, such as planning and inhibiting habitual reactions (Salthouse, 2010).

The failure of interventions that use BCTs to address self-regulatory processes to produce changes in behaviour of older adults has recently promoted theoretical and empirical investigations to understand this lack of success (Warner, Wolff, Ziegelmann, Schwarzer, & Wurm, 2016). Despite the interest in ageing and its correlates as a moderator of the effectiveness of BCTs targeting self-regulatory processes, there has been little qualitative research to explore the experiences of people using self-regulation BCTs in daily life. This is important as learning more about how BCTs are subjectively experienced and used by participants of different ages may provide insights into their reduced effectiveness in older participants. The use of qualitative methods also allows examination of the experience of these BCTs in settings with greater external validity. In line with
this reasoning, the Medical Research Council (MRC) for evaluating complex interventions has recommended the use of qualitative methodology to better evaluate participants’ experiences and understanding of techniques learned in interventions (Moore et al., 2015).

To address this lack of qualitative research into people using self-regulatory BCTs in everyday life, the present study reports a secondary analysis of qualitative interviews collected from the fidelity assessment (Williams et al., 2020) of a feasibility study of a walking intervention delivered to participants by nurses or healthcare assistants in seven general practice surgeries (French et al., 2011). The intervention used various self-regulatory BCTs, including goal setting, self-monitoring, action planning (identifying when, where, how, and with whom to perform the behaviour), and supportive planning (identifying factors that would facilitate the behaviour implementation; French et al., 2011). An earlier version of this walking intervention had previously resulted in large increases in objectively assessed walking among middle-aged adults (Darker, French, Eves, & Sniehotta, 2010; French, Stevenson, & Michie, 2012). However, when an updated version of the intervention was delivered to participants with a mean age of more than 55 years, there were no significant increases in walking behaviour compared to the control group, over a 6-month period (Williams et al., 2015). The apparent sensitivity of this intervention to participant age therefore provided an opportunity for understanding why self-regulatory BCTs may be less effective in older populations.

The aim of the present study was therefore to investigate participants’ understanding, experiences, and enactment of self-regulatory BCTs, and to consider how these differ according to age.

METHOD

Design

A longitudinal qualitative design was used, consisting of semi-structured interviews with participants on two separate occasions: shortly after completing the second session of the walking intervention (time-1 interview) and 3 months later (time-2 interview) (see Figure 1). The data collection was nested within a larger feasibility study (see Figure 1).

Participants

The participants were patients from seven general practices in two adjacent regions of the United Kingdom (Coventry and Warwickshire), who were participating in the feasibility study of a walking intervention. The inclusion criteria for this were as follows:
Self-regulation walking intervention \( (n = 12) \)

First intervention session (week 1)
Session consisted of the following:
• Baseline assessment of current walking levels using the pedometer
• Questionnaires and worksheets to enhance walking self-efficacy were used
• Goal setting and action plans

Second intervention session (week 2)
Session consisted of the following:
• Increasing goals and reviewing action plans
• Using supportive planning and diaries

Time-1 interviews shortly post the second intervention session \((n=12)\)

Time-2 interviews 3 months’ post intervention \((n=12)\)

End of intervention

FIGURE 1. Timeline of intervention sessions and interviews for participants in the present study.
(i) Diagnosed with at least one chronic disease, for which physical activity is beneficial to their health, including type 2 diabetes, pre-diabetes, lower back pain, fibromyalgia, coronary heart disease, cardiovascular disease, osteoporosis/osteoarthritis, hypertension, hypercholesterolemia, or obesity/overweight

(ii) Classified as sedentary, due to a failure to satisfy the recommended levels of physical activity, amounting to 30 minutes a day at least five times a week

(iii) Absence of any learning disabilities or mental health problems

The participants of the present interview study were a subset of the 59 participants who completed both intervention sessions (out of 66 participants who initially consented, with seven then not finishing both sessions). Thirteen of these participants were invited to take part in longitudinal interviews. Purposive sampling ensured at least one participant from each of the participating general practice surgeries, with further sampling selecting variability of patients in terms of age, gender, and presence of health conditions.

Procedure

Ethical approval of the present research was provided by the Warwickshire Local Research Ethics Committee (Ref: 09/H1211/56). All participants consented separately to participation in the intervention study to increase their walking, and further consented to be interviewed. All patients were interviewed in their own homes or at their local general practice in Coventry or Warwickshire. Interviews were conducted in a face-to-face setting within 1 week of the participants receiving the second intervention session. This was in order to reduce the possibility of recall issues. All interviews with the participants were audio-recorded and transcribed verbatim.

Materials

The Intervention. The intervention was delivered by two practice nurses and six healthcare assistants to patients in their own practice, over two sessions. Session one consisted of techniques to enhance self-efficacy, including prompting focus on past success, and the self-regulation techniques of goal setting and action planning. Self-monitoring techniques, including diaries and pedometers, were provided at the end of the session. Session two included provision of feedback, revision of progress on using goals and action plans, and supportive planning. Supportive planning is a form of coping planning, but with a greater emphasis on increasing supportive factors, rather than overcoming barriers to achieve the goal (Darker et al., 2010). A fuller description of the intervention is provided elsewhere (French et al., 2011).
Table 1 represents the self-regulatory BCTs that are the focus of this current research: goal setting, action planning, supportive planning, and self-monitoring, alongside other techniques of the walking intervention that were not adopted in the present study. The study focused on these four techniques because they were considered to be self-regulatory BCTs, and the interviews included sufficient data about them.

**Interview Schedule.** The first interview schedule (Appendix A: see electronic supplemental file 1) covered participants’ experience of the intervention, such as their understanding of the intervention resources and techniques; their experience with the intervention providers; and their view of the intervention resources. The second interview schedule (Appendix B: see electronic supplemental file 2) concentrated on assessing the participants’ enactment of the skills developed in the intervention; their perception of the intervention’s effectiveness; and their general impression of the intervention. These topics reflect the primary interest of the interview schedules, which was to assess intervention fidelity (Bellg et al., 2004).

**Data Analysis**

The interviews were analysed using Thematic Analysis (Braun & Clarke, 2006), with data structured using the Framework Approach (Gale, Heath, Cameron, 2008). The definitions of BCTs based on the CALO-RE taxonomy are presented in Table 1.

### TABLE 1
The Definitions of the BCTs Based on the CALO-RE Taxonomy

| BCTs                                      | Definition of the BCTs                                      |
|-------------------------------------------|------------------------------------------------------------|
| Intervention techniques included in the present study |                                                       |
| Goal setting                              | Making a behavioural resolution (e.g. doing more exercise) and to make a decision of either changing or maintaining a change. |
| Action planning                           | Creating detailed plans of how the individual will achieve the goal in terms of when and where to act, as a minimum. |
| Supportive planning                       | Developing helpful factors that would assist the individuals to apply their health-related plan and generate ideas for how they could achieve these factors successfully. |
| Self-monitoring                           | Prompting individuals to monitor their own behaviour.      |
| Intervention techniques not included in the present study |                                                       |
| Prompting focus on past success           | Asking the participant to think of previous successful experiences when performing the behaviour. |
| Providing feedback                        | Providing participants with feedback related to their self-monitoring records and progress on goals and action plans. |
| Reviewing behavioural goals and plans     | Reviewing whether previously set goals were attained.     |

**Note:** The BCTs are described using the definitions of the BCTs in the “Coventry, Aberdeen & London – Refined” (CALO-RE) taxonomy (Michie, Ashford, Sniehotta, Dombrowski, Bishop, & French, 2011).
Rashid, & Redwood, 2013). The framework approach was appropriate because it facilitates the management of large datasets and the use of deductive and inductive approaches to analysis (Ritchie & Spencer, 1994).

The decision on conducting the present analysis was informed by the process of conducting the primary analysis, which focused on fidelity issues (Williams et al., 2020) that suggested that the present analysis may be worthwhile. A preliminary step in the present analysis was the examination of the interviews by DF to ensure that there would be sufficient material present to achieve the present study aims. The main analysis was then undertaken by RB.

A hybrid inductive-deductive approach was taken with the framework analysis. An initial analytic framework was developed by inductively coding eight materials from eight transcripts (four from each time point) that related to the aim of the present research. This initial framework was refined following discussions between the first and second authors, to produce five categories (Appendix C: see electronic supplemental file 3). All transcripts were then indexed by coding them using the categories in this initial framework. Codes from both time points were combined into a single matrix to enable consideration of the ways in which participants’ understanding of the self-regulatory BCTs influenced the enactment of these BCTs. Such links over time were not a feature of the present analysis.

The data within each category in the matrix were then thematically analysed; initially analysis considered only data within each category, but then links were made across categories, where appropriate. Once the themes had been developed, the data within each theme were interrogated to examine whether there were any differences in participant age bearing upon the participants’ understanding, experience, and enactment of self-regulatory BCTs. Age was initially examined as a continuous variable, but as the analysis progressed, it became clear that it was useful to dichotomise the participants into different age groups. Further, as the analyses developed, it became apparent that employment status was a useful additional variable, and due to this inductive insight it was incorporated into the analysis.

RESULTS

Out of the 13 purposively recruited participants, one could not take part in the interviews due to sickness. Therefore, 12 participants were interviewed twice (six males; six females), aged between 39 and 75 years (M = 58 years; SD = 8.5). Table 2 provides demographic information on all the participants. The participants varied in occupational status, with five participants retired. The time-1 interviews lasted between 25 minutes and 111 minutes (M = 62 minutes; SD = 24), and the time-2 interviews lasted between 18 minutes and 70 minutes (M = 44 minutes; SD = 36). The thematic analysis produced four themes.

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Being Realistic

The majority of participants seemed to understand the importance of setting goals that they could achieve. One strategy that most of the participants adopted was to aim for a lower goal than they anticipated achieving, to lessen the chances of failing to achieve their goals, and any additional walking was a bonus.

I just want to be realistic with the targets and in fact I’d probably go a bit under so it makes me look good because then I’ve achieved a lot more!

(Ajay, 47 years, time-1 interview)

She’s said do you want to increase [the goal] and I said no because you know I’d rather set myself something that I know I’m able to achieve and if I go above it then to me that’s a bonus.

(Dana, 52 years, time-1 interview)

### TABLE 2
Demographic Information of Participants in the Present Study

| Patient pseudonyms/ Number | Gender | Age | Health condition | Ethnicity | Occupational status | Educational level |
|----------------------------|--------|-----|------------------|-----------|---------------------|------------------|
| Dana (P1)                  | Female | 52  | Hypertension     | British white | Unemployed         | GCSE or equivalent |
| Jean (P2)                  | Female | 64  | Diabetes/Asthma  | British white | Retired            | Degree            |
| Jack (P3)                  | Male   | 75  | Hypertension     | British white | Retired            | Degree            |
| Peter (P4)                 | Male   | 52  | Hypertension     | British white | Part-time employment| A-level           |
| Ajay (P5)                  | Male   | 47  | Diabetes         | Asian      | Self-employed      | Postgraduate      |
| Martin (P6)                | Male   | 64  | Pre-diabetes     | British white | Self-employed      | A-level           |
| Christine (P7)             | Female | 61  | Hypertension     | British white | Retired            | GCSE or equivalent |
| Danni (P8)                 | Female | 39  | Asthma           | British white | Unemployed         | Education not known |
| James (P9)                 | Male   | 62  | High cholesterol | British white | Retired            | Degree            |
| Max (P10)                  | Male   | 56  | Heart disease    | British white | Part-time employment| A-level           |
| Maggie (P11)               | Female | 64  | Hypertension     | British white | Full-time employment| Education not known |
| Ruth (P12)                 | Female | 65  | Diabetes Chronic kidney disease Hypertension | British white | Retired            | No qualifications |
Martin was the only participant who set a goal that exceeded his baseline walk by 30 minutes, rather than the 5 or 10 minutes suggested by the healthcare assistant. Although his goal was reasonable for him, his rationale was that, even if he walked less than the 60 minutes that he aimed for, it would still be better than achieving a lower initially proposed goal. Martin’s background in sales and management appeared to have influenced his goal setting skills.

[The healthcare assistant] was saying, yeah you’re doing 30, where do you want to set the target? 35–40. Well, I’ve been in sales and marketing for 40 years. So you know, if you gonna go for targets set a reasonable target. If you don’t set a reasonable target you have got nothing to aim for. So if I aim for 60 and I did 50 than I’m 20 min better off.

(Martin, 64 years, time-1 interview)

Age differences were identified when looking at the rationale behind the participants setting achievable goals. Previous work experience of goal setting was one of the most frequently reported reasons for setting goals among the participants aged over 60 years, as was the case with Martin. Such experience seemed to enhance participants’ awareness that setting unachievable goals could elicit negative feelings, such as disappointment or the likelihood of abandoning the goal.

I do realise that, from my own past experience in teaching, that you have got to have achievable goals. It’s no good giving yourself goals that you are going to fail at because that is when you give up.

(Jean, 64 years, time-2 interview)

In a lot of jobs if you’ve got a target you, psychologically, you’re encouraging yourself to try and achieve it and you don’t want to be disappointed in yourself for failing to achieve it.

(James, 62 years, time-1 interview)

By contrast, participants under the age of 60 years appeared to consider their goals and plans in terms of sustainability of the behaviour change in the long term. They also appeared to consider their work demands when developing their goals and ensured that these goals would fit into their busy work routine.

[The plan has] got to be something that I’m going to be able to do. It’s no good, you know, starting it and not finishing it because, you know, this isn’t a sort of a six months thing, this is sort of a lifetime thing.

(Max, 56 years, time-1 interview)
I know what my next couple of weeks are going to be like and it’s going to be pretty sedentary because I’m going to be doing decorating, so I said I don’t want to sort of push [the goal] anymore because I know I’m not going to be able to do it.

(Ajay, 47 years, time-1 interview)

Time Flexibility

Participants had different attitudes to time, which seemed to be influenced by their occupational status. Those in full- or part-time employment appeared to understand the concept of an action plan as a technique to help them accommodate their walking goals in their work routines, such as at lunch time at work. They frequently reported the availability of suitable places for walking around their workplace, which seemed to further facilitate the achievement of their walking goals.

[The action plan] fell into two categories really. One was that, at lunch times at work, I would go out somewhere because where I am in [town] there are very various parks and lakes and stuff that you can walk around.

(Peter, 52 years, time-2 interview)

So then I would go and just go for a walk round a sort of certain estate or circuit and actually do that walk. So that would take me an hour so I actually did plan it – well it’s my lunch break I’ll go and have a quick walk

(Maggie, 64 years, time-2 interview)

Moreover, some of the employed participants referred to the importance of time prioritisation when planning their walks. This was apparently important to Max because he had other commitments during the day that distracted him from taking his walk.

The first thing I do once I’ve got up in the morning and that is go walking, whereas I might have said well I’ll get the kids up and I’ll make sure they’re all ready to start going to school and I’ll go for a walk when I drop them off at school… But if I’d said that I’d have thought of a million other things I could do on the way home.

(Max, 56 years, time-2 interview)

Retired patients above the age of 60 years did not seem to consider the action planning technique as important, with the majority making only loose action plans, and preferring to walk as the mood took them during the day. It seemed that, due to the greater availability of time experienced during retirement, these participants did not wish to restrict themselves to specific times for their walks during the day, as it could have infringed upon the convenience of these walks.

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I found [the action plan] a little bit restrictive, because I’m retired and really my time is my own, . . . I sort of put down, oh I will go out at that time . . . but I would rather have not have done that, and on the next one I put when convenient and I found that a lot better.

(Christen, 61 years, time-1 interview)

see my action plan to achieve these are well when, whenever I feel like it in the day, where, so far, mainly in the local area around the house, with whom, on my own, it was a sort of, there was no sort of action plan really.

(Jack, 75 years, time-1 interview)

Even when the participants aged over 60 years applied the action planning technique to other contexts in their lives, they demonstrated the initial usefulness of the technique, with limited enactment in the long term. For instance, Jean used the action planning technique to make dietary adjustments and linked this to her diabetes management: a use of the action planning technique for other behaviours was not an intended effect of the intervention. However, in the long term, Jean found that recording her walks and dietary adjustments was time-consuming and so she did not continue using the technique.

My action plan was to come up with a table of what I was going to do and I was also to record my walking and to record what I am eating as well linked to my diabetes. In the end I did make a start on that but I thought I was spending so much time on this I could have been out walking, so that got abandoned.

(Jean, 64 years, time-2 interview)

Although this theme showed a role of age in influencing the patients’ responses to the action planning technique, the role of occupational status also seemed to influence the participants’ use of the technique irrespective of their age.

Complexity

The participants seemed to find the supportive planning technique overly complex. This BCT involved identifying factors that could facilitate behaviour change, and then putting these in place (e.g. asking a partner to cook dinner to allow more time for physical activity). Older participants, in particular, appeared to find this BCT to be burdensome, and this burden was manifested in several ways. First, some participants demonstrated limited ability to distinguish between the supportive planning and other BCTs used in the intervention:

I think [the supportive plan] was basically keep to the plan, like I told you before it’s to get what I’m going to do in the house done, then have a shower and just go.

(Ruth, 65 years, time-1 interview)
I think [the supportive plan] was the same as the time before because I remember
she said to me now how are you going to achieve it and I said just be organised.
(Maggie, 64 years, time-1 interview)

Other older adults admitted that they could not recall this technique: “I cannot
remember [the supportive plan]” (Jean, 64 years, time-1 interview); “[the sup-
portive plan is] not ringing bells” (Christine, 61 years, time-1 interview). By
contrast, whilst many of the participants under the age of 60 years recalled the
supportive plans, they often struggled over filling them out, and could not think
of possible ways of achieving their walking goals more easily.

I did find it bloody hard to think of what to write on [the supportive plan] I really
did. It was, what you know, what do you need to do it. And I thought, well I don’t
need anything, I mean I just, you know when I wake up in the morning I can do it.
I really did struggle there.

(Max, 56 years, time-1 interview)

I couldn’t really think of anything different to, umm. I think I struggled on [the
supportive plan].

(Dana, 52 years, time-1 interview)

Cognitive Usefulness

Cognitive usefulness represents the cognitive benefits that the participants gained
when using the self-monitoring techniques, such as pedometer and diaries. For
instance, participants of all ages frequently reported the role of self-monitoring
techniques in raising their awareness of the amount of walking that they did. In
particular, pedometers were useful for providing objective feedback, which
appeared to help the participants better understand their performance. They also
appeared to enable participants to compare the pedometer’s feedback with their
overall weekly walking performance.

Having the pedometer was very good at letting, you know giving me feedback
which told me that some of the walking I did was actually not particularly energetic
and therefore useful to get about.

(James, 62 years, time-2 interview)

I’m a person that likes to measure things and I found the pedometer quite interest-
ing really, although I think I only got feedback off it once.

(Max, 56 years, time-2 interview)

Additionally, the pedometers appeared to increase the participants’ sense of
self-monitoring because they acknowledged that a pedometer provides objective
results, which reduces the possibility of cheating on recording one’s own walking.

[The pedometer] encouraged you to actually do this, simply because it was a monitoring device. There was no way you could cheat an electronically device as such.

(Ajay, 47 years, time-2 interview)

When I had [the pedometer] on then I knew that I was actually doing it and it was being monitored. But you could have fibbed your way through it if you hadn’t got the monitor on couldn’t you?

(Maggie, 64 years, time-2 interview)

The age differences in this theme appeared in relation to the participants’ experiences with diaries. Participants above the age of 60 years found the diaries useful in assisting their memory. It appeared to remind them at what times they did their walks.

If you said to me, when did I do Monday or when did I do Tuesday: I can’t remember. I go and look at the log [the diary] and I say oh yeah I did that.

(Martin, 64 years, time-1 interview)

I think [the diary] is a valuable reminder because it improves your awareness of the good habits of walking. Because, like anything else, when it is missing, you don’t always notice it is missing until it has been missing a while.

(James, 62 years, time-2 interview)

However, the majority of the participants aged over 60 only used diaries at the beginning of the intervention, despite their understanding of their usefulness. For one participant, this limited enactment seemed to be related to external barriers, such as being too busy.

[Action planning and diaries] probably were initially helpful that I had to record how I had achieved and how much I had achieved, . . . I think that it did me good, and it sort of backfired or fired on to the next few weeks. . . . quite often I have been busy and maybe the walking had to take a back seat.

(Jack, 75 years, time-2 interview)

Well I think I did [the diary] for about a month and then for the last two months I am afraid I didn’t do that and realise that I should be.

(James, 69 years, time-2 interview)

By contrast, participants under the age of 60 years did not appear to perceive the diaries as useful, either because they did not adequately capture context in
relation to their goal achievement, or because they tended to remember how many walks they had taken.

[The diary was not helpful] because the overall context was missing . . . just knowing that yesterday you did five minutes, today you did ten minutes, okay that is interesting: I have done five minutes more than the day before. What does that mean? If I carry on at ten minutes, is that any use?

(Peter, 52 years, time-2 interview)

[The diary] wasn’t great for me, I didn’t feel it was necessary. I have got a bit of a mental clock that tells me that I have done what I have got to do, and yeah it wasn’t overly necessary.

(Max, 56 years, time-2 interview)

DISCUSSION

The majority of the participants acknowledged the importance of setting realistic walking goals, with the use of goal setting influenced by previous experience in work settings for older adults, whereas younger adults were more focused on fitting goals around their existing work schedules. Occupational status appeared to influence the participants’ responses to the action planning technique, irrespective of chronological age. The retired participants preferred not to restrict themselves to specific times, whereas the employed participants benefited from using the technique to find time for their walks. Cognitive burden appeared to be a general issue associated with the supportive planning technique, but older participants seemed less able to differentiate between supportive planning and other BCTs, whereas many younger participants found it difficult to come up with ideas when filling out the supportive plans. Although the diaries appeared to be more useful in assisting the memory of older adults, the majority of participants showed limited long-term enactment of diaries, irrespective of chronological age.

Strengths and Limitations

Qualitative studies of interventions being conducted with members of the general public in their own communities are ideally suited to shedding light on why interventions that show promise in laboratory studies work less well when implemented in less tightly controlled settings. To the authors’ knowledge, this is the first study to qualitatively investigate how participants understand and experience self-regulatory BCTs with particular regard to the role of age differences. A key strength of the present study was the inclusion of participants across a wide age range, which enabled a more exploratory approach to identifying similarities.
and differences in the understanding and enactment of self-regulatory BCTs amongst the participants. Another key strength is that the study covered a number of self-regulatory BCTs.

Limitations include the present study involving a secondary analysis of interviews that were not collected for the purpose of the present analysis, which meant that it was not possible to explore the participants’ enactment of all the selected self-regulatory BCTs, such as self-monitoring using the pedometer. Additionally, it is unclear whether the participants would have had similar or different experiences of using other self-regulatory BCT techniques, such as receiving feedback. A third limitation is that it is often not clear whether the differences observed between younger and older adults were indeed due to age, or to occupational status, or to extent of cognitive capabilities/decline.

Relationship to Previous Research

The present study found that, whilst goal setting was a generally popular and well-understood BCT, there were differences between older and younger adults in terms of why realistic goals were considered important. Adults under 60 years appeared to set realistic goals due to their consideration of their present work demands that may interfere with goal fulfilment. They also appeared to think of goals in terms of maintenance of healthy habits over a longer perspective. By contrast, these older adults tended to emphasise how previous experiences of setting unrealistic goals could elicit negative feelings or increase the likelihood of abandoning the goal.

These age-related differences are in line with socio-emotional selectivity theory, which suggests that older adults are more likely to prioritise activities that benefit their short-term emotional states, whereas younger adults are more motivated by longer-term goals (Carstensen et al., 1999). They therefore support explanations for the possible reduced effectiveness of self-regulatory BCTs in older adults as arising from age-related reductions in the perceived value of physical activity (Devereux-Fitzgerald, Powell, Dewhurst, & French, 2016; McGowan, Devereux-Fitzgerald, Powell, & French, 2018). This study also provides evidence to support a role of age-related cognitive decline in potentially reducing the potential effectiveness of self-regulatory BCTs. This was seen both in terms of older adults appearing to understand the more complex techniques less well than younger adults, and also in terms of them finding diaries more useful in assisting memory than the younger adults. This appeared to stem from various reasons, such as a lack of understanding of how the diary could help achieve health outcomes, resulting in a lack of effort invested in such self-monitoring strategies. This explanation fits with the generally observed decline in cognitive abilities with age, which includes functions such as memory as well as the cognitive processes needed for behavioural regulation and the mental control required for effortful tasks, such as planning and inhibiting habitual reactions.
The present research indicates that the subjective experience of using complex BCTs fits with the objectively observed decline in cognitive processes required.

Evidence for age- or occupation-related reductions in the acceptability of self-regulatory BCTs was also found in participants’ reactions to action plans. In particular, the retired participants aged over 60 years did not perceive action plans to be useful, as they did not wish to restrict themselves to particular times for their walks. This finding is consistent with previous qualitative evidence, which found that a sample of participants aged over 60 years who were mostly retired demonstrated low acceptability of the action planning technique, as they appeared to prefer more flexible plans to suit their spontaneous lifestyle (Arnautovska et al., 2017). This was true even when they used planning techniques that ensured that their plans were flexible (Arnautovska et al., 2017). This also resembles findings from a RCT that highlighted older participants’ refusal to use planning techniques, due to their preference for flexible time management and less rigid plans for their physical activities (Warner et al., 2016). Similar findings were obtained for supportive planning: participants aged over 60 years, in particular, seemed to find it difficult to differentiate between supportive plans and other BCTs, whereas participants under 60 years found it difficult to think of factors to facilitate their adherence to walking goals. This may be due to this BCT requiring the complex mental operations of mentally rehearsing factors that facilitate behaviour (e.g. fewer childcare commitments), as well as which other behaviours could facilitate these factors (e.g. discussions with spouse). These difficulties experienced over supportive planning in the present study appear to be in line with the experience of older adults when attempting to use a coping planning technique in a previous experimental study (Ziegelmann, Lippke, & Schwarzer, 2006). The supportive planning technique is essentially similar to coping planning but with a focus on factors that support the behaviour rather than factors that inhibit it (French et al., 2011).

The present study makes two further contributions to the literature. Firstly, it suggests that occupational status may be as important as age in influencing the use of action plans. Specifically, participants in full-time and part-time jobs appeared keen to find time for their walks, and the action plans supported them in this, irrespective of age. This may be because employed individuals are often restricted in the amount of free time they have for physical activity (Fountaine, Piacentini, & Liguori, 2014). Therefore, the use of action plans may make it clearer to participants how their goals can fit into their daily routines. Secondly, the apparently limited enactment of the action planning technique among older adults aged over 60 years seemed to be due to the participants’ perception of walking as part of their daily routine, which did not require any planning. This indicates that the enactment of the action planning technique may be influenced by other variables, such as habit formation. Therefore, it is possible that the

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enactment of the action planning technique might become more limited, once individuals have habituated to their health behaviour.

**IMPLICATION FOR PRACTICE**

Interventions that contain BCTs that address self-regulation appear to be less effective for older adults than younger adults (French et al., 2014; O’Brien et al., 2015). This appears to be at least partly due to many of these BCTs being unacceptable to older adults (Devereux-Fitzgerald et al., 2016). The results of the present study suggest that the widespread acceptability of the BCTs of goal setting and self-monitoring with pedometers supports their use with participants of varying ages. By contrast, caution should be applied in using BCTs such as action planning with retired patients above 60 years, as the participants of this age in the present study perceived it to be a restrictive strategy, which limited their enjoyment of walking.

The main practical implication of these results is that it would appear helpful to provide support in the use of some BCTs, especially those that involve greater cognitive complexity such as supportive planning/coping planning, as participants seemed to experience difficulties in this area. This may consist of help from those who are delivering the interventions, or adaptation in the instructions used, to allow greater flexibility of the plans being developed. Therefore, future interventions that incorporate the supportive planning technique could benefit from breaking down the questions into smaller elements, with the aim of stimulating ideas for facilitating physical activity. The need for such help appears more acute for older adults, but there is evidence that younger adults would also benefit from this kind of adaptation of common BCTs.

**Future Research**

Although the present research has highlighted apparent differences between younger and older participants in the understanding and enactment of BCTs to promote self-regulation, it is unclear whether employment status and cognitive capability are more important than age per se in influencing how individuals understand and enact self-regulatory BCTs. It is important to now establish whether some BCTs would still be appropriate for older adults still in work or, by contrast, whether the same BCTs would not be appropriate for younger people who are out of work. Further investigation of how each of these variables relates specifically to acceptability is also warranted.

Second, although the present research addressed several BCTs, it would be useful in future qualitative research to focus on a greater variation self-regulatory BCTs, and possibly combinations of self-regulatory BCTs, in order to capture a wider range of experiences related to the participants’ understanding and enactment of such techniques. Similar work using experimental methods with
combinations of self-regulation BCTs in older populations would also be useful. However, much research with older adults currently includes younger older adults, and those who are functioning well. Such future quantitative research would be most valuable if conducted with adults who are at least 65 years old, and with a range of functioning and deprivation characteristics, to allow these to be investigated alongside factors such as employment status and cognitive abilities.

The main aim of future research in this area should be to identify which self-regulatory BCTs are suitable for which populations. It would also be useful to consider in more depth the extent to which the delivery of self-regulatory BCTs enhances their effectiveness. The development of methods of delivery that minimise memory and other cognitive demands would allow older adults to derive a fuller potential benefit from self-regulatory BCTs than is currently the case.

CONCLUSION

The present study found evidence for age-related variation in understanding, experiencing, and enacting self-regulatory BCTs, although other factors, such as cognitive ability and employment status, seemed to contribute to this pattern. It is recommended that future research explores strategies that will facilitate usage of BCTs, as this could enhance the sustainability of behaviour change.

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**SUPPORTING INFORMATION**

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix S1. Time-1 Interview Schedules.
Appendix S2. Time-2 Interview Schedules.
Appendix S3. Analytical framework.