

Bridging the gap between goal intentions and actions: a systematic review in patient populations

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Abstract

Purpose: To evaluate the evidence for the effectiveness of *if-then* implementation intentions (*if-then* plans) in adult patient populations. Outcomes of interest included adherence, goal pursuit and physical health outcomes.

Method: Keywords were used to search electronic databases without date or language restrictions (up to 30/4/14). Studies were included if they 1) concerned a patient population; 2) used *if-then* plans as a sole intervention or as part of treatment, therapy or rehabilitation; 3) if they were randomised controlled trials. The PEDro scale was used to evaluate study quality. Guidance as set out by the Cochrane Collaboration was used. Two reviewers independently extracted data, discrepancies were discussed and if required referred to a third reviewer.

Results: 18 of 2,141 articles were identified as potentially relevant and four studies of people with epilepsy, chronic back pain, stroke and obesity met the inclusion criteria. People who form *if-then* plans achieved better outcomes on epilepsy and stroke medication adherence and physical capacity than controls.

Conclusions: Of the four studies that used an *if-then* plan only one, with people with epilepsy, looked at the intervention as a stand-alone strategy. Further research needs to explore if this simple approach improves rehabilitation outcomes and is a helpful and feasible strategy for people experiencing disabilities.

Introduction

A key aspect of effective rehabilitation practice involves the development of rehabilitation goals or anticipated rehabilitation outcomes to help focus rehabilitation interventions and processes as well as home programmes [1, 2]. Rehabilitation goals support people in taking part in activities that are meaningful and enhance patients' motivation to work on goal directed activities (or goal intentions) [1, 3]. In fact, most human behaviour and activity is goal directed [4] and success in achieving desired goals are determined by the person's skills in regulating cognition, emotions and behaviour [5-7]. However, this process is complex and difficult for people in the context of rehabilitation [7-9], particularly in the face of chronic disabling conditions where we hope that goal directed activities are sustained in the longer term [10]. Indeed, the steps involved in achieving goals, such as doing one's exercises or completing other goal related tasks, can be compromised by disruption to patients' mood, cognition, motivation, a loss of purpose, or sense of self/meaning that can accompany brain injury and other symptoms inherent in the condition, such as fatigue [11, 12]. These factors are particularly crucial in neurological populations where impairments in executive functioning may have compromised core skills associated with regulating one's own behaviour, cognition and emotion [8, 13]. For example, people with neurological impairment often get side-tracked or forget what they had planned to do, have difficulties with the skills associated with motivation, find their goals unachievable or too challenging, or experience other priorities on their time [8, 13]. Environmental factors can also impact on function [14]. For example, rain and snow may deter people to practise their walking outdoors and inaccessible gym facilities may prevent people from using them.

People in the general population also experience self-regulatory problems in their goal striving, such as failing to start, getting derailed, or being influenced by negative states [15-

17]. Indeed, most social psychological theories (e.g. Theory of Reasoned Action, Theory of Planned Behaviour, Attitude-Behaviour Theory, Protection Motivation Theory) propose that the most important and immediate predictor of someone's goal-directed behaviour is his/her intention to perform it [18]. However, research has shown that having intentions to work towards a goal only moderately predicts the actual goal directed behaviour in the general population (28% of variance explained) [18]. In other words, often the very best intentions to do something (e.g. a home exercise programme) do not translate into the desired action. This is commonly referred to in the behaviour change literature as the 'intention-behaviour gap' [18]. Theoretical frameworks and related strategies seeking to address the 'intention-behaviour gap' are therefore receiving growing attention [13]. One such strategy is that of forming or operationalising 'implementation intentions'. Whilst goal intentions specify what people want to do within a certain time period in order to achieve goals, specifying implementation intentions (e.g. action plans) refers in more detail to the when, where, and how of future action [19]. Thus, implementation intentions pre-specify behaviours one will perform in the service of goal attainment and makes explicit the situational context in which one will enact it [15]. Gollwitzer [16] operationalised implementation intentions as '*if-then*' plans: plans linking two steps:

1. **Situational cues**: '*If*' - good opportunities to act, critical moments
2. **Contextualised responses**: '*Then*' – specific steps required to be effective in attaining goals or desired outcomes [16, 17, 20, 21].

If-then plans are intended to enable people to deal more effectively with self-regulatory problems that might undermine goal striving, and in doing so increase the rate of goal attainment [15, 20]. *If-then* plans are constructed relating to the specific nature of the difficulty (e.g. failing to get started, getting derailed, and overcoming environmental barriers). For example, if trying to overcome one's initial reluctance to work on a mobility

goal, an intention-to-act goal ('to walk to the end of the street and back twice a week') would be rephrased to be an *if-then* plan as: 'If it is 9am on Tuesday or Thursday *then* I will walk to the end of the street and back'. To avoid being derailed from enacting the plan, say as a consequence of detrimental self-states (e.g. feeling anxious), a second *if-then* plan might state 'If I start to feel anxious about going for a walk *then* I will remind myself that in the past walking has made me feel good'. Similarly, *if-then* plans can be developed to manage possible adverse contextual influences (e.g. 'if it is raining when I am scheduled to go for a walk, *then* I will drive to the local shopping mall and I will walk from the supermarket to my favourite clothes shop and back again).

If-then plans are shown to operate through making pre-rehearsed cues/mental representations accessible [16, 22], enabling a strategic automaticity of response in certain situations which negate the need to deliberate, helping one to be prepared and act quickly [23]. Of particular note, experimental research has shown that implementation intentions structured in the *if-then* format are more effective in achieving goal pursuit than when they are formulated without these specific words [24].

Extensive experimental research conducted with the general population (mostly students) has shown that the use of *if-then* plans significantly increases performance and outcome when compared to control groups (e.g. in goal attainment, initiation of goal striving, shielding of on-going goal pursuit from unwanted influences) [17, 22, 25-28]. In health promotion studies of healthy eating, smoking cessation and physical activity, making *if-then* implementation intentions results in significantly better translation of goals into action and better outcomes than when compared to control groups [29-38]. However, many of these studies also used additional strategies (e.g. a pen and paper task [31], mental contrasting [37], mobile message

reminders [35, 36], a pedometer [29]), which can confound the true influence of implementation intentions.

As outlined above people with disabling conditions can experience additional difficulties in goal striving. Therefore, as part of our on-going research in the evaluation of innovative strategies to enhance patient engagement in their rehabilitation [39-43] we were interested in exploring the extent to which implementation intentions in the specific form of an *if-then* plan had been tried and tested in patient populations. The aim of this systematic review was to evaluate the evidence for the effectiveness of *if-then* implementation intentions (hereafter called *if-then* plans for brevity) when used as a sole intervention or as part of treatment or therapy (including strategies to promote healthy behaviour) in adult patient populations. Outcomes of interest included adherence, goal pursuit and physical health outcomes.

Methods

This systematic review follows the guidelines as set out by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [44].

Identification and Selection of studies

We developed a search strategy aiming to capture all studies evaluating the impact of *if-then* plans in adult patient populations (excluding mental health and paediatric populations) on adherence, goal pursuit or physical health outcomes. The search strategy is displayed in table 1. Wildcards and truncation were used as set out by the different databases, as well as the use of proximity searches and grouping of the terms ‘implementation intentions’. In addition, we

searched for articles that had cited three seminal papers on implementation intentions [16, 20, 21] and conducted hand searches of reference lists of all articles concerning any patient population, including reviews. No date restrictions and language restrictions were set. The search included studies published up to 30th April 2014. All references were downloaded into EndNote X4 [45].

Table 1 Literature search strategy*

Search engines used	Scopus, EBSCO Health, PsychInfo, PEDro, AMED, Cochrane
Databases searched	PubMed, Biomedical Reference Collection, CINAHL, Dentistry and Oral Sciences Source, Health Business Fulltext Elite, Health Source (Consumer & Nursing/Academic editions), Medline, Psychology and Behavioural Sciences Collection, PsychInfo, SPORTDiscus, PEDro, AMED
Search words	(implementation intention*) (if then plan*) (if-then) (if w1 then)
Other	Doc type ar OR re Reference scanning for relevant articles
Citation tracking: forward tracking three key articles	Gollwitzer PM. Implementation intentions: Strong effects of simple plans. <i>American Psychologist</i> 1999;54:493-503. [15] Gollwitzer PM, Brandstätter V. Implementation Intentions and Effective Goal Pursuit. <i>Journal of Personality and Social Psychology</i> 1997;73:186-199. [19] Gollwitzer PM, Oettingen G. The emergence and implementation of health goals. <i>Psychology and Health</i> 1998;13:687-715. [20]

* Given only 18 potential papers were identified that had used implementation intentions with patient populations there was no need to include outcomes of interest formally in the search strategy (these were assessed by review)

Studies were included if they A) concerned a patient population (i.e. with a clinical diagnosis as set out in the International Statistical Classification of Diseases and Related Health Problems (ICD-10)); B) had used an *if-then* implementation intention strategy as a sole intervention or as part of treatment, therapy or rehabilitation (including strategies for promoting healthy behaviours as defined by Gollwitzer [20, 21]) and C) if the study design was a Randomised Controlled Trial (RCT). Articles were excluded if they 1) described a

theory or developed a concept; 2) concerned studies with children, adolescents, animals, mental health populations or health professionals. Two reviewers (a non-expert AMcC and a content expert PK) screened all titles and abstracts and if these were not sufficiently clear also the full article, to determine whether the article was potentially relevant. Full texts were then examined to evaluate if the study met the review inclusion criteria (by PK and AMcC). These papers were then randomly allocated to others in the team (KMcP, NK and AT) to ensure the selection process was robust. There was an option for any discrepancies to be discussed with a fourth reviewer but this was not required.

Quality review of included studies

All trials identified were independently scored by two reviewers (AMcC and PK) for quality. The PEDro scale was used as it has established validity [46, 47]. This scale measures study quality and contains 11 criteria (eligibility criteria specified, random allocation, concealed allocation, groups comparable at baseline, subject blinding, therapist blinding, assessors blinding, 85% data available of at least one key outcome, intention to treat analysis, between group comparisons reported for at least one key outcome, point measures and measures of variability provided for at least one key outcome). The first criterion on the PEDro scale is not scored. The remaining ten items receive a score of 1 if the criterion is met, thus scores range from 0-10. Guidelines on PEDro scoring were followed as outlined on the website (<http://www.pedro.org.au/english/downloads/pedro-scale/>).

Data extraction

Multiple reports based on datasets arising from the same study were linked and data extracted onto one study form. Data extraction followed guidance as set out by the Cochrane Collaboration [48] and included data on study procedures, participants, interventions,

outcomes, results and miscellaneous items (e.g. funding source, key conclusions from authors, references to other studies, correspondence required, reviewers' comments). Two reviewers independently extracted the data (AMcC and PK). Discrepancies were discussed and if required referred to the third reviewer (NK/AT). Authors were contacted to gather missing data when required.

Data analysis

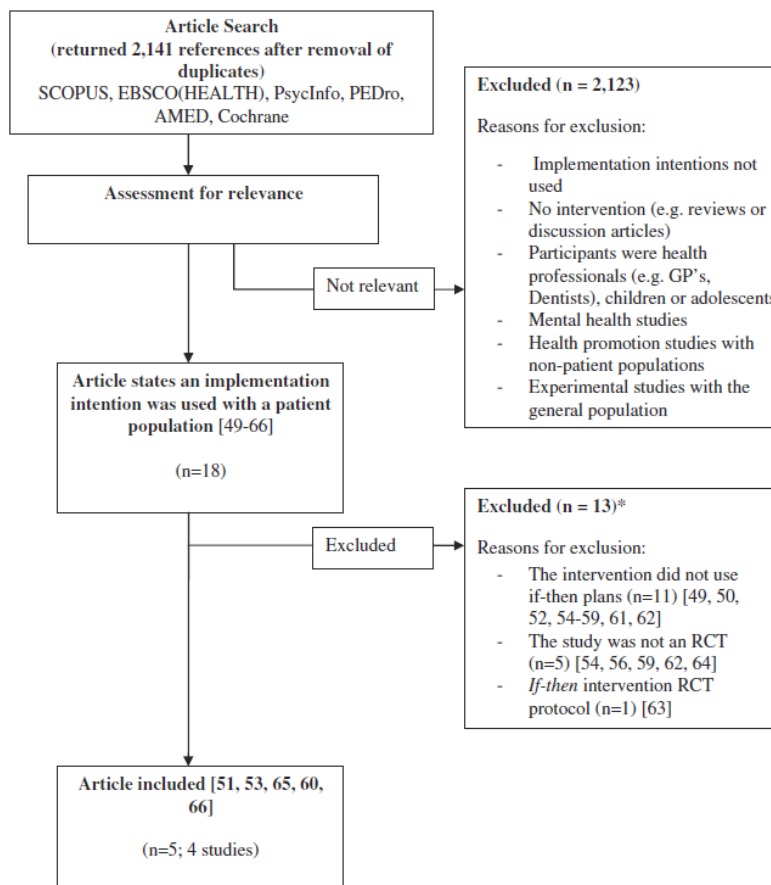
Descriptive analysis was conducted on all included studies. Given the heterogeneity of studies identified and the wide range of outcome measures used, it was not possible to conduct a meta-analysis. We recorded whether the (*if-then*) implementation intention plans produced favourable results when compared to the comparison intervention or not (on adherence, goal pursuit or health outcomes) so that some comparison between studies could be made.

Results

The search strategy initially yielded 2,141 articles (figure 1) after duplicates were removed. Of these, 18 articles concerned 15 studies with a patient population and stated that an implementation intention had been used [49-66]. Two articles were excluded as they described the development of an intervention, an RCT protocol and its feasibility testing [63, 64]. Eleven were excluded as they did not use *if-then* implementation intentions [49, 50, 52, 54-59, 61, 62]. Participants in those studies that had not used *if-then* plan as outlined by Gollwitzer and colleagues [20, 21] were asked to plan when-what-where-and-how they would pursue their goals but were not asked to develop *if-then* plans associated with these goals.

That is, although contextual criteria were considered, they were not structured in a manner that connected them explicitly and specifically. In addition, five had not used an RCT methodology [54, 56, 59, 62, 64]. These studies will be further discussed in the discussion section.

Figure 1. Literature search results.



* Since some papers were excluded for more than one reasons the figures in this box are >13.

The four included studies (reported in five articles) concerned the evaluation of the effectiveness of an *if-then* plan on i) medication adherence in epilepsy [51] and stroke [53, 65], ii) improving exercising and behavioural change in people with chronic back [60], and iii) improving physical activity in obese older adults [66]. Table 2 outlines a summary of the interventions employed in the included studies.

Table 2 Summaries of interventions used in the included studies

Articles	Interventions used	Outcome measures used
Brown et al. 2009 [51]. Enhancing antiepileptic drug adherence	<p>Control group: n=32, mean (SD) age 44.1 (16.4), 38% male</p> <ul style="list-style-type: none"> 14-Page packet of self-report measures at baseline <p>Intervention group: n=37, mean (SD) age 41.9 (15.4), 42% male</p> <ul style="list-style-type: none"> 14-Page packet of self-report measures at baseline, plus: Self-completed intention implementation worksheet: writing down environmental cues for tablet taking using the format of an "if-then" plan on the worksheet, repeating this plan 3 times quietly, when able repeat it without reading tick a box. 	<p>Primary outcomes: Electronic pill-monitoring; % of doses taken, days on which correct no. of doses was taken, doses taken on schedule.</p> <p>Follow-up: Hospital Anxiety and Depression Scale, Liverpool Seizure Severity Scale, Prospective and Retrospective Memory Questionnaire.</p>
Christiansen et al. 2010 [60]. Physical capacity improvements in chronic back pain patients	<p>Control group: n=30, mean (SD) age 47.7 (9.2), 37% male</p> <ul style="list-style-type: none"> Treatment as usual: outpatient back pain program (3 weeks, ave 6hrs/day, 30h/wk) <p>Intervention group: n=30, mean (SD) age 47.8 (9.6), 40% male</p> <ul style="list-style-type: none"> Treatment as usual (see above) plus: Mental contrasting, implementation intentions, cognitive behavioural therapy (MCII-CBT): Two half-hour 1:1 sessions on day 3 and day 9 after baseline, delivered by a trained psychologist. Session 1 (Mental Contrasting): Participants indicated their expectations of success of improving their physical capacity and the importance of this, and elaborated on two positive aspects of the desired future and two negative aspects of impeding reality Session 2 (CBT & implementation intentions): Common cognitive behavioural therapeutic principles of problem solving; participants assisted in the formation of implementation intentions (if-then plans), written down on small cards; implementation intention stage 5 minutes. 	<p>Primary outcomes: Hannover Activities of Daily Living (ADL) questionnaire (pain disability).</p> <p>Secondary outcomes: lifting test from the Functional Capacity Evaluation (lift a 5 kg box as often as possible within 2 min); bicycle ergometer test; pain numeric rating scale.</p>
Belanger et al. 2013 [66]	<p>Control group: n=51, mean (SD) age 59.0 (4.6), 22.8% male</p> <ul style="list-style-type: none"> 3 sessions with a physical activity coach over 2 months Session 1: feedback on baseline level of physical activity (PA), 	<p>Primary outcome: physical activity (pedometers)</p> <p>Secondary outcomes: weight, body mass</p>

O'Carroll et al. 2010 and 2013 [53, 65]	<p>information regarding recommended level of PA, health benefits and safety; establishment of behavioural goals; distribution of a PA logbook</p> <ul style="list-style-type: none"> • Session 2&3: revision of the PA logbook; general encouragement; establishment of new behavioural goals (if necessary); distribution of a new PA logbook 	<p>index</p> <p>Moderators, newly developed questionnaires of: intention, perceived behavioural control, self-efficacy, action and coping</p>
	<p>Intervention group: n=50, mean (SD) age 59.8 (5.8), 17.8% male</p> <ul style="list-style-type: none"> • 3 session as above plus implementation intentions: action plans in if-then format, what are the obstacles and potential solutions, if-then plans for obstacles 	
	<p>Intervention group: n=29, mean (SD) age 68.4 (11.3), 69% male</p> <ul style="list-style-type: none"> • Session 1: medication-taking routine individually tailored coping plan written down on a worksheet (for all daily doses of the medication); repeat each plan up to three times until able to remember it without looking at what was written down. • Session 2: reviewed the effectiveness of the implementation intentions plan and any barriers/difficulties in following it; any required changes were developed collaboratively (i.e. suitable <i>if-then</i> plans before adherence measurement commenced); elicit and, if appropriate, challenge any mistaken beliefs about a patient's illness and/or medication; correct any misperceptions. 	<p>Primary outcome: % prescribed doses taken, days on which the correct dose was taken, doses taken on schedule (within 3-h window of the median time taken) measured with Medication Events Monitoring System (MEMS) pill bottle.</p> <p>Secondary outcomes: The Medication Adherence Report Scale (MARS), Patient Beliefs About Medication and Illness, blood pressure</p>
	<p>Control group: n=29, mean (SD) age 70.7 (10.5), 59% male</p> <ul style="list-style-type: none"> • Session 1& 2: non-medication-related conversation with the research fellow 	
	<p>Both Groups</p> <ul style="list-style-type: none"> • Session 2: research fellow filled Medication Events Monitoring System (MEMS) pill bottle with 1 month's supply of a single antihypertensive medication; patients were instructed to only take out one dose of their medication whenever they opened the pill bottle; 2 monthly visits to refill the MEMS pill bottle. 	

Quality of included studies was acceptable (table 3). Nevertheless, key limitations included: the absence of a power calculation to determine sample size [51, 60]; assessors not being blind to the interventions [51, 53, 60, 65, 66]; and data on key outcomes being available at follow-up for fewer than 85% of participants allocated to the groups [51, 60, 66]. Further limitations of the included studies will be discussed below.

Table 3 Quality scoring [46] of included articles

Pedro scoring	Brown et al. 2009 [51]	Christiansen et al. 2010 [60]	Belanger et al. [66]	O'Carroll et al. 2010 and 2013 [53, 65]
Aim of interventions	Enhancing drug adherence	Improve physical capacity	Improve physical activity	Enhancing drug adherence
Patient population	Epilepsy	Chronic back pain	Obese older adults	Stroke
Eligibility criteria were specified (not counted in the quality score)	(√)	(√)	(√)	(√)
Subjects were randomly allocated to groups	√	√	√	√
Allocation was concealed	√	√	√	√
The groups were similar at baseline regarding the most important prognostic indicators	X	√	√	√
There was blinding of all subjects	√	√	√	√
There was blinding of all therapists who administered the therapy	√	√	X	X
There was blinding of all assessors who measured at least one key outcome	√	X	X	X
Measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups	X	X	X	√
All subjects for whom outcome measures were available received the treatment or control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"	√	√	√	√
The results of between-group statistical comparisons are reported for at least one key outcome	√	√	√	√
The study provides both point measures and measures of variability for at least one key outcome	√	√	√	√
Total PEDro score	8	8	7	8

Brown et al. [51] used worksheets as a one-off written exercise to derive *if-then* plans to affect epilepsy medication adherence. The authors did not report how much time patients required for this task. Anticipated obstacles of goal directed behaviour were not explicitly addressed with *if-then* plans. The study demonstrated a significant difference between the intervention and control groups on medication adherence, in favour of the intervention group. Participants in the intervention group took more prescribed doses of their medication (93.4% vs. 79.1%), took the correct number of doses on more days (88.7% vs. 65.3%), and took more of their doses in the correct 6-hour time window (78.8% vs. 55.3%), in comparison to controls ($P < 0.01$). The authors reported an overall effect size of 0.78 in favour of the intervention although it was not clear from which outcome this statistic was derived. Notably, regression analyses showed that medication adherence was only improved in those with poor memory for intended action, in those who had reported missing many doses previously, or if they were less concerned about their epilepsy ($P < 0.001$). Key limitations of this work include selection bias as those on more frequent doses of medication were not included and groups not being similar at baseline (with those in the intervention group reporting more frequent symptoms and expressing greater concerns about their epilepsy than those in the control group) [51]. In addition, the study had a short follow-up, did not assess seizure control or side effects, and a power calculation was not performed.

Christiansen et al. [60] used *if-then* plans as part of a complex intervention in people with chronic back pain that also included mental contrasting and cognitive behavioural therapy. *If-then* plans were employed to manage obstacles in goal pursuit. This intervention took place over two half hour sessions with a psychologist with the actual *if-then* planning stage taking only 5 minutes. Participants in the intervention and control group also took part in usual treatment, which entailed a 3-week back pain programme (90 hours in total). Participants in

the intervention group (which included Mental Contrasting, Cognitive Behavioural Therapy & *if-then* planning) had significantly better outcomes on measures of physical capacity than the control group, both directly after the intervention and after a 3-month period at home. The differences in the physical capacity achieved by the two groups had significant effects (Hannover ADL score: effect size $d = .77$, $P < 0.01$; lifting task: $d = .77$, $P < 0.01$; ergometer test $d = 0.53$, $P < 0.05$). There were no significant differences between the groups on their current, average or maximum pain severity ($P > 0.05$). This study did not include an *if-then* only group, so it is not possible to say which component of this complex experimental intervention led to the positive findings in favour of the intervention group.

Belanger et al. [66] provided three sessions with a physical activity coach during which obese older adults were given information about physical activity and asked to set goals with opportunity to review these during the follow up sessions. The intervention group also developed *if-then* plans, both for their goals and obstacles they could foresee. There were no significant differences between the groups over time ($P > 0.05$) although those in the experimental group significantly increased their daily number of steps walked at 6-month follow-up from baseline ($t(133) = -3.9$; $p < 0.0001$; $d = 0.68$), and from post-intervention ($t(133) = -3.4$; $p < 0.001$; $d = 0.59$). By comparison, those in the control group did not improve significantly their level of participation in physical activity ($t(133) = -1.5$; $p > 0.05$; $d = 0.26$). There was also no significant difference between groups on Body Mass Index or waist circumference ($P > 0.05$). Lack of blinding of assessors and loss to follow-up were key limitations of the study.

The study by O'Carroll et al. [53, 65] investigated *if-then* plans on stroke medication adherence. Both groups had two sessions with a researcher. The control group had a

discussion about non-medically related issues. Participants in the intervention group developed individually tailored coping plan written down on a worksheet using worksheets, drawing on the study by Brown et al. [51]. At the follow-up session the plans were reviewed and if required adjusted. In addition, the researcher ascertained if patients held any mistaken beliefs about their illness and/or medication and corrected any misperceptions. The study showed significant differences in favour of the intervention group for the percentage of doses taken on schedule (mean difference, 9.8 %; 95 % CI (0.2, 16.2); $p < 0.05$) but there was no significant differences on other outcomes. Given the intervention consisted of not only *if-then* plans but also another behaviour change approach it is not possible to conclude that the difference between the groups was solely due to *if-then* plans. A key limitation of this study was the large number of people excluded from the study, affecting generalizability (76%) and the delivery, data collection and analysis by an unblinded researcher.

Discussion

We identified four studies (reported in five articles) that evaluated the impact of *if-then* plans on health related behaviours or outcomes in a patient population. Although the quality of these four studies was acceptable, they were not definitive trials, so the positive findings should be considered with caution. The studies showed that compared to controls, people who form implementation intentions in the form of *if-then* plans achieve better outcomes on medication adherence in epilepsy and stroke [51, 65], physical capacity in chronic back pain (when combined with Mental Contrasting & Cognitive Behavioural Therapy) [60], but not physical activity in obese older adults. The study by Brown et al. [51] was also included in a recent systematic review of behavioural change strategies aimed at improving adherence to antiepileptic medications in adults and children with epilepsy [67]. Strategies reviewed

included implementation intentions, motivational interviewing, and intensive reminders and concluded that only implementation intentions and intensive reminders were promising in enhancing adherence to antiepileptic medications [67]. Interestingly, findings from the Brown et al. study [51] suggest that cognitive or memory problems are significant reasons for non-adherence in epilepsy medical treatment and that a rather simple, written *if-then* plan (without support) is beneficial. Their study also suggests such an intervention could potentially be a cheap addition to routine practice, even for people with cognitive problems. By contrast, the study in chronic back pain patients used *if-then* plans as part of a complex intervention and since the study did not include a group that only received the *if-then* plans, it was not possible to ascertain if the positive outcomes were due to the implementation intentions, the cognitive behavioural therapy, the mental contrasting or a combination of interventions [60]. Similarly, the study on stroke medication adherence also actively intervened if participants held misconceptions about their medication [53, 65], limiting the conclusion we can draw about the effectiveness of *if-then* plans alone. Since the included studies used a different mode of delivery (e.g. pen and paper exercise versus face to face delivery) it is not yet possible to recommend which approach to use.

Studies that were excluded from this review included a diverse range of patient groups (e.g. cardiac patients [49, 52, 55, 57], orthopaedic rehabilitation in-patients [54], people with spinal cord injury [50], multiple sclerosis [59] and facial palsy [56, 62], patients prescribed with antibiotics [58], and diabetes patients [61, 63, 64]). The goals in these studies were also diverse, including *increasing* physical activity levels [50, 52, 54, 55], fruit and vegetable intake [49], adherence to medication [58], and self-monitoring of blood glucose [61]; *decreasing* fat consumption [57]; and *improving* prospective memory [59], movement quality [56, 62], and life style behaviour changes such as diet [63, 64]. Whilst the ADAPT study has

been set up to use *if-then* plans, these are part of a complex intervention in primary care and effectiveness data is not yet available [63, 64]. Many of the remaining studies used an intervention asking participants to plan what, when, where, how, and in some studies with whom they would work towards their goals [49, 50, 52, 54-58]. In addition, many used the implementation intervention as part of complex interventions [49, 54, 56, 58, 59, 61, 62]. Whilst outcomes in these studies were often in favour of the intervention groups, none used *if-then* implementation intentions [16], which was the focus of this review and barriers or facilitators were rarely addressed as part of the plans. These studies were essentially trialling action (and coping) planning, which uses different strategies and relies more on conscious self-regulatory processes than *if-then* implementation intentions [68]. Consequently, these studies cannot be used to draw conclusions about the effectiveness of *if-then* plans in patient populations.

A strength of our review was the employment of the PRISMA approach [44]. In addition, we kept the search strategy deliberately broad because initial scoping for the review found very few studies with patient populations. We used a wide range of electronic databases, including those covering medical, allied health and psychological subjects. The broad search strategy led to a large number of hits. However, only four studies were included, limiting the conclusions we can draw from the review for patient populations.

Conclusions

We were interested in the potential impact of *if-then* implementation intentions given they have been shown to help in making goal directed behaviour more automatic and requiring

less deliberation [17, 23]. In adults in the general population this has shown to be more effective than simply forming an action plan (i.e. what, when and where) [16, 18, 20, 69], and as such may have relevance in rehabilitation. This systematic review identified four studies that used an *if-then* implementation intention with a patient population and three demonstrated significant benefit in favour of the intervention. While definitive conclusions cannot be drawn about the effectiveness of this approach, this review suggests it is a promising approach within rehabilitation. A greater focus on theoretically informed approaches to goal setting and goal-directed behaviour in rehabilitation has been called for [8] and *if-then* implementation-intention plans appear worthy of investigation as a simple approach to overcome barriers to goal directed behaviour. The effectiveness, helpfulness and appropriateness of such a strategy should be carefully tested given the complex issues people engaged in rehabilitation face (such as the fluctuating impact of disease, fatigue, and cognitive difficulties). Future work should explore the effectiveness of *if-then* plans compared to goal setting alone on rehabilitation engagement, and other key outcomes of interest, such as pain, mobility and participation.

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Declaration of interest

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