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Self-management interventions for people with intellectual disabilities: A systematic review

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ABSTRACT

Objective: People with intellectual disabilities (ID) often experience difficulties managing their affairs. This study reviewed self-management interventions for people with mild to moderate ID, studying interventions' effectiveness and applied behavioural change techniques (BCTs).
Methods: A systematic literature search was conducted in PubMed, PsychINFO, Web of Science, Embase, Emcare, Cochrane, and ProQuest. Data were extracted on study, intervention, and participant characteristics, and results.
Results: Of the 681 studies retrieved, 36 met the inclusion criteria. Most studies used case study designs and small samples. There were eight randomised controlled trials and one non-randomised study. Studies were mostly of moderate quality (Mixed Methods Appraisal Tool). Twenty-two interventions targeted a singular practical skill for a specific context. In allinterventions, the provider applied several BCTs; in 13 studies participants were also trained to apply BCTs themselves. In all studies, improvements in self-management were reported, which mostly maintained over time (n = *20*). If measured, generalisation to other settings was also found.
Conclusions: Future studies should aim for a higher methodological quality and couldconsider targeting more generic self-management and a wider application of BCTs by people with ID themselves.
Practice implications: The findings suggest that training can promote self-management in people with ID.

Contents

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1. Introduction

Awareness is increasing that people with intellectual disabilities (ID) should have equal rights and be included as equal co-citizens in society. This is supported by the United Nations [1], which further declare that people with ID should be enabled to live as independently as possible and to be autonomous with respect to making their own decisions. In the Netherlands, this increasing awareness coincides with the emergence of a 'participation society', where citizens, including people with ID, first have to try to arrange their affairs themselves, before they can turn towards the government. However, people with ID commonly have difficulties with self-managing their affairs [2–4], which can vary from difficulties with personal care and household activities, to trouble with recreational activities, community participation, and employment [5–8]. Various studies have shown nonetheless that most people with ID have **a** desire to manage their activities more independently [2,9–11]. Increasing the abilities of people with ID to handle their affairs themselves could enhance their quality of life and community participation [3,12] and could reduce behavioural problems [13]. Interventions that promote self-management of people with ID are therefore of importance.

Self-management is a broad term that refers to processes and activities that are related to deliberately influencing one's behaviour in order to reach personally desired outcomes [14]. This umbrella term includes being independent in handling one's affairs and in taking care of oneself, thereby solely relying on one's own abilities, efforts, resources, and judgement [15]. Self-management is also strongly related to self-determination, which involves having personal control over making choices and decisions to lead one's life according to one's own preferences, without being completely subjected to external influences [16,17].

Various studies on self-management interventions for people with ID have been conducted and several literature reviews have already collectively analysed some of these previous studies. However, like the individual studies themselves, these reviews only focused on a specific self-management domain such as self-management at work [18–21], self-management of chronic disease [22,23], or the use of activity schedules [24] and self-instructions [8]. Although it was generally found that the self-management interventions reviewed were effective, it is difficult to determine which factors play a key role in the interventions' effectiveness. This is largely due to studies' widely varying self-management goals, outcome measures, and research methods, which hamper thorough comparison. A greater understanding of the key elements of effective self-management interventions could benefit the further development of such interventions and consequently the quality of life of people with ID. In this regard, further identification of the behavioural change techniques (BCTs) applied and their respective effectiveness could contribute to our understanding of how self-management interventions work and how their effects can be optimised [25]. BCTs are active components of an intervention that are designed to alter or redirect causal processes that regulate behaviour [26], such as self-instructions and reinforcements. People with ID can learn to apply BCTs themselves to attain a greater self-management, but they can also be applied by an intervention provider. Recently, Willems, Hilgenkamp, Havik, Waninge and Melville [27] examined how BCTs were applied in interventions for people with ID that targeted physical activity and nutrition. They found that in most cases, several BCTs were applied in the interventions reviewed, such as 'providing information on consequences of behaviour in general' and 'planning social support/social change'. The application of BCTs in self-management interventions for people with ID has not yet been studied.

The aim of the current systematic literature review is to summarise studies that have evaluated the effectiveness of self-management interventions for people with mild to moderate ID. In contrast to the abovementioned reviews that only focused on a certain type of self-management interventions, this review analyses a broad range of interventions that aim to promote self-management in daily life. We aim to examine the BCTs that were used to promote the targeted self-management behaviour, as well as the effectiveness of the interventions. In this way, we aim to create a broader insight into the effects of such self-management interventions for this population.

2. Methods

2.1. This systematic review was performed in accordance with the PRISMA guidelines [28]

2.1.1. Search strategy and inclusion criteria

In order to identify relevant studies for our review, PubMed (incl. MEDLINE), PsychINFO, Web of Science, Embase, Emcare, COCHRANE Library (incl. CENTRAL), and ProQuest (Social Services Abstracts and Sociological Abstracts) were systematically searched from inception to 18 September 2017. The search strategy was based on the Population, Intervention, Comparison, and Outcome (PICO) approach. Search terms (including major headings, Medical Subject Heading terms, title words, and text words) were used that are indicative of intervention studies (Intervention) aimed at promoting self-management (Outcome) for adults with ID (Population), excluding studies that solely included children or adolescents (see Appendix A).

Studies were included if they evaluated the effect of an intervention for adults with mild to moderate ID that aimed to improve their self-management in daily life. Inclusion criteria concerned that documents were original, peer-reviewed, and published in English (i.e., no reviews, dissertations, and book chapters). Exclusion criteria concerned intervention studies aimed at family, staff, or minors with ID (< 18 years). In some studies, not only adults with mild to moderate ID participated, but also minors, adults with severe ID, or people with other disabilities or psychiatric diagnoses. These studies were only included if the

effects of the intervention on adults with mild to moderate ID could be distinguished from the people in the other groups. Studies were excluded if the interventions were aimed at managing challenging behaviour or emotions, or if outcome measures focused on physical outcomes (e.g., body weight, oral health status). These latter studies were excluded because improvements in physical functioning would not directly indicate improved self-management skills.

2.2. Study selection

After excluding all duplicates, retrieved references were loaded into Endnote. Titles and abstracts were independently screened by two reviewers (JS and EE) without blinding to authorship or journal (see Fig. 1). An 83.2 % agreement was achieved. The full texts of the articles that potentially met the criteria were retrieved and examined, including the articles for which there was disagreement. After screening the full texts, reviewers agreed for 95.9 % of the articles that they should be included or excluded. Disagreements between reviewers were discussed until consensus was reached. For three cases for which disagreement remained, two other authors (AZ and WG) were included in the discussion.

The quality of the remaining studies was assessed using the Mixed Methods Appraisal Tool [MMAT; 29]. This was conducted independently by two reviewers (JS and EE), who discussed their judgements afterwards until consensus was reached. Quality criteria could be rated as 'yes' (1 point), 'no' (0 points), or 'can't tell' (0 points).

2.3. Data extraction and analysis

From the studies included, two reviewers (JS and EE) independently extracted information about the study characteristics, participant characteristics, outcome measures, intervention characteristics, BCTs, and main results (both direct and at follow-up). If information was missing, we tried to retrieve the missing data from the authors. We were able to contact the authors of thirteen articles. One of them replied and provided us with additional information. Regarding the BCTs, for each article we analysed which BCTs were used to target the self-management behaviour and whether these fit the taxonomy of BCTs as described by Michie, Ashford, Sniehotta, Dombrowski, Bishop and French [25]. For 12 articles (33 %), this was done by two reviewers (JS and EE) who initially agreed for 92.1 % of the BCTs and who agreed for

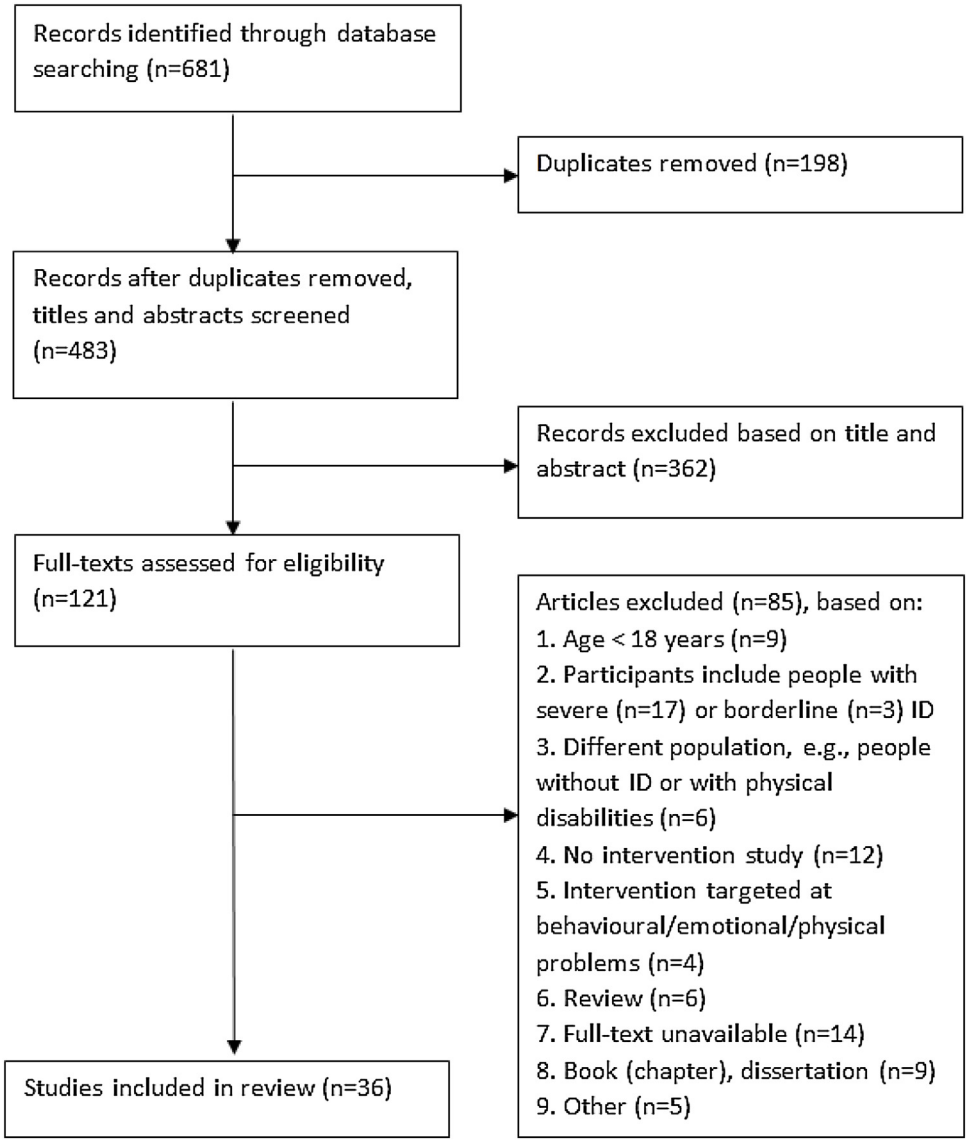

Fig. 1. Flow diagram of the selection process.

100 % after discussing the disagreements. Because of the high agreement rate, the other articles were only analysed by one of the two reviewers. Applied BCTs that we came across that were not described in taxonomy of Michie, Ashford, Sniehotta, Dombrowski, Bishop and French [25] were defined separately based on the descriptions in the articles that we reviewed (Appendix B). A distinction was made whether BCTs were applied by the participant (e.g., participants use self-instructions while performing a task) or by the provider of the intervention (e.g., the provider gives verbal instructions on how to perform a task). This allowed us to examine to what extent participants were trained to execute the targeted self-management behaviour completely by themselves or whether they were still dependent on the provider during the intervention.

3. Results

After describing the results from our literature search, findings are presented on the study characteristics and the study quality. Next, participant characteristics, outcome measures, intervention characteristics, and findings on effectiveness are described. In spite of our attempts to request missing information from the authors of the studies included, much of these data remained missing.

3.1. Search results

The literature search yielded 681 potential publications, of which 483 were unique articles. Of the 121 full texts that were retrieved after screening of the title and abstracts, 36 met our inclusion criteria. Articles were excluded based on a hierarchical approach; if an article was already excluded based on a previous reason, it was not further assessed whether it would also be excluded based on other reasons. Detailed information about the selection process is presented in Fig. 1. Appendix C provides a list of studies that were excluded in the final stage.

3.2. Study characteristics

Table 1 presents the characteristics of the 36 articles included. Except for three studies, all were conducted in English speaking countries, of which the United States was the most common (n = 26). Other countries of origin were Ireland (n = 3), Canada (n = 2), Sweden (n = 2), Great Britain (n = 1), Hong Kong (n = 1), and New Zealand (n = 1). The majority of articles were published between 1979 and 1999 (n = 20), a few were published in or after 2010 (n = 5). The total number of participants in all 36 studies was 370. Sample sizes greatly differed between studies, ranging from 1 to 57. Nineteen studies (52.8 %) had less than five participants. There were no dropouts during the period in which interventions were provided, but five studies (article #4, 8, 11, 14, 30) reported dropouts at follow-up measurements, ranging from 16.6%–50% of the initial sample size. The majority of studies had a (multiple) case study design (n = 24). Few studies used a randomised controlled trial (n = 8), had a no-treatment control group (n = 5), or contained more than one training condition (n = 7). In case of the latter, the difference between the conditions concerned for example that more BCTs were applied in one group (e.g., in addition to self-instruction, also self-evaluation and self-reinforcement), or that one group received in vivo training (training in the real life community) versus conventional classroom training in the other group. Twenty-four studies (66.7 %) used multiple baseline measures and 23 studies conducted multiples probes during the course of the intervention. Follow-up data were available for 23 studies (63.9 %). Period of follow-up was generally a couple of months, however this varied from several days to a few years after training. Data regarding the moments of assessment were often not explicitly reported and moments also greatly varied between studies and even within studies, with sometimes some participants being assessed more often than others, with varying periods of time in between.

3.3. Study quality

Table 2 and Appendix D show the results of the quality appraisal using the MMAT [29]. Most studies had more nil scores than positive scores, with five studies meeting only one of the five quality criteria (article #1, 14, 17, 22, 30) and 21 studies meeting two out of five. Four studies had positive ratings on three out of five criteria (article #6, 11, 16, 27), five studies had positive ratings on four out of five criteria (article #7, 8, 9, 20, 36), and one study had positive ratings on all quality criteria (article #2), The reason why many studies had lowered ratings was because the sampling strategy, the target population and the sample were not clearly described, and because no statistical analyses were performed. In randomised controlled studies it was often unclear whether the randomisation was correctly performed, whether the groups were comparable at baseline, and whether outcome assessors were blinded to the intervention.

3.4. Participant characteristics

Data regarding age were not always complete. In six studies only the average age without a standard deviation was provided, in four only the range. Based on the data that were available, the average age was found to vary between 18.2–50.3 years. Participants' ages ranged from 18 to 64 years. On average, 54.5 % of participants were female. Most studies included both people with mild and moderate ID (n = 16), instead of solely people with mild (n = 11) or moderate ID (n = 9). It was, however, not always clear how the level of ID was determined. Data regarding recruitment and inclusion and exclusion criteria were also often not fully reported (n = 33).

3.5. Outcome measures

The specific outcome measures differed per study, but in most cases (n = 30; 83.3 %) it concerned to what extent the self-management behaviour targeted was performed properly (e.g., number of correctly performed steps). In five studies, previously developed instruments (e.g., questionnaires) were used, but whether these were validated measures was not reported (article #1, 4, 11, 14, 23). Twenty-seven studies (75.0 %) assessed participants' behaviour in their real-life setting.

3.6. Intervention characteristics

The majority of interventions (n = *22*) had a specific focus on a practical skill, such as teaching people with ID a singular daily living skill within a certain context. Only six studies targeted several daily living skills (article #1, 11, 14, 16, 31, 36). The interventions mostly focused on improving self-management at home (n = 17; e.g., food preparation, doing laundry) or in the community (n = 11; e.g., traveling by bus, doing groceries). Interventions focusing on self-determination or rights were scarce (article #4, 6, 8) and targeted a specific domain or context (e.g., dealing with health right violations). Two studies focused on self-management at work (article #9, 35) and another two studies focused on social interaction (article #20, 25). There was one study that aimed for generalisation of self-management skills across situations (article #16). Studies did not so much use previously established or manualised interventions, but study authors either developed their own intervention or (partially) used an

Table 1
Main study and participant characteristics of the studies included.

#	Authors (year)	Country	Design (Presence of control group or multiple training groups)	Setting	Participants • *N* • Mean (M) age (*SD*) • Gender (% female) • Level of ID	Target behaviour	Time-related aspects • Number of sessions • Length of session • Timespan	Provider	Individual or group training (group size)
1	Crnic et al. (1979) [46]	USA	Unclear (no)	Group home	*n* = 17; M = 23.4 (*n/a*), 52.9% female; mild ID	Independent living skills NOS[a]	4–18 months (mean = 12.1)	Support staff	Individual
2	Davies et al. (2003) [47]	USA	Within-subjects (no)	Unknown	*n* = 9; M = 25.8 (*n/a*); 44.4% female; mild ID	Withdraw cash from ATM	1 session; 20–45 minutes	Unknown	Individual
3	Davies et al. (2010) [48]	USA	Between-subjects (control group)	Unknown	*n* = 23; M = 32.0 (*10.4*); 60.9% female; mild-moderate ID	Navigate a bus route	1 session; 30–60 minutes	Hand-held computer Researcher	Individual
4	Dukes et al. (2009) [39]	IRL	Multiple case study (no)	Unknown	*n* = 4; M = 22.5 (*0.6*); 50.0% female; moderate ID	Sexually related decision making	20 sessions; 45 min; twice a week for 10 weeks	Unknown	Individual
5	Faloon et al. (2008) [36]	USA	Case study (no)	Human services agency	*n* = 1; age = 19; 0.0% female; mild ID	Use of overt and covert self-rules	3–5 sessions per week; 30–40 minutes	Experimenter	Individual
6	Faw et al. (1996) [40]	USA	Multiple case study (no)	Group homes and simulation home	*n* = 4; M = 22.8 (*2.2*); 25.0% female; mild-moderate ID	Self-determination skills in selecting a home	4 sessions; 1 h	Trainer	Individual
7	Feldman et al. (1999) [49]	CAN	Multiple case study (no)	Home	*n* = 10; M = 28 (*n/a*); 100% female; mild ID	Child-care skills	1 session	Manual	Individual
8	Feldman et al. (2012) [42]	CAN	Randomised controlled trial (control group)	Unknown	*n* = 31; M = 49.0 (*7.6*); 51.6% female; mild-moderate ID	Recognition and redressing health rights violations	Mean number of sessions = 10.89 (SD = 3.88); 2 h; twice a week	Trainer	Group (3)
9	Gilson et al. (2016) [50]	USA	Case study (no)	Internship job site	*n* = 1; age = 22; 0.0% female; level of ID unknown	Social interactions and task engagement at work	30 sessions; 4 h	Job coach	Individual
10	Goodson et al. (2007) [51]	USA	Multiple case study (no)	Vocational training centre	*n* = 4; M = 34.8 (*1.5*); 0.0% female; moderate ID	Setting a table	5–6 sessions for video prompting, 9–13 sessions for video-prompting plus error-correction	Computer Trainer	Individual
11	Hällgren et al. (2005) [52]	SWE	Multiple case study (no)	Unknown	*n* = 6; M = n/a (*n/a*); 66.7% female; mild-moderate ID	Activities of Daily Living (ADL)	5 sessions; 3 months	Occupational therapist	Individual
12	Johnson et al. (1981) [53]	USA	Multiple case study (no)	Sheltered workshop	*n* = 4; M = 32.4 (*13.7*); 25.0% female; mild-moderate ID	Cooking skills: broiling, baking, boiling	2–12 sessions per subtask (mean = 4–6); 5–40 minutes (mean = 17)	Trainer	Individual
13	Katz et al. (1986) [54]	NZL	Multiple case study (no)	Group home	*n* = 9; M = n/a (*n/a*); 55.6% female; mild-moderate ID	Fire-safety skills	20–30 sessions	Student	Individual
14	Kottorp et al. (2003) [55]	SWE	Multiple case study (no)	Disability Services	*n* = 3; M = 26.7 (*3.0*); 100% female; moderate ID	Activities of Daily Living (ADL)	6–10 sessions; 4 months	Occupational therapist	Individual
15	LaCampagne et al. (1987) [56]	USA	Multiple case study (no)	Day treatment centre	*n* = 4; M = 30.0 (*5.4*); 75.0% female; mild ID	Paying bills	12 sessions; 1 h; 12 days	Trainer	Group (4)
16	Lovett et al. (1989) [57]	USA	Between-group (group 1: self-recording training, group 2: self-recording, self-evaluation, self-reinforcement training	Home	*n* = 9; M = 27.0 (*5.2*); 55.6% female; mild-moderate ID	Activities of Daily Living (ADL)	Unknown	Trainer	Individual
17	Marchetti et al. (1983) [58]	USA	Randomised controlled trial (group 1: classroom training, group 2: community training)	Classroom or community	*n* = 18; M = 41.0 (*n/a*); unknown % female; mild-moderate ID	Pedestrian skills	40 sessions; 1.5 h; twice a week for 20 weeks	Support staff	Group (3)
18	Martin et al. (1987) [59]	USA	Multiple case study with partial-sequential withdrawal (no)	Home	*n* = 3; M = 31.0 (*8.9*); 66.7% female; mild-moderate ID	Preparation of breakfast and dinner	50 meals; maximum of 3.5 months	Support staff	Individual

Table 1 (*Continued*)

#	Authors (year)	Country	Design (Presence of control group or multiple training groups)	Setting	Participants • *N* • Mean (M) age (*SD*) • Gender (% female) • Level of ID	Target behaviour	Time-related aspects • Number of sessions • Length of session • Timespan	Provider	Individual or group training (group size)
19	Matson (1981) [60]	USA	Randomised controlled trial (control group)	Outpatient Clinic and grocery store	*n* = 20; M = 34.0 (*n/a*); 50.0% female; mild ID	Shopping behaviour	20 sessions; 1 h; 20 weekdays	Trainer	Group (5)
20	Matson (1982) [61]	USA	Randomised controlled trial (control group, group 1: modelling training, group 2: independence training)	Unknown	*n* = 45; M = 38.4 (*n/a*); 55.6% female; mild ID	Phone conversational skills	1 h; three times per week for 2 months	Trainer	Group (7–8)
21	Matson et al. (1986) [62]	USA	Multiple case study (no)	Care institution and grocery stores	*n* = 3; M = 41.7 (*10.6*); 0.0% female; mild-moderate ID	Computational and shopping skills	26 sessions; 1.5 h; twice a week for 13 weeks	Teacher	Group (3)
22	McInerney et al. (1992) [63]	USA	Within-subjects (no)	Shopping malls	*n* = 29; M = n/a (*n/a*); 69.0% female; mild-moderate ID	Use of the bus	60–90 minutes; 3–5 times per week (mean = 2.86 sessions per week; SD = 1.50) for 6.58 weeks on average (SD = 4.19)	Occupational therapist	Group (4–5)
23	Michie et al. (1998) [64]	GBR	Randomised block design (control group, group 1: classroom training, group 2: in vivo training)	Unknown	*n* = 57; M = 36.2 (*12.7*); unknown % female; mild-moderate ID	Community living skills	±180 sessions, twice per week	Unknown	Group (4–6)
24	Neef et al. (1990) [65]	USA	Case study (no)	Day habilitation centre, (group) home, and laundromat	*n* = 1; age = 41; 0% female; mild-moderate ID	Laundry skills (washing and drying)	3–4 times per week; ±3.4 h for drying and ±36.1 for washing	Trainer	Individual
25	Ores et al. (1984) [66]	USA	Within-subjects design (no)	Unknown	*n* = 10; M = n/a (*n/a*); 50.0% female; moderate ID	Make a telephone call	1 session; 48 s-5 min and 22 s demonstration time, 33 s-5 min practice time	Researcher	Individual
26	Rehfeldt et al. (2003) [67]	USA	Multiple case study (no)	Day treatment	*n* = 1; age = 22; 0.0% female; moderate ID	Making a sandwich	13 sessions	Computer Instruction	Individual
27	Richman et al. (1984) [68]	USA	Multiple case study (no)	Home	*n* = 1; age = 34; 100% female; mild-moderate ID	Menstrual care skills	5–15 minutes	Researcher Support staff	Individual
28	Risley et al. (1980) [69]	USA	Multiple case study (no)	Sheltered workshop	*n* = 3; M = 37.7 (*13.2*); 33.3% female; mild-moderate ID	Making an emergency call	Mean number of sessions = 6; 8–35 minutes (M = 13); 5 per week	Trainer	Individual
29	Sarber et al. (1983) [70]	USA	Case study (no)	Home and supermarket	*n* = 1; age = 34; 100% female; mild ID	Menu planning and grocery shopping	Unknown	Counsellor	Individual
30	Sigafoos et al. (2005) [3]	USA	Multiple case study (no)	Vocational programme	*n* = 3; M = 35.3 (*SD* = 1.2); 0.0% female; moderate ID	Make a bag of microwave popcorn	±25 sessions; 6–8 minutes; twice per week	Computer Trainer	Individual
31	Taber-Doughty et al. (2010) [71]	USA	Multiple case study with alternating treatment (group 1: telecare support, group 2: standard care staff)	Home	*n* = 4; M = 49.3 (*5.9*); 25.0% female; mild-moderate ID	Household tasks	20 sessions; 5–7 days	Support staff Telecare staff	Individual
32	Tam et al. (2005) [72]	HKG	Quasi-experimental (group 1: conventional training, group 2: Virtual Reality training)	Vocational skills training centre	*n* = 16; M = 18.2 (*2.3*); 50.0% female; moderate ID	Supermarket shopping	Control group: two 30 min sessions VR group: one 45 min sessions and one 30 min session	Trainer	Individual
33	Taylor et al. (1997) [73]	IRL	Multiple case study with multi-element phases (no)	Vocational training centre and supermarkets	*n* = 7; M = 28.7 (*5.6*); 50.0% female; mild ID	Shopping	3–4 sessions per week	Trainer	Group (3–4)
34	Taylor et al. (2000) [74]	IRL	Multiple case study (group 1: Stimulus Equivalence Training, group 2: Single Instance training, group 3: Multiple Exemplar training)	Vocational training centre and supermarkets	*n* = 6; M = 27.2 (*5.9*); 66.7% female; mild ID	Supermarket shopping	±32 sessions; 45 min (individual session) and 90 min (group training); 4 days a week for 2 months	Trainer	Group (6)

Table 1 (*Continued*)

#	Authors (year)	Country	Design (Presence of control group or multiple training groups)	Setting	Participants • *N* • Mean (M) age (*SD*) • Gender (% female) • Level of ID	Target behaviour	Time-related aspects • Number of sessions • Length of session • Timespan	Provider	Individual or group training (group size)
35	Wacker et al. (1986) [75]	USA	Case study (no)	School and job site	*n* = 1; age = 19); 100% female; moderate ID	Clerical Tasks	40 sessions; 2 h	Job coordinator	Individual
36	Wu et al. (2016) [76]	USA	Multiple case study (no)	School	*n* = 2; M = 18.5(*0.7*); 50% female; mild-moderate ID	Daily living skills	13 or 40 sessions; 15−30 minutes	Trainer	Individual

n/a = not available.
[a] Not Otherwise Specified.

intervention that had been previously studied (article #1, 4, 8, 10, 13, 14, 18–21, 27). Interventions widely differed from one another, using for example classroom training, written or pictorial instructions, video demonstrations, simulations, or electronic devices. Interventions were mostly provided on an individual basis (n = 26), with ten studies using group interventions (range 3–8 participants in a group). Five studies explicitly reported some kind of tailoring within their intervention (e.g., tailoring to individual learning preferences), but it is possible that other interventions were also (partially) tailored, especially those that were provided individually.

3.7. Setting and provider

The setting of the interventions varied between studies, with half of the interventions (partially) taking place in the real life setting of the participants (e.g., at home or at work), thereby fostering the transfer of learnt skills to daily life. It widely varied between studies who the provider of the intervention was (e.g., trainer) and most studies (*n* = 29) did not specify how this person was instructed to provide the training and what his or her qualifications were.

3.8. Length and intensity

The number and duration of training sessions greatly differed between interventions and data about this were often incomplete. For example, the number of sessions varied from 1 to 180 over a period of 1 day to 18 months and information about this was missing for at least half of the studies. Session length was mostly less than 1 (*n* = 9) or 2 h (*n* = 8), although for 16 studies no data were available. Three studies provided 'booster' sessions for participants who were lagging behind (article #8, 16, 26) and four studies provided follow-up sessions after the training (article #1, 6, 12, 36).

3.9. Behavioural change techniques

To obtain an overview of the BCTs that were applied to attain the targeted self-management behaviour, we analysed per study which antecedent BCTs preceded the desired self-management behaviour of participants and which consequent BCTs followed afterwards [Appendix B; [25] [30],]. We also made a distinction whether BCTs were applied by the participant or by the provider of the intervention (Table 2).

All interventions aimed to promote self-management by means of the provider of the intervention, who applied a range of BCTs to help the participants reach the targeted self-management behaviour (*n = 34*). A common combination of BCTs preceding the desired self-management behaviour of participants (12/36 studies, 33.3 %) concerned the provider modelling the targeted behaviour or skill, giving instructions, and providing prompts (e.g., a visual/auditory cue, least-to-most prompting). These three BCTs were not only provided verbally, but sometimes also visually (e.g., with the use of a pictorial manual, videos, or gestures). In nine studies, the provider encouraged the generalisation of the targeted self-management behaviour to another situation (e.g., a different supermarket; article #6, 8, 17, 22, 24, 28, 33, 36). Less frequently antecedent BCTs applied included chaining (article #15, 22, 23, 27), physical guidance (e.g., holding someone's hand while executing a task; article #12, 13, 28, 34, 36), and role-play (article #6, 8, 9, 23, 32, 34). Consequent BCTs that were applied by the provider that followed the execution of the desired self-management behaviour mostly concerned giving feedback (*n = 29*), which could be further distinguished into praise, corrective feedback, or descriptive feedback. Often a combination of these types of feedback was used (16/36 studies, 44.4 %). In nine cases, some kind of reinforcement was provided (e.g., a consumable or activity; article #7, 12, 13, 16, 17, 20, 21, 23, 32).

Several studies (*n* = 13) trained participants to apply BCTs themselves to attain the targeted self-management behaviour. The antecedent BCTs that were taught concerned the use of self-instructions (article # 5, 7, 18, 23, 33, 36) or environmental cues (article #3, 22). Consequent BCTs applied by participants regarded some form of self-recording or self-monitoring of the performed self-management behaviour, followed by self-evaluation of the performance and self-reinforcement (article #16, 19, 20, 21), or praise (article #5, 13, 33).

3.10. Intervention effectiveness

Although quantitative data on results was missing or incomplete in almost half of the studies, all studies reported that the interventions applied were effective, which generally meant that participants were better able to execute the self-management behaviour targeted properly and independently after training. Twenty-four studies collected follow-up data and twenty of these found that training effects maintained over the follow-up period. All 15 studies (41.7 %) that examined whether participants were able to execute the self-management behaviour trained in other settings (e.g., doing groceries at an unfamiliar supermarket) found evidence for such generalisation effects. Studies that included a no-treatment control group all found that participants from the training groups performed better than the control group (article #3, 8, 19, 20, 23), both immediately after training as well as at follow-up (in case follow-up data were available). In studies with several training groups, results were mixed. Two studies only reported a significant improvement in the community or in vivo training group, but not in the classroom group (article # 17, 23). Other studies found that training groups improved equally (article # 32, 34) or that both training groups improved performance but

Table 2
Intervention characteristics of the included studies.

#	Authors (year)	Target behaviour	Behaviour Change Techniques				Main results	Quality appraisal
			Applied by participant		Applied by provider			
			Antecedent	Consequent	Antecedent	Consequent		
1	Crnic et al. (1979) [46]	Independent living skills NOS[a]	Unknown	Unknown	Unknown	Unknown	Outcome: Improved skills in personal maintenance, clothing care, home maintenance, food preparation, time management, social behaviour, community utilisation, communication, and academic functioning. Generalisation to daily life: yes Follow-up: not measured	**1/5**
2	Davies et al. (2003) [47]	Withdraw cash from ATM	n/a	n/a	Instruction Modelling Prompts	Feedback (NOS[a])	Outcome: Fewer required help prompts and fewer errors. Generalisation to daily life: yes Follow-up: not measured	**5/5**
3	Davies et al. (2010) [48]	Navigate a bus route	Use of cues (pictures and audio messages)	n/a	Instruction Prompts	Feedback (descriptive)	Outcome: Experimental group was more successful at completing a bus route, made less errors and needed less landmarking prompts vs. control group. Generalisation to daily life: yes Follow-up: not measured	**2/5**
4	Dukes et al. (2009) [39]	Sexually related decision making	Unknown	Unknown	Unknown	Unknown	Outcome: Improved knowledge of human sexuality and safety practices and improved decision-making capacity. Generalisation to daily life: not measured Follow up: Maintenance of effects for safety practices, some decay in knowledge.	**2/5**
5	Faloon et al. (2008) [36]	Use of overt and covert self-rules	Self-instruction	Feedback (praise)	Instruction Modelling Prompts	Feedback (corrective, praise)	Outcome: Accuracy improved after overt and covert self-instruction training. Performance decreased during overt and covert blocking sessions. Generalisation to daily life: yes Follow-up: not measured	**2/5**
6	Faw et al. (1996) [40]	Self-determination skills in selecting a home	n/a	n/a	Generalisation Instruction Modelling Prompts Roleplay	Feedback (descriptive, instructive, praise)	Outcome: Increase in skills regarding asking preference questions, reporting information, and evaluating homes. Generalisation to daily life: yes Follow up: Performances were maintained.	**3/5**
7	Feldman et al. (1999) [49]	Child-care skills	Self-instruction	n/a	Instruction	Feedback (NOS[a]), Modelling, Reinforcement (NOS[a])	Outcome: Increased child-care skills to normal levels for most mothers and child-care skills. Higher mean percentage correct after training. Generalisation to daily life: yes Follow-up: Even higher mean percentage correct, skills were maintained.	**4/5**
8	Feldman et al. (2012) [41]	Recognition and redressing health rights violations	n/a	n/a	Generalisation Instruction Modelling Prompts Roleplay	Feedback (praise)	Outcome: Training group had more correct responses to video scenarios showing health rights, respect, or responsibility situations vs. control group. Generalisation to daily life: yes Follow-up: Improvements were maintained.	**4/5**
9	Gilson et al. (2016) [50]	Social interactions and task engagement at work	n/a	n/a	Instruction Modelling Prompts Roleplay	Feedback (corrective, praise)	Outcome: Social interactions increased modestly and high task engagement maintained when job coaches reduced proximity and delivered prompts discretely. Generalisation to daily life: yes Follow-up: not measured	**4/5**
10	Goodson et al. (2007) [51]	Setting a table	n/a	n/a	Instruction Modelling	Feedback (corrective)	Outcome: Accuracy in setting the table improved from 0–60% (baseline) to 100% after a video prompting plus error correction procedure. Generalisation to daily life: yes Follow-up: not measured	**2/5**
11	Hällgren et al. (2005) [52]	Activities of Daily Living (ADL)	n/a	n/a	Unknown	Feedback (NOS[a])	Outcome: ADL performance improved in five out of six participants after the intervention, both regarding motor and process skills. Generalisation to daily life: yes Follow-up: Improvements were maintained.	**3/5**

Table 2 (*Continued*)

#	Authors (year)	Target behaviour	Behaviour Change Techniques				Main results	Quality appraisal
			Applied by participant		Applied by provider			
			Antecedent	Consequent	Antecedent	Consequent		
12	Johnson et al. (1981) [53]	Cooking skills: broiling, baking, boiling	n/a	n/a	Instruction Modelling Physical guidance Prompts	Feedback (descriptive, praise) Reinforcement (reward)	Outcome: Relatively quick acquisition of cooking skills once training initiated. Three out of four participants showed generalisation effects within and between the cooking methods. Generalisation to daily life: not measured Follow-up: Relatively high maintenance of cooking skills.	**2/5**
13	Katz et al. (1986) [54]	Fire-safety skills	n/a	Feedback (praise)	Instruction Modelling Physical guidance Prompts	Feedback (corrective, descriptive, praise) Reinforcement (reward)	Outcome: For most participants, perfect mastery of fire-safety skills after training and significantly increased knowledge and understanding of fire-safety behaviour. Generalisation to daily life: yes Follow-up: Most participants maintained perfect mastery.	**2/5**
14	Kottorp et al. (2003) [55]	Activities of Daily Living (ADL)	n/a	n/a	Compensatory techniques (NOS[a]) Environmental restructuring	Feedback (NOS[a])	Outcome: The intervention had different impacts across participants. Generally, ADL process ability improved, but effects on ADL motor ability and awareness of disability were questionable. Generalisation to daily life: yes Follow-up: Improvements were maintained.	**1/5**
15	LaCampagne et al. (1987) [56]	Paying bills	n/a	n/a	Chaining Instruction Modelling	Feedback (NOS[a])	Outcome: Few errors in paying bills after training, compared to many errors at baseline. Skills generalised to untrained bills. Generalisation to daily life: not measured Follow-up: Skills were maintained.	**2/5**
16	Lovett et al. (1989) [57]	Activities of Daily Living (ADL)	n/a	Feedback (NOS[a]) Self-evaluation Self-recording Self-reinforcement	Instruction Modelling	Feedback (NOS[a]) Reinforcement (reward)	Outcome: Improved ADL performance compared to baseline. Group 2 (several BCTs) generally performed better than Group 1 (self-recording only) and performed slightly better during maintenance phase, but received more training. Generalisation to daily life: yes Follow-up: Higher ADL task completion for all participants during long-term follow-up vs. baseline.	**3/5**
17	Marchetti et al. (1983) [58]	Pedestrian skills	n/a	n/a	Generalisation Prompts	Feedback (praise) Reinforcement (social NOS[a])	Outcome: Community training group significantly improved pedestrian skills. No significant change in the Classroom group. Generalisation to daily life: yes Follow-up: not measured	**1/5**
18	Martin et al. (1987) [59]	Preparation of breakfast and dinner	Self-instruction	n/a	Instruction Prompts	Feedback (corrective, praise)	Outcome: Rapid improvement in food preparation skills with the use of picture recipe cards. Generalisation to daily life: yes Follow-up: Two participants maintained high performance, for the other it was variable, but satisfactory.	**2/5**
19	Matson (1981) [60]	Shopping skills	n/a	Self-evaluation	Instruction Modelling	Feedback (descriptive, praise)	Outcome: Intervention group improved shopping skills, which generalised to another store. The control group did not improve. Generalisation to daily life: yes Follow-up: Intervention group maintained gains and generalisation effects.	**2/5**
20	Matson (1982) [61]	Phone conversational skills	n/a	Self-evaluation Self-monitoring	Instruction Modelling Shaping	Feedback (corrective, descriptive, praise) Reinforcement (social NOS[a])	Outcome: Independence training group had better conversational skills than the modelling and the control group. Modelling group performed better than the control group. Generalisation to daily life: not measured. Follow-up: Results were similar to immediate outcomes.	**4/5**
21	Matson et al. (1986) [62]	Computational and shopping skills	n/a	Self-evaluation	Instruction Modelling	Feedback (descriptive, praise) Reinforcement (social and tangible NOS[a])	Outcome: Computational and shopping skills rapidly improved after initiation of intervention. Skills generalised to other stores. Generalisation to daily life: yes Follow-up: Improvements were maintained.	**2/5**

Table 2 (*Continued*)

#	Authors (year)	Target behaviour	Behaviour Change Techniques				Main results	Quality appraisal
			Applied by participant		Applied by provider			
			Antecedent	Consequent	Antecedent	Consequent		
22	McInerney et al. (1992) [63]	Use of the bus	Use of cues (environmental landmarks	n/a	Chaining Generalisation	Feedback (corrective, praise)	Outcome: Only follow-up measures were used. Generalisation to daily life: yes Follow-up: Participants maintained their mobility skills regarding making leisure outings by bus.	**1/5**
23	Michie et al. (1998) [64]	Community living skills	Self-instruction	n/a	Chaining Instruction Modelling Prompts Roleplay Shaping	Reinforcement (social NOS[a])	Outcome: In-vivo training group performed better on community living skills and adaptive behaviour vs. the other groups, and scored higher on independent functioning and socialisation vs. the control group. Classroom group only performed better regarding library use vs. the control group. Generalisation to daily life: yes Follow-up: Results were similar to immediate outcomes.	**2/5**
24	Neef et al. (1990) [65]	Laundry skills (washing and drying)	n/a	n/a	Generalisation Modelling	Feedback (corrective, praise)	Outcome: Accuracy on the single case machine improved from 70–83% at baseline to 100% at post-training. Performance on general case machines improved from 60–83% to 92–95%. Generalisation to untrained machines only occurred after general case instruction. Generalisation to daily life: yes Follow-up: not measured	**2/5**
25	Ores et al. (1984) [66]	Make a telephone call	n/a	n/a	Modelling	n/a	Outcome: Nine out of ten participants were able to dial successfully immediately after training. Generalisation to daily life: not measured Follow-up: Results were similar to immediate outcomes.	**2/5**
26	Rehfeldt et al. (2003) [67]	Making a sandwich	n/a	n/a	Modelling	Feedback (praise)	Outcome: Rapid mastery of meal preparation skill once training initiated. Skill generalisation across settings. Generalisation to daily life: not measured Follow-up: Skill was maintained.	**2/5**
27	Richman et al. (1984) [68]	Menstrual care skills	n/a	n/a	Chaining Instruction Prompts	Feedback (corrective, praise)	Outcome: Performance improved substantially after training initiated. 100 % correct performance maintained on the validation and maintenance session. Generalisation to daily life: yes Follow-up: Maintenance of a high level of responding.	**3/5**
28	Risley et al. (1980) [69]	Making an emergency call	n/a	n/a	Generalisation Instruction Modelling Physical guidance	Feedback (corrective, descriptive, praise)	Outcome: Performance improved after training initiated. Skill generalisation to other emergency parties. Generalisation to daily life: not measured Follow-up: Results were similar to immediate outcomes	**2/5**
29	Sarber et al. (1983) [70]	Menu planning and grocery shopping	n/a	n/a	Instruction Modelling Prompt	Feedback (corrective, praise)	Outcome: Improved performance on planning nutritious meals from 0% to 100 % after completion of intervention. Grocery shopping skills improved from 25–72.5% to 100% post-intervention. Generalisation to daily life: yes Follow-up: Meal planning and grocery shopping skills varied from 92.5–100%.	**2/5**
30	Sigafoos et al. (2005) [3]	Make a bag of microwave popcorn	n/a	n/a	Instruction Modelling	n/a	Outcome: Two out of three participants improved from 0–30% at baseline to 100% independence after video prompting started. Generalisation to daily life: no Follow-up: Independence ranged from 80–100%.	**1/5**
31	Taber-Doughty et al. (2010) [71]	Household tasks	n/a	n/a	Instruction Prompts	n/a	Outcome: Slightly more independent performance when prompted by a telecare provider vs. a standard care provider. Generalisation to daily life: yes Follow-up: Results were variable.	**2/5**
32	Tam et al. (2005) [72]	Supermarket shopping	n/a	n/a	Instruction Modelling Roleplay	Feedback (NOS[a]) Reinforcement (verbal NOS[a])	Outcome: Conventional training and Virtual Reality (VR) group showed a significant and similar improvement in shopping skills. Generalisation to daily life: yes Follow-up: not measured	**2/5**

Table 2 (*Continued*)

#	Authors (year)	Target behaviour	Behaviour Change Techniques				Main results	Quality appraisal
			Applied by participant		Applied by provider			
			Antecedent	Consequent	Antecedent	Consequent		
33	Taylor et al. (1997) [73]	Shopping	Self-instruction	Feedback (descriptive, praise)	Instruction Modelling Prompts	n/a	Outcome: In Phase 1, successful performance of shopping task across training and generalisation stores using overt and covert self-instruction. Blocking of overt and covert self-instruction resulted in reversal to baseline levels. In Phase 2, successful performance of shopping task using self-rules. High levels of task analysis responding corresponded with high levels of self-instruction. Similar results in the generalisation settings. Generalisation to daily life: yes Follow-up: not measured	**2/5**
34	Taylor et al. (2000) [74]	Supermarket shopping	n/a	n/a	Generalisation Instruction Modelling Physical guidance Prompts Roleplay	Feedback (corrective, praise	Outcome: All participants reached criterion responding in supermarket training settings with little difference between groups. Stimulus equivalence training and Multiple exemplar training were equally effective in promoting generalisation, single instance training was the least effective. Generalisation to daily life: yes Follow-up: not measured	**2/5**
35	Wacker et al. (1986) [75]	Clerical Tasks	n/a	n/a	Modelling	Feedback (corrective, praise)	Outcome: 90 % of sheets were copied correctly. Substantial increase in incidental behaviours, indicating a more appropriate interaction with the work environment. Generalisation to daily life: yes Follow-up: not measured	**2/5**
36	Wu et al. (2016) [76]	Daily living skills	Self-instruction	n/a	Generalisation Modelling Physical guidance Prompts	Feedback (corrective)	Outcome: All participants acquired a variety of daily living skills using video prompting. Generalisation to daily life: yes Follow-up: 100 % accuracy was maintained.	**4/5**

n/a = not applicable.
[a] Not Otherwise Specified.

with one group outperforming the other (article #16, 20, 31). In two of these latter cases (article #16, 20), the group with the most improvement received an intervention that used more BCTs than the other training group (e.g., not just self-recording, but also self-evaluation and self-reinforcement).

4. Discussion and conclusion

4.1. Discussion

This systematic review analysed studies on interventions that aim to promote self-management in daily life for adults with mild to moderate ID. We described the effectiveness of the interventions, as well as the BCTs that were used to attain the desired self-management behaviour. In all the studies included, the authors reported that the self-management interventions were effective and that the positive effects were generally maintained over time. All studies that measured generalisation effects found that the self-management behaviour trained was generalised to other tasks or (daily life) situations. With regard to the BCTs, all interventions involved BCTs applied by the provider of the intervention (e.g., trainer); in addition, one third of interventions also involved training participants with ID to apply BCTs themselves. Antecedent BCTs applied by participants included self-instructions and the use of cues; consequent BCTs included self-monitoring of the execution of the target behaviour and self-reinforcement. In most studies (n = 32), providers combined several antecedent BCTs, such as modelling, instructing, and prompting, with several consequent BCTs such as providing feedback or reinforcement. The findings seem to imply that interventions can promote self-management in people with mild to moderate ID, irrespective of the self-management behaviour targeted and the characteristics of the intervention.

This review extends previous reviews that only analysed interventions for people with ID that targeted a specific self-management domain [e.g., 18, 22] or BCT [e.g., 8, 24]. In line with previous reviews, the self-management interventions included showed positive results, but it was difficult to determine which factors contributed to the effectiveness of the interventions. Previous studies have suggested that a combination of multiple BCTs is most effective in promoting behaviour change [18,31]. However, it is as yet unknown which particular combinations might be especially effective for this population. Our finding that the interventions studied were considered effective is promising, as this suggests that people with mild to moderate ID can improve their self-management in daily life, regardless of the target behaviour, the specific intervention characteristics, and BCTs applied. It seems that as long as people with mild to moderate ID are provided with a self-management training, they are able to manage their affairs more independently, regardless of the type of affairs or self-management behaviour targeted. However, the finding that all interventions were reported to be effective also

suggests a possible publication bias [32]. This type of bias is further increased because we only included articles and no book chapters or dissertations. In addition, studies were generally of moderate quality, which is common in the field of ID [27,33], and which further suggests a high risk of bias. Sample sizes were often very small, two thirds of studies used a (multiple) case study design; and only ten studies included a control group. Notably, quantitative data on results was often missing or incomplete. As a result, the interpretation and generalisation of the positive findings must be conducted with great caution, and hence no firm conclusions can be drawn.

Regarding the BCTs used to attain the targeted self-management behaviour, in the reviewed interventions it was found that in most cases BCTs were only applied by the intervention provider. This means that most of the time when people with ID were trained to promote their self-management, they were still largely dependent on the provider of the training. One could argue however, that a more effective and efficient way to promote overall self-management in people with ID is to teach them to apply BCTs or strategies themselves, such as self-instructions, self-rules, or general problem solving. This could reduce the need for proximity of a provider [34]. Especially since support staff already feel they cannot provide the quality of care that is needed for people with ID [35], a decreased dependence on the support provider is important to consider in self-management interventions. Furthermore, BCTs used by participants themselves can more easily be applied to other self-management tasks or situations [34,36–38], although whether this will occur may depend on the cognitive level of the person with ID.

If generalisation of BCTs is to be achieved, this needs to be targeted in interventions. However, even in the interventions reviewed in which BCTs were applied by participants, they only focused on the application of BCTs for specific behaviours. These behaviours often concerned very specific practical skills necessary at home or in the community, such as preparing food or withdrawing money. Looking at the quality of life domains as proposed by Schalock [39], the focus of self-management interventions for people with ID has mostly been limited to the domains of personal development, material wellbeing, and physical wellbeing. Domains such as interpersonal relations, self-determination, social inclusion, and rights, on the other hand, were hardly addressed in the interventions reviewed. Only three interventions targeted self-determination or rights [40–42], but these again only focused on a specific domain or context (e.g., making sexuality-related decisions). Therefore, to promote the overall quality of life of people with ID, interventions may need to go beyond training individual practical skills and may also need to focus on other important domains in life, such as self-management at work and in social interactions.

4.2. Limitations

One imitation of this study is that given the heterogeneity in study designs, types of interventions, and outcome measures, it was only possible to conduct a systematic review and not a meta-analysis,. In addition, we could not analyse which factors (e.g., participant or study characteristics) contributed to the effectiveness of interventions, and how and to what extent these factors contributed. We also could not analyse whether interventions in which BCTs were applied by participants with ID were more effective than those in which the BCTs were solely (or mainly) applied by the providers. Reasons for this were that all interventions were found to be effective, that sometimes only qualitative descriptions of results were reported, and that quantitative data (e.g., effect sizes) were often incomplete. Other important information was also often not reported. This included information regarding age, diagnosis of ID, recruitment of participants, inclusion and exclusion criteria, moments of assessment, any tailoring of interventions, the provider, the length and intensity of the intervention, and the BCTs applied. All this hampers the aggregation of data and thus the deduction of factors contributing to interventions' effectiveness, as well as a further examination of the specific groups of people with ID for which interventions are particularly effective. Also, the total sample size of all the studies reviewed was relatively small, which limits the generalisability of our findings. The abovementioned limitations commonly affect not only studies on self-management interventions, but also other types of studies in the field of ID, such as studies on lifestyle change interventions [27,33].

For future studies on self-management interventions we recommend providing more detailed information about the results and the participant and intervention characteristics. In addition, given the frequent occurrence in this field of relatively low-quality studies, there is a need for studies of high quality and with a low risk of bias (e.g., by including larger samples and applying randomisation techniques). Aspects to consider in future interventions could be the wider application of BCTs by people with ID themselves, with the aim of promoting overall self-management and quality of life, rather than solely targeting a particular practical skill. The transfer and generalisation of the target behaviour to daily life and across settings may also need to be incorporated in the interventions, as well as in the assessment of the intervention outcomes. Future studies could also further explore e-health or m-health interventions [43], for example by creating self-management apps for tablets and mobile phones [44]. This may help people with ID to easily apply BCTs in all kinds of everyday situations without having to be dependent on the availability of their support staff and relatives [45]. For some people with ID this may require prior self-management training in using computers, tablets, and mobile phones, as well as in handling the internet and its potential dangers (e.g., unreliable websites and contacts) [44].

4.3. Conclusion

In sum, this review described a broad range of interventions for people with mild to moderate ID aimed at promoting their self-management in daily life; at the same time, we evaluated the effectiveness of the interventions and the BCTs applied. Interventions generally targeted a particular skill by using a combination of several BCTs, mainly applied by the provider of the training. Although the results must be interpreted with caution due to the moderate methodological quality of most studies and the resulting high risk of bias, the finding that all interventions were reported to be effective seems to suggest that additional training can aid in the promotion of self-management in people with mild to moderate ID, regardless of the specific skill trained and the type of intervention provided. Further research is necessary to study the interventions' effectiveness more thoroughly, for example by examining what factors contribute to the effects of interventions and which type of intervention is effective for which subgroup of people with ID. This requires more specific information about the participants (e.g., diagnosis of ID, comorbidities) and the interventions (e.g., BCTs applied). Furthermore, it is recommended that self-management interventions target more diverse quality of life domains [39].

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Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.pec.2020.06.009.

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