Effectiveness of Motivational Interviewing on adult behaviour change in health and social care settings: A systematic review of reviews

Helen Frost, Pauline Campbell, Margaret Maxwell, Ronan E. O’Carroll, Stephan U. Dombrowski, Brian Williams, Helen Cheyne, Emma Coles, Alex Pollock

1 School of Health and Social Care, Edinburgh Napier University, Sighthill Court, Scotland, United Kingdom,
2 Nursing, Midwifery, Allied Health Professional Research Unit (NMAHP-RU), Glasgow Caledonian University, Glasgow, United Kingdom,
3 Nursing, Midwifery, Allied Health Professional Research Unit (NMAHP-RU), School of Health Sciences, University of Stirling, Stirling, Scotland, United Kingdom,
4 School of Health Sciences, Division of Psychology, University of Stirling, Stirling, Scotland, United Kingdom

Current address: Faculty of Kinesiology, University of New Brunswick, Fredericton, New Brunswick, Canada.
* H.Frost@napier.ac.uk

Abstract

Background
The challenge of addressing unhealthy lifestyle choice is of global concern. Motivational Interviewing has been widely implemented to help people change their behaviour, but it is unclear for whom it is most beneficial. This overview aims to appraise and synthesise the review evidence for the effectiveness of Motivational Interviewing on health behaviour of adults in health and social care settings.

Methods
A systematic review of reviews. Methods were pre-specified and documented in a protocol (PROSPERO–CRD42016049278). We systematically searched 7 electronic databases: CDSR; DARE; PROSPERO; MEDLINE; CINAHL; AMED and PsycINFO from 2000 to May 2018. Two reviewers applied pre-defined selection criteria, extracted data using TIDIER guidelines and assessed methodological quality using the ROBIS tool. We used GRADE criteria to rate the strength of the evidence for reviews including meta-analyses.

Findings
Searches identified 5222 records. One hundred and four reviews, including 39 meta-analyses met the inclusion criteria. Most meta-analysis evidence was graded as low or very low (128/155). Moderate quality evidence for mainly short term (<6 months) statistically significant small beneficial effects of Motivational Interviewing were found in 11 of 155 (7%) of meta-analysis comparisons. These outcomes include reducing binge drinking, frequency and quantity of alcohol consumption, substance abuse in people with dependency or addiction, and increasing physical activity participation.
Conclusions

We have created a comprehensive map of reviews relating to Motivational Interviewing to signpost stakeholders to the best available evidence. More high quality research is needed to be confident about the effectiveness of Motivational Interviewing. We identified a large volume of low quality evidence and many areas of overlapping research. To avoid research waste, it is vital for researchers to be aware of existing research, and the implications arising from that research. In the case of Motivational Interviewing issues relating to monitoring and reporting fidelity of interventions need to be addressed.

Introduction

There is overwhelming epidemiological evidence that health behaviour such as smoking, substance abuse (drugs and alcohol), physical inactivity, and unhealthy eating are associated with increased morbidity and mortality. The cost to the UK NHS for diseases associated with poor diet, physical inactivity, smoking, alcohol and obesity are estimated to be in excess of £12 billion [1]. The challenge of addressing unhealthy lifestyle choice is complex and requires sustained behaviour change. The UK NICE (2014) guidelines [2] recommend a range of behaviour change approaches, guided by a taxonomy of interventions [3], aimed at changing health-related behaviour of individuals, communities or whole populations.

Motivation to change is a key component of the behaviour change process as it guides and maintains goal-related behaviour [4]. One approach to change motivation and subsequent behaviour is Motivational Interviewing, introduced by William Miller in 1983 to help people with alcohol problems change their drinking behaviour [5]. The approach was developed further in the 1990s into "A collaborative conversation style for strengthening a person’s own motivation and commitment to change" [5]. Motivational Interviewing aims to explore and resolve ambivalence that people might have about health behaviour in favour of change. It encourages people to say why and how they might change and pertains both to a style of relating to others and a set of skills to facilitate that process. The four overlapping processes involve: 1) engaging in a working relationship; 2) focusing on a problem to change; 3) evoking the person’s desire to change; 4) planning the change [5]. In 1997 an international organisation of trainers established 'The Motivational Interviewing Network of Trainers (MINT)' with an aim to improve the quality and effectiveness of counseling and consultations for professional delivering Motivational Interviewing. The organisation has grown to represent 35 countries and 26 languages, which demonstrates the global popularity of this intervention. Some reviews report positive outcomes for Motivational Interviewing and suggest it could be useful for a wide range of behavioural and health problems [6–9] whilst others are more cautious in their conclusions and recommendations [10–12].

Many different health care professionals and other groups are using behaviour change interventions including Motivational Interviewing to help people change or adapt their behaviour. However, it is unclear for which behavioural problems and populations Motivational Interviewing is most beneficial, or in some cases, where there is evidence of no effect or possible harm. This overview aims to identify, appraise and synthesise the review evidence for the effectiveness of Motivational Interviewing on health behaviour of adults in a wide range of health and social care settings to answer the following question:

What is the strength and quality of the current evidence to support the use of Motivational Interviewing to change adult behaviours in health and social care settings?
This question is important to guide health care professionals, researchers and other stakeholders to the most effective and worthwhile interventions for patients.

**Methods**

**Design**

We conducted a systematic review of existing reviews (referred to as an overview [13]). An overview synthesises the evidence from more than one systematic review at a variety of different levels, including the combination of different interventions, different outcomes, or people from different populations with different conditions.

**Search methods**

We systematically searched the following electronic databases from January 2000 to 28th May 2018; Cochrane Database of Systematic Reviews (CDSR); Database of Reviews of Effects (DARE); PROSPERO (an international prospective register of systematic reviews); MEDLINE; CINAHL; AMED and PsycINFO. The search string was adapted for each database. (See Appendix 1 for Medline search). A comprehensive search combined key terms using Boolean operators (e.g. AND, OR) for: Intervention (e.g. "motivational interviewing," "motivational enhancement") and Review type (e.g. "systematic review," "meta-analysis," "review literature," "qualitative systematic review," "evidence synthesis" OR "realist synthesis", "qualitative AND synthesis", "meta-synthesis" OR meta synthesis OR metasynthesis", "meta-ethnograph" OR metaethnograph OR meta ethnograph", "meta-study OR metastudy OR meta study"). Truncated forms of these terms and alternative spellings were included. To be eligible for inclusion, reviews met the following criteria:

**Inclusion criteria.**

- Reviews using structured, pre-planned methods to synthesise research studies addressing a clearly defined topic or research question (which could comprise either quantitative, qualitative or mixed methodology)
- Published from January 2000
- Interventions described as Motivational Interviewing or Motivational Enhancement Therapy (MET) delivered in any format (e.g. face to face, online, group, text or telephone)
- English language
- Interventions focused on adults.

**Exclusion criteria.**

- Letters, commentaries, expert opinion, theoretical and “non-systematic” or unstructured reviews e.g. reviews without an aim that did not clearly describe the search strategy, selection criteria and quality assessment employed.
- Reviews focused solely on children and adolescents under the age of 18 years
- Reviews focused on Motivational Interviewing intervention to change professional or organisational group behaviour.
- Reviews focused on combined psychological interventions e.g. Motivational Interviewing combined with Cognitive Behavioural Therapy.
Identification of studies
Members of the review team (PC / SM) ran the search strategy and then examined all titles to exclude clearly irrelevant papers. Two reviewers (PC and HF) independently reviewed the abstracts of all potential records identified from the electronic searches and excluded those not meeting the inclusion criteria. Inter-rater reliability was assessed for agreement of abstract screening.

Two reviewers (PC and HF) independently assessed full papers for all potentially relevant reviews. Full text papers ranked as irrelevant by both reviewers were excluded at this stage of the screening process. The final selection of full text papers (judged as relevant or unsure) were discussed at a consensus meeting, with a third reviewer (MM or AP) as required.

Data extraction
Three reviewers (PC, HF and EC) independently extracted the following information: review question or aims; types of studies included; characteristics of participants and numbers included; interventions details. The TIDieR framework[14] was used to guide reporting of interventions components and comparators. Two reviewers (HF and PC) checked all the extracted data and discussion between the two reviewers resolved any disagreement; with assistance from a third reviewer (AP) when necessary. A data extraction form (excel) specifically developed by the overview author team was used to collate the data.

Categorisation of reviews
Two reviewers (PC and HF) categorised each review into one of four of the following domains depending on the focus of the review.
- Domain 1: Stopping or preventing an unhealthy behaviour
- Domain 2: Promoting healthy behaviour for a specific problem
- Domain 3: Behaviour change for multiple health related problems and /or multiple behaviour problems
- Domain 4: Behaviour change in specific settings

Reviews in Domain 1 and 2 were then sub-grouped by HF and PC according to the main health behaviour or problem.

Assessment of quality of reviews
Two reviewers (HF and PC) independently assessed the methodological quality of included reviews using the ROBIS tool [15]. Any disagreement was resolved through discussion between the two reviewers. The tool covers four domains to detect bias in systematic reviews relating to study eligibility criteria; identification and selection of studies; data collection and study appraisal; synthesis and findings. The full result of assessment of bias aids transparency and aims to help researchers judge risk of bias in the review process, results and conclusions.

Meta-analyses data extraction
One reviewer (PC) extracted comparative data for individual and combined outcomes from any review that included meta-analyses. Data exploring effectiveness of Motivational Interviewing as the main intervention compared with any other intervention or control was extracted. One reviewer (HF) checked the data entry.

This included the following data: Number of trials and participants in the meta-analysis; Measure of effect (e.g. effect size, mean difference, standardised mean difference, relative risk); Measure of variability (95% confidence intervals) and Measure of heterogeneity (I-squared).
Three reviewers (AP, PC and HF) checked the quality assessment of individual studies reported in the reviews and considered the results when grading the evidence. We used the GRADE (Grades of Recommendation, Assessment, Development, and Evaluation) criteria to assess whether the quality of the evidence presented in the meta-analyses was high, moderate, low or very low [16] for all available comparator data within each review. This involved judgement of risk of bias relating to study design, imprecision, inconsistency, indirectness, and publication bias [17]. In addition, one reviewer (PC) extracted any data that included exploration of moderator variables and tabulated effect size for each comparator.

**Meta-analysis synthesis**

For reviews including a meta-analysis two reviewers (PC and HF) independently checked the overlap in studies within all the reviews and resolved any uncertainty through discussion. We excluded data superseded by a more up-to-date review (e.g. where a Cochrane review had been updated while we were conducting the overview), or in cases where an overlapping review was conducted with the same review question, we selected the higher quality review judged using the ROBIS quality assessment tool [15]. We tabulated the intervention, comparison, outcome, number of studies and participants’ data relating to effectiveness and the GRADE of evidence [18]. Using the data relating to effectiveness we noted whether there was statistically significant evidence of benefit or harm for each outcome reported in the meta-analyses, or if there was no evidence of benefit or harm (no statistically significant effect).

**Narrative review synthesis**

For all systematic reviews without meta-analysis data (defined as narrative reviews), we summarised key findings. We systematically documented and explored the conclusions reported by the authors of the reviews. Where these reviews included overlapping aims and outcomes, we compared conclusions; where there was a discrepancy in conclusions, we focused conclusions of the most up-to-date and highest quality reviews (judged using ROBIS) [15]. We considered whether these were in agreement with the results of any related meta-analyses reported in other reviews and focused our conclusions on the most up-to-date and high quality data.

**Results**

The search identified 5222 records; we screened 2852 titles and removed 2363 obviously irrelevant records after removing duplications. Two reviewers screened 489 abstracts and 235 full text articles, excluded 131 reviews and extracted data from the remaining 104 reviews. The inter-rater reliability for abstract screening was 92%. The PRISMA flow diagram (Fig 1) shows the flow of literature through the searching and screening process.

**Description of included reviews**

Two reviewers categorised the reviews into four domains. The number of reviews in each domain are represented in Fig 2.

- **Domain 1. Stopping or preventing an unhealthy behaviour including smoking cessation** (n = 11) [11, 12, 19–43], substance misuse for general population (alcohol and drugs) (n = 23) [28, 29, 38–58], substance misuse for people with mental health problems (n = 8) [31, 33, 35–37, 59–61] and people with gambling addiction (n = 3)[7, 62, 63] (Total = 45).

- **Domain 2. Promoting healthy behaviour for a specific problem including; management of oral health (n = 5) [64–68], eating disorders (n = 3) [10, 69, 70], weight loss management (n = 4) [71–74], management of metabolic disease (Type 2 diabetes) (n = 6) [75–80],**
Fig 1. PRISMA Study flow diagram. MI = Motivational Interviewing; CBT = Cognitive Behavioural Therapy.

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management of neurovascular (stroke) and cardiovascular disease (n = 3) [81–83], management of sexual health (n = 5) [84–88], adherence to medication (n = 9) [89–97] and engagement with interventions; cardiac care [98], health screening [99] and mental health interventions [100] (n = 3), cancer care (n = 1) [101], musculoskeletal problems [102, 103] (n = 2), irritable bowel disorder [104] (n = 1).

Domain 3. Behaviour change for multiple health related problems and/or multiple behaviour problems (n = 9) including one recent review of Technology Delivered Motivational Interviewing (TDMI) [105] and eight reviews focused on various health problem such as excess drinking, smoking, and physical inactivity [8, 9, 106–111].

Domain 4. Behaviour change in specific settings (n = 8) including emergency care settings [112, 113] (n = 2), primary care [114–117] (n = 4), medical care settings for multiple problems [6, 118] (n = 2).

**Domain 1: Reviews focused on interventions aimed at preventing unhealthy behaviour**

**Smoking cessation.** Of the 11 reviews [11, 12, 19–27], two reviews focused on reducing exposure of smoke to children [11, 20], one on smoking during pregnancy [19], three on
general smoking cessation [22–24], two were carried out in emergency care settings [25, 26]. One review was updated from an earlier review of Motivational Interviewing to support smoking cessation [119] with the addition of 14 studies since 2010 [12]. One review focused on smokeless tobacco users although only one out of 34 trials included Motivational Interviewing [21].

**Substance misuse.** Thirty-one reviews assessed substance misuse/abuse of which 13 focused primarily on alcohol related problems [28, 39, 40, 43–46, 49, 50, 52, 53, 55, 58]. Reviews in this domain included different populations and problems [29, 38, 41, 42, 48, 56, 57] [53, 54]; both alcohol and drug abuse users [56]; young adults [39]; pregnant women and drug use [38], two reviews focused on cannabis use [41, 42]; one focused on offenders and treatment retention [29]. Eight reviews describe substance misuse in people with co-existing mental health disorders [31–37]. Jiang et al (2017) focused on brief non face-to-face interventions e.g. telephone.

**Gambling behaviour.** Three reviews focused on Motivational Interviewing and psychological therapies for gambling addiction [7, 30, 63]. Yakovenko et al (2015) [7] identified eight trials including longer term follow up, Petry (2017) [63] reviewed trials of psychological interventions but identified only 2 trials that included Motivational Interviewing as a stand-alone intervention.

**Domain 2: Reviews focused on interventions aimed at promoting healthy behaviour for a specific problem**

**Oral hygiene behaviour.** Five reviews focused on oral hygiene, 3 compared conventional oral hygiene advice with Motivational Interviewing interventions [64, 65, 68]. One compared periodontal therapy alone with Motivational Interviewing and periodontal therapy combined [66], and one included a meta-analysis of psychological treatment for people with poor oral health [67].

**Eating disorders.** Three reviews focused on eating disorders of mainly female participants e.g. Anorexia nervosa and bulimia nervosa [10, 69, 70].

**Weight management behaviour.** Three reviews focused on changing diet and physical activity for weight management in obese adults [71, 72, 74] and one investigated the management of weight gain during pregnancy [73].

**Management of diabetes.** Six reviews focused on the management of people with diabetes. They include reviews focussed on evidence for; improving health behaviour in the management of diabetes [75], promoting glycaemic control [77] and lifestyle modifications programmes for metabolic risk [78]. Four other reviews categorised in Domain 3 (multiple health problems / behaviours) and Domain 4 (Behaviour change in specific settings) assessed the effectiveness of Motivational Interviewing for diabetes management alongside obesity and other health related problems [71, 91, 114, 118].

**Management of neurovascular disorders and cardiovascular disease (CVD).** Three reviews focused on behaviourial interventions for neurovascular disorders, but the reviews only included 11 trials in total evaluating the effectiveness of Motivational Interviewing. One review investigated Motivational Interviewing for the management of activities of daily living for stroke victims, identifying one study only [81]. Hildebrand (2015) reported one of 39 trials that incorporated Motivational Interviewing into interventions to support occupational therapy for stroke victims [82]. Lee et al (2016) [83] investigated lifestyle modification, physiological and psychological outcomes for people diagnosed with Cardiovascular disease. Overall there is insufficient evidence in this group to make firm conclusions about effectiveness of Motivational Interviewing.
Sexual health behaviour. Five reviews focused on promoting safe sexual behaviours [84–88]. Two reviews focused specifically on sexual health in gay men [84, 85]. One review focused on the effectiveness of Motivational Interviewing on contraceptive use in women [87].

Adherence to medication. Adherence to medication was assessed for different populations and health problems. Hu et al (2014) assessed interventions including Motivational Interviewing to increase medication adherence in racial and ethnic minority groups [94]. Five reviews assessed medication adherence for patients with HIV [90, 94, 96, 97, 120]. Two recent reviews with meta-analyses assessed the effectiveness of Motivational Interviewing to enhance medication adherence for adults with chronic diseases and health problems [93, 95].

Engagement with interventions. Three reviews focused on engagement with a specific intervention [98–100]; one specifically on cardiac rehabilitation. Karmali et al (2014) assessed adherence to cardiac rehabilitation but only one trial of Motivational Interviewing was identified in this review [98]. A review with meta-analysis of outcomes relating to adherence by Lawrence et al (2017) [100] investigated individuals’ uptake of mental health interventions. Miller et al (2017) [99] assessed the efficacy of Motivational Interviewing to improve health screening for various problems e.g. breast screening, uptake of colonoscopy.

In addition, two other reviews grouped in Domain 1 and 2 assessed the effect of Motivational Interviewing on adherence to drug management programmes in offender populations [29] and adherence to treatment for chronic pain [102].

Management of musculoskeletal problems. Two reviews focused on musculoskeletal problem [102, 103] with some overlap of trial within the reviews. In the most recent review, Alperstein and Sharp (2016) identified 7 trials focused on pain outcomes and adherence to treatment in adults with various musculoskeletal problems e.g. low back pain, rheumatoid arthritis [102].

Management of irritable bowel disorders. One review explored the use of Motivational Interviewing to improve outcomes for people with irritable bowel disorders including quality of life measures [104].

Cancer care. One review focused on Motivational Interviewing to address various lifestyle behaviours and health problem associated with cancer such as fatigue, weight problems, and physical activity participation [101].

Domain 3: Reviews that focused on multiple health related problems and/or multiple behaviour problems

Nine reviews focused on behavioural interventions for people with multiple health problems [8, 9, 105–111]; These included multiple risk factors for cardiovascular disease [110]; diet, exercise, diabetes and oral health [109]; alcohol, drugs, diet and exercise [106, 111]; substance abuse, smoking, HIV risk, diet and exercise [107] multiple behaviour problems [8, 108] and multiple health outcomes [9]. Shingleton et al (2016) evaluated the efficacy of technology delivered Motivational Interviewing interventions in a mixed population from different socioeconomic backgrounds [105].

Domain 4: Reviews focused on behaviour change interventions in specific settings

Eight reviews reported behaviour change interventions delivered in specific settings [6, 112–118]. One included a combination of healthcare settings [118]; one focused on medical care settings [6]; four were carried out in primary care [114–117]. Merz et al (2015) [113] and Kohler and Hofmann (2015) [112] focused on young adults in emergency care units. In addition, two
reviews described in Domain 1 (preventing an unhealthy behaviour) also reported smoking cessation in emergency department settings [25, 26].

**Review characteristics and quality assessment**

Tables 1–4 report details of the review characteristics and implications for clinical practice and research. Further details of the interventions using the 'Template for Intervention Description and Replication (TIDieR) [14] are reported in S1 Table. Of the 104 reviews 40 were judged by two authors (PC and HF) as overall low risk of bias [7, 11, 12, 20, 21, 25–27, 30, 35, 38, 41, 44, 47–49, 51, 53, 54, 56, 57, 59, 65, 71, 81, 83, 84, 89, 91–94, 97, 98, 100, 102, 111, 113–115]. Fig 3 summaries the risk of bias across all reviews. S2 Table reports the assessment of bias for each review individually using the ROBIS tool [15].

**Results of meta-analyses**

Thirty-nine reviews reported meta-analyses but it was not possible to extract data from all. [6–9, 12, 21–23, 26, 27, 30, 38, 39, 41, 45, 46, 48, 49, 56–58, 67, 71, 73, 74, 77, 81, 84, 87, 91, 93, 95, 100, 102, 106, 108, 111, 112, 116]. Table 5 provides a brief summary of results from the reviews with pooled data comparisons.

Of the 155 meta-analysis comparisons that were extracted, we found no high quality evidence. Twenty seven comparisons provide moderate quality evidence according to the GRADE criteria. Most of this evidence was categorised in Domain 1 (Stopping an unhealthy behaviour). Further details of the outcomes for the moderate quality evidence are reported in Table 6.

Seventy one comparisons provided low quality evidence and 57 provide very low quality evidence judged by the GRADE criteria. S3 Table summarises the comparisons that were judged as providing low or very low quality evidence. The key reasons for downgrading the evidence to low or very low quality primarily relate to; risk of bias of the review was unclear; heterogeneity was judged to be moderate to high, or confidence intervals very large; volume of evidence was judged to be insufficient to support a definitive conclusion and concerns about the quality of the trials included within the comparison judged by review authors.

**Moderate quality evidence for effectiveness of Motivational Interviewing**

Table 6 summarises the 27 comparisons, which provide moderate quality evidence for Motivational Interviewing interventions judged from six reviews [12, 49, 56, 58, 84, 111]. Eleven of these 27 comparisons (7% (11 of 155) of all meta-analyses’ comparisons) provide moderate quality evidence for mainly short term (<6 months) statistically significant beneficial effects of Motivational Interviewing. The remaining 16 comparisons demonstrate no benefit or harm, compared with a control of usual care or other active interventions. Moderate quality evidence of a beneficial effect of Motivational Interviewing was available for;

**Alcohol use.** 13 comparisons from two reviews [49, 58] explored the effect of Motivational Interviewing on outcomes relating to alcohol use in mixed populations. Eight of the 13 comparisons provide consistent evidence that Motivational Interviewing has a beneficial effect on outcomes relating to the frequency and/or volume of alcohol consumption, for short term outcomes (<4 months), but the evidence relating to sustained (>4 months) outcomes is less consistency. Comparisons relating to risky behaviour and drink driving demonstrated no benefit (or harm) of Motivational Interviewing. There is evidence of beneficial effects from one review of young adults (<25 years), for reducing binge drinking, frequency, quantity of alcohol consumption and peak blood alcohol concentration [58].
Table 1. Characteristics of included reviews of Motivational Interviewing (MI) and summary of findings for Domains 1 (Smoking Cessation). Abbreviations: MI = Motivational Interviewing, BMI Brief Motivational Interviewing, RCT = randomised controlled trial, MET = Motivational Enhancement Therapy.

| Review author | Objective | Type and Number of studies | Participants | Intervention/comparisons | Outcomes | Authors conclusions | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|---------------|-----------|-----------------------------|--------------|--------------------------|----------|--------------------|-----------------------------------------------|--------------------------------------------------------------------------------|
| Basi et al (2014)[11] | To determine the effectiveness of interventions aiming to reduce exposure of children to environmental tobacco smoke. | 82 RCTs, 52 controlled trials (n = 11824) | Parents, family members, child care workers and teachers | MI / Usual care—Placebo | Primary outcome—children’s exposure to tobacco smoke | Inconclusive | NR (LOW) | There is moderate quality evidence (assessed by GRADE) that MI interventions provide small beneficial effects in smoking cessation in the short and long term (4–12 months) compared to no treatment. Effects are likely to be small. (See Tables 5 & 6) Further high quality research focusing on training and competency, fidelity, delivery and dose in different settings for specific groups is justified. Windows of opportunity to promote smoking cessation should be investigated further e.g. in specific antenatal groups and during pregnancy. |
| Hawley et al (2010) | To determine whether or not MI promotes smoking cessation. | 34 RCTs, 22 controlled trials (n = 1838) | Parents, family members, child care workers, and teachers | MI / Usual care, MI + behavioural therapy | Primary outcome—abstinence from tobacco use after 6 months | Inconclusive | NR (UNCLEAR) | |
| Heckman et al (2010) | To investigate the efficacy of interventions incorporating MI for smoking cessation. | 16 RCTs and 1 CRT (n = 1947) | Mixed adults of different race and sex | MI (Brief advice, written materials) | Primary outcomes: abstinence from smoking | M-A | |
| Hettma et al 2010 [23] | To focus solely on smoking cessation and examine potential moderating factors to inform clinical practice guidelines. | 31 studies (n = 2816) | Mixed adults including pregnant/postpartum women | MI (Brief advice, written materials) | Primary outcomes: abstinence from smoking | M-A (HIGH) | |
| Lindson-Hawley et al (2015) | To determine whether or not MI promotes smoking cessation. | 28 studies (n = 16371) | Mixed population | MI / usual care in the trials. | Abstinence from smoking after at least six months follow-up | M-A | |
| Mantler et al (2012) | To compare three different dimensions of MI at facilitating smoking cessation. | 17 studies (n = 11600) | Adults between 18 and 64 years | MI strategies / written materials | Self-reported outcomes and biological measures | Inconclusive | NR (UNCLEAR) | |
| Pelletier et al (2014) | Effectiveness of smoking cessation interventions for patients in the adult or paediatric emergency care setting. | 4 RCTs (n = 74–1044) | Adults in emergency setting | MI plus brochures/ control brochures | Smoking cessation | Inconclusive | NR (LOW) | |
| Rabe et al (2013)[29] | To examine the efficacy of Department–Initiated Tobacco Control | 7 RCTs (n = 1986) | Adults age range from 18–78 years | MI plus booklet / (Universal care, brief advice only, brief counselling) | Smoking abstinence | M-A | |
| Stead et al (2014)[37] | To assess the effect of combining behavioural support and medication to aid smoking cessation, compared to a minimal intervention or usual care or usual care. | 66 studies, 53 included MI (n = <25000) | Adult smokers, 35 to 65% female participants with average age from low 40’s to mid-50. | MI strategies / usual care or brief advice or less intensive behavioural support | Abstinence from smoking after at least six months of follow-up | M-A | Combination of pharmacotherapy with behavioural support improves quit rates compared to no treatment or a minimum intervention. |

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| Domain 2: Substance Misuse (Alcohol and Drug) | Objective | Trials and Number of studies | Intervention: Comparison | Outcome(s) | Authors' conclusion | Notes and references | Explanation to clinical practice and research (e.g. shifts in evidence) |
|---------------------------------------------|-----------|----------------------------|-------------------------|------------|---------------------|---------------------|----------------------|
| Substance Misuse in People with Co-existing Mental Health Problems | To assess the effects of brief MI intervention on reducing alcohol and other substance use in people with mental health problems | 23 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Young Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in young adults | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Older Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in older adults | 3 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Pregnant Women | To assess the efficacy of MI in reducing alcohol and other substance use in pregnant women | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in People with Co-existing Mental Health Problems | To assess the effects of brief MI intervention on reducing alcohol and other substance use in people with mental health problems | 23 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
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| Substance Misuse in Older Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in older adults | 3 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Pregnant Women | To assess the efficacy of MI in reducing alcohol and other substance use in pregnant women | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in People with Co-existing Mental Health Problems | To assess the effects of brief MI intervention on reducing alcohol and other substance use in people with mental health problems | 23 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Young Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in young adults | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Older Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in older adults | 3 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Pregnant Women | To assess the efficacy of MI in reducing alcohol and other substance use in pregnant women | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in People with Co-existing Mental Health Problems | To assess the effects of brief MI intervention on reducing alcohol and other substance use in people with mental health problems | 23 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Young Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in young adults | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Older Adults | To evaluate the efficacy of MI in reducing alcohol and other substance use in older adults | 3 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Substance Misuse in Pregnant Women | To assess the efficacy of MI in reducing alcohol and other substance use in pregnant women | 11 RCTs | College students with mean age of 18.1–21.2 across all studies | MI plus a stepped care approach versus waits-list control plus usual care, TAU | Alcohol of any type | MI effective in reducing alcohol use in college students with both Binge Drinkers and Non-Binge Drinkers | 99 (2008) - MI is highly effective in reducing alcohol use among college students with both Binge Drinkers and Non-Binge Drinkers. The evidence was high quality and showed consistent results across studies. |
| Domain 1: Substance Abuse (Alcohol and Drugs) |
|---------------------------------------------|
| **Comparison Outcomes** Authors’ conclusions Meta-analysis (M-A) or of overview) |
| Baker et al (2015) | To determine whether psychological interventions that included MI in the treatment of alcohol misuse among people aged 25–45 (n = 942) | Poor quality included. No clear difference between outcomes; alcohol or treatment between MI and other treatment groups. No evidence of protection in the presence of alcohol or treatment between MI and other treatment groups. | Poor quality included. No clear difference between outcomes; alcohol or treatment between MI and other treatment groups. No evidence of protection in the presence of alcohol or treatment between MI and other treatment groups. |
| Baker et al (2018) | To determine whether psychological interventions that included MI in the treatment of alcohol misuse among people aged 25–45 (n = 318) | Increased MI attention to control at one MI and 45 group | No moderate quality evidence of effectiveness (assessed by GRADE). |
| Briand et al (2019) | To evaluate the outcomes of the effect of MI in the treatment of alcohol misuse among people with alcohol dependence and co-morbidity (n = 17 RCTs; 9 included MI (n > 2018) | NR | NR |
| Cleary et al (2009) | To assess current evidence for the efficacy of psychological interventions for reducing substance use, improving mental state and encouraging treatment adherence and retention in people aged 50 (n = 318). | NR | NR |
| De Man-Van et al (2009) | To explore the nursing role in the management of post stroke depression and to identify effective non-pharmacological interventions for the treatment of depression (n = 411). | Low to very low evidence - mixed results. | Low to very low evidence - mixed results. |
| Kelly et al (2012) | To assess the effectiveness of MI in the management of psychosis and comorbid substance use (n = 29). | MI improved depression using MI, compared to no treatment. | MI improved depression using MI, compared to no treatment. |
| Lader et al (2007) | To examine the clinical effectiveness of MI in the treatment of alcohol misuse and other addictions in people aged 50 (n = 2015). | MI showed significant effect on reducing gambling severity and financial loss at 3–12 months. | MI showed significant effect on reducing gambling severity and financial loss at 3–12 months. |
| Cowlishaw et al (2010) | To synthesise evidence on randomised trials of psychological interventions for pathological and problem gambling (n = 1245 range 13–231). | MI was effective in reducing gambling behaviour, although not necessarily other symptoms of pathological gambling. | MI was effective in reducing gambling behaviour, although not necessarily other symptoms of pathological gambling. |
| Jirjo et al (2015) | To review trials for psychosocial treatments of pathological gambling among adults (n = 114). | Non-substance use disorders | Non-substance use disorders |
| Petty et al (2015) | To evaluate the psychological and psychosocial outcomes of gambling problems (n = 114). | MI showed reduced gambling problems, compared to no treatment. | MI showed reduced gambling problems, compared to no treatment. |
| Yamada et al (2013) | To examine the effects of MI interventions compared with other interventions in the treatment of pathological gambling (n = 114). | MI showed reduced gambling problems, compared to no treatment. | MI showed reduced gambling problems, compared to no treatment. |

**Note:** NR = Not Relevant; M-A = Meta-analysis; GRADE = Grading of Recommendations Assessment, Development and Evaluation; CBT = Cognitive Behavioral Therapy; TAU = Treatment as usual; MI = Motivational Interviewing; LOW = Low quality evidence; UNCLEAR = Unclear; HIGH = High quality evidence; BMI = Body Mass Index; MET = Moderate Exercise Training; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; CB = Cigarettes; BAD = Booze and Drugs; SOEP = German Socio-Economic Panel Study; JFF = Just For Fun).

**Systematic review of reviews of the effectiveness of Motivational Interviewing**

https://doi.org/10.1371/journal.pone.0204890.t002
Table 3. Characteristics of included reviews of Motivational Interviewing (MI) and summary of findings for Domain 2. Abbreviations: MI = Motivational Interviewing, BMI Brief Motivational Interviewing, RCT = randomised controlled trial, MET = Motivational Enhancement Therapy, HAART = Highly Active Antiretroviral Therapies, ETS = Environmental Tobacco Smoke, SUMSM = Substance-using men who have sex with men, T2D = Type 2 Diabetes, CVD = Cardiovascular disease, NVD = neurovascular disease, BMI = Body Mass Index, BCT = Behaviour change techniques.

### Domain 2: Musculoskeletal problems

| Review author                  | Objective                                                                 | Type and Number of studies | Participants                                                                 | Intervention / Comparison                                                                 | Outcomes                                                                 | Authors’ conclusions                                                                 | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|-------------------------------|---------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Aperslin and Sharp (2016)     | To examine the efficacy of MI on the primary outcome of adherence to treatment in addition, to investigate the efficacy of MI on the secondary outcomes of pain intensity and function | 7 RCTs (n = 962)            | Age ≥ 18 yrs with benign chronic pain (> 3 months) due to MSK problems e.g. low back pain, chronic pain, fibromyalgia and rheumatoid arthritis | MI: 2 studies included education, 1 placebo, 1 self-help, 1 other treatment unspecified  | Primary outcome adherence to treatment for pain post treatment and 1 at follow-up: Secondary measures pain and physical function | Small to moderate effect of MI for increasing adherence to treatment for pain at short but not long term follow up. No gains in physical function. | M-A (LOW)                                                                 | Low quality evidence (Assessed by GRADE) for small effects on adherence to treatment for pain. (See SI Table) Limited evidence but promising for adherence to treatment measures |

| Chilton et al (2021) [109]    | To summarise the available literature and provide a detailed overview of the application and effectiveness of MI for musculoskeletal conditions. | 10 studies, 3 RCTs.        | 2 studies of LBP, 1 chronic pain, 1 fibromyalgia and 1 osteoporosis. | Trans theoretical model (TTM)-based motivational counselling or MI or MI self-efficacy, workshop attendance and exercise adherence, pain intensity | Self-efficacy; workshop attendance and exercise adherence, pain intensity | The evidence base for effectiveness of MI for musculoskeletal problems is limited due to methodological factors. | NR (UNCLEAR)                                                                 |                                                                                                                                   |

### Domain 2: Oral Health

| Review author                  | Objective                                                                 | Type and Number of studies | Participants                                                                 | Intervention / Comparison                                                                 | Outcomes                                                                 | Authors’ conclusions                                                                 | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|-------------------------------|---------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Gao et al (2014) [64]          | To synthesise the evidence on the effectiveness of MI compared with conventional (health) education in improving oral health. | 20 papers including 16 studies (n = 3252) | Dental patients, special-needs groups (adults with mental illness), disadvantaged communities | MI: Conventional (health) education (CE), focusing on disseminating information and giving normative advice | Oral hygiene, motivation/ readiness/confidence; knowledge of periodontal health | Inconclusive effectiveness for most oral health outcomes. | NR (UNCLEAR)                                                                 | Low quality evidence (assessed by GRADE) for no statistically significant difference in gingivitis measures from 3 studies (See SI Table) Narrative reviews found inconclusive evidence due to poor methodology of the primary studies within the reviews. High quality studies required. |

| Kay et al (2016) [65]          | To review the evidence regarding the use of motivational interviewing to promote positive oral health behaviours in a one-to-one setting. | 8 studies 5 RCTs 2 Quasi RCTs and 1 qualitative study | Mainly healthy adults, age up to 70 yrs old. 1 trial focused on children | MI: TAU, 2 mins oral hygiene, Traditional education and pictures of periodontal disease | Oral hygiene, plaque levels, Gingivitis, bleeding score | MI technique, which is based on the concept of autonomy support, has potential for helping patients with poor oral health | NR (LOW)                                                                 |                                                                                                                                   |

| Kopp et al (2017) [66]         | To reveal the effects of MI as an adjunct to periodontal therapy. | 5 RCTs (n = 483) (2 trials only provide MI without CBT) | Patients with periodontal disease | MI: Periodontal therapy / Periodontal therapy alone | Oral hygiene, Gingival values: plaque values, bleeding on probing, probing pocket depth. | MI as an adj to periodontal therapy might have a positive influence on clinical periodontal parameters and psychological factors related to oral hygiene 3 out of 5 RCTs positive. Future studies should include fidelity measures, several MI sessions. | NR (UNCLEAR)                                                                 |                                                                                                                                   |

| Werner et al (2008) [67]       | To study the effectiveness of psychological interventions in adults and adolescents with poor oral health. | 11 RCTs (3 include MI n = 151) | Patients with moderate to severe chronic periodontitis. The majority of patients were >50 yrs of age. | MI: TAU or traditional oral health education, delivered by a dental hygienist | Dental caries, periodontitis, gingivitis, and peri-implantitis | No statistically significant difference in gingivitis when MI was compared with treatment as usual. Small but statistically significant improvement in plaque. The clinical relevance of results is debatable. No statistically significant difference in oral health-related quality of life. | M-A (UNCLEAR)                                                                 |                                                                                                                                   |

Domain 2: Eating Disorders (Continued)
Table 3. (Continued)

| Domain 2: Management of Metabolic Disorders (Diabetes) |
|-----------------------------------------------------|
| RCTs (1 cluster RCT) (n = 1258) | 3 x adult population (1 adolescent) | Motivational learning/TAU group sessions inubating dietary and behavioural skill training | Blood pressure Weight Sodium intake Alcohol intake Dietary intake (At/n/dance at group session) Self-monitoring of fat intake | MI used in combination with nutrition education at least moderately efficacious for facilitating diet modification, offering an advantage beyond standard education alone | M-A (HIGH) |
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Table 3. (Continued)

| Study | Description | Sample | Intervention | Outcome | Evidence Level |
|-------|-------------|--------|--------------|---------|----------------|
| Clifford et al (2014) | To systematically examine the evidence of MI in improving health behaviours in adults with diabetes. | Adults with type 1 and 2 diabetes, diagnosed adults, mixed sex, age range 16-80 | MI/Varied including usual care, attention placebo, diabetes education and treatment recommended for achieving glycemic control. | Only four of the studies found positive and significant effects of MI on diabetes self-management outcomes in four of the eight health behaviour topics investigated. These behaviours were smoking, blood-glucose control, diet and weight management. | NR (UNCLEAR) |
| Elong and Kwokkianj (2016) | To examine empirical evidence for the impact of MI on behaviour change and resultant clinical outcomes in adults with T2D. | 14 RCTs | MI based intervention/ usual care or no MI intervention. | Dietary changes, physical activity, smoking cessation, and alcohol reduction. | NR (UNCLEAR) |
| Jones et al (2014) | To review the evidence for the efficacy of MI in promoting glycemic control in people with diabetes by examining the mean magnitude of effect in change in levels of glycated haemoglobin (HbA1c) as a function of MI. | 13 RCTs | MI UC (diet counselling, support visits, diabetes education session & support club, video/phone healthy lifestyle sessions; meetings at diabetes clinic; varied visits; structured diabetes education session) | Measure of HbA1c. HbA1c is a standardised measurement used in diabetes treatment and a direct indicator of diabetes management. MI in the management of blood glucose levels appears to be limited. Change in glycemcic control in people who received a MI compared to a control group was not statistically significant. MI aimed at helping people manage their diabetes may need to be re-examined. | M-A (HIGH) |
| Lin et al (2014) | To evaluate the literature on the effectiveness of lifestyle modification programs (LMPs) on the metabolic risks in adults with metabolic syndrome (MetS). To determine whether the LMPs are effective in improving patient-reported outcomes (PROs). | 5 RCTs (n = 256 in MI RCT Fitch et al 2006 N = 30) | MI Usual care | LMPs exhibited positive effects on some metabolic risks and on quality of life in adults with MetS. | NR (UNCLEAR) |
| Soderlund (2016) | To examine the effectiveness of MI for physical activity self-management for adults diagnosed with diabetes mellitus type 2 (T2D). | 9 studies (RCTs, quasi-studies and pilot studies n = >3260) | MI Usual care | MI sessions should target a minimal number of self-management behaviours, be delivered by counsellors proficient in MI, and use MI protocols with an emphasis placed on duration or frequency of sessions. | NR (HIGH) |
| Thepwongsa et al (2016) | To evaluate the effects of MI delivered by GPs to Type 2 diabetes patients on the change of GP’s attitude, knowledge and practice and patients’ clinical outcomes. | 9 studies, 5 RCTs (n = 183 GPs and n = T2D patients) | MI/unclear but 1 study had no control | GP satisfaction, knowledge, behavioural changes, process of care and clinical outcomes e.g. blood sample tests. | NR (UNCLEAR) |

Domain 2: Management of Neurovascular (Stroke) and Cardiovascular disease (CVD)

(Continued)
Table 3. (Continued)

| Domain 2: Management of Sexual Health Behaviour |  |  |
| --- | --- | --- |
| To review the effectiveness of MI in reducing, or no intervention, substance abuse, and substance use among men who have sex with men (MSM) | 12 RCTs (2 M-A, 10 M-A) (n = 335) | M-A Education level of substance and alcohol use | M-A: No high or moderate quality evidence of the effectiveness of MI on substance use. Moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance abuse, and substance use among men who have sex with men (MSM). Further research is needed to determine the effectiveness of MI on reducing substance use. |
| To examine the use of MI to improve health outcomes in persons living with HIV | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 2400) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI in improving health outcomes in persons living with HIV. |
| To examine the effectiveness of MI on HIV risk reduction among MSM | 19 RCTs (14 RCTs, 5 RCTs only: 10 M-A, 4 M-A) (n = 8348) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, and adherence and sexual behaviour. | Very high quality evidence of the effectiveness of MI on HIV risk reduction among MSM. |
| To deliver MI to MSM living with HIV | 13 RCTs (6 RCTs, 7 RCTs only: 4 M-A, 3 M-A) (n = 450) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | Very high quality evidence of the effectiveness of MI on HIV risk reduction among MSM. |
| To examine the effectiveness of MI on reducing, or no intervention, substance use among LGB | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 335) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance use among LGB. |
| To examine the effectiveness of MI on reducing, or no intervention, substance use among youth | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 335) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance use among youth. |
| To examine the effectiveness of MI on reducing, or no intervention, substance use among women with a history of intimate partner violence | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 335) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance use among women with a history of intimate partner violence. |
| To examine the effectiveness of MI on reducing, or no intervention, substance use among women with a history of substance use disorder | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 335) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance use among women with a history of substance use disorder. |
| To examine the effectiveness of MI on reducing, or no intervention, substance use among women with a history of drug use | 12 RCTs (6 RCTs, 6 RCTs only: 2 M-A, 4 M-A) (n = 335) | MI, Advice and education, health promoting programme, reduction of viral load, and CD4+ T-cell counts. Level of unprotected sex, adherence and sexual behaviour. | No high or moderate quality evidence of the effectiveness of MI on reducing, or no intervention, substance use among women with a history of drug use. |
Table 3. (Continued)

| Review author | Objective | Type and number of studies | Participants | Intervention / Comparison | Outcomes | Authors’ conclusions | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|----------------|-----------|----------------------------|--------------|---------------------------|----------|----------------------|-------------------------------------------------|---------------------------------------------------------------------------------|
| Karanli et al (2014) [9] | To describe and evaluate the effectiveness of motivational interviewing (MI) on medication adherence among patients with HIV/AIDS. | 18 RCTs (14 MI n = 252) | Adults over 18 with a diagnosis of HIV/AIDS | MI including motivational interviewing | Measures of medication adherence | Weak evidence to suggest that MI improves adherence | NR (LOW) | Low quality evidence (Assessed by GRADE) for statistically significant differences in medication adherence for adults with mental health issues (See S3 Table) |
| Lawrence et al (2017) [10] | To systematically review the evidence on the effectiveness of MI as a pre-treatment intervention to enhance cardiac rehabilitation and its effects on lifestyle components. | 14 RCTs (12 included in Meta-analysis: n = 803) | Patients with a diagnosis of a chronic disease | MI as a pre-treatment intervention | Measures of lifestyle components | Weak evidence to suggest that MI improves lifestyle components | M-A (LOW) | |
| Miller et al (2017) [99] | To examine the efficacy of MI for improving health screening uptake. | 14 studies 11 RCTs (n = 6059) | Patients referred for cancer screening uptake (N = 8): HIV testing (N = 3); attendance of a hepatitis C screening appointment and sexually transmitted infections. | MI and BMU Group Mailed letter, generic pamphlet about CRC screening, TAU | Health screening uptake | NR (UNCLEAR) | |

Domain 2 - Adherence to Medication Interventions

| Review author | Objective | Type and Number of studies | Participants | Intervention / Comparison | Outcomes | Authors’ conclusions | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|----------------|-----------|----------------------------|--------------|---------------------------|----------|----------------------|-------------------------------------------------|---------------------------------------------------------------------------------|
| ASF Garnett et al (2016) [9] | To critically appraise and synthesise the best available evidence on the effectiveness of MI in improving adherence to prescribed medications. | 14 RCTs (3 include MI n = 533) | ≥18 years old with a diagnosis of a chronic disease | MI as a pre-treatment intervention | Adherence to cardiac medication | Substantial heterogeneity limited robustness of conclusions; MI appeared promising as means to enhance cardiac medication adherence. | NR (LOW) | No high or moderate quality evidence for adherence to prescribed medications; small effects on medication adherence e.g. adults with chronic diseases. |
| Binford and Alston (2012) [90] | To systematically review the evidence on interventions to improve medication adherence and virologic outcomes among HIV-infected persons who use drugs. | One RCT and 2 pilot trials using MI/CBT 1 RCT (n = 65) | HIV-infected people who use drugs | MI: time and content equivalent without MI in 1 RCT. | Adherence to drug taking and Immunological impact | Good short-term gains in cART adherence and limited efficacy in sustaining adherence improvement and viral load reduction at follow-up points | NR (UNCLEAR) | The most promising results are for adherence to HAART medication in people who are HIV-positive, but the higher quality evidence concluded that the methodology within the trials was poor. |
| Eastall et al. (2013) [91] | To describe and evaluate the evidence on MI as a pre-treatment intervention to improve medication adherence. | 26 RCTs (n = 5216) | A range of conditions including asthma, diabetes and hypertension. HIV infected people | BCTs including MI/TAU; for 13 studies (50%), standard care as a control | Medication adherence (the definition for this differed across trials). | Cognitive-based behaviour change techniques are effective interventions eliciting improvements in medication adherence. Non-specific for MI | M-A (LOW) | |
| Hill et al. (2012) [92] | To systematically examine the MI intervention literature and report evidence and gaps regarding outcomes of MI as an intervention to improve HAART adherence in patients infected with HIV. | 5 RCTs (n = 963 ranged from 141 to 326 patients) | Patients with HIV, Mean age of 38 and 43.6 years old | MI: standard care=normal care; Medical consultation; eight session educational programme; 1 educational audiotape | Adherence to treatment (HAART) all studies measured viral load. | MI is a promising intervention to improve HAART adherence in HIV-positive individuals, but further studies of rigorous methodological quality are needed to fully understand the effect of this intervention | NR (UNCLEAR) | |
| Hu et al. (2014) [93] | To provide a systematic review of interventions to increase medication adherence in racial and ethnic minority populations. | 36 RCTs and 4 Quasi RCTs (n = 685 for 7 trials of Mi only) | African-American population. Patients with chronic conditions, HIV/AIDS, hypertension, asthma. | MI: Unusual | Adherence to medication | MI appeared to be an effective intervention for some African-American populations. Studies conducted with HIV positive patients, patients with asthma and hypertension found MI improved adherence. | NR (HIGH) | |
| Nieuwlaat et al. (2014) [94] | To assess the effects of interventions intended to enhance patient adherence to prescribed medications for medical conditions, on both medication adherence and clinical outcomes. | 18 in total (n = 46,966) 13 studies included | Patients prescribed medications for medical disorders, not for addictions | MI alone and in combination with CBFT varied e.g. usual care, Treatment as usual, GP advice with no training in MI | Adherence and clinical outcomes | Effects were inconsistent from study to study, and only a minority of lowest risk of bias RCTs improved both adherence and clinical outcomes. | NR (LOW) | |
Table 3. (Continued)

| Study                          | Objective                                                                 | Number of RCTs (n) | Population                                                                 | Interventions                                                                 | Outcome Measures                                                                  | Findings                                                                 | Level of Evidence |
|-------------------------------|---------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------|
| Palacio et al (2016) [95]     | To evaluate the impact of MI and of the MI delivery format, fidelity assessment, fidelity-based feedback, counsellors' background and MI exposure time on adherence. | 17 (n = 2,529)     | Patients with HIV, Asthma, Osteoporosis, CVD and RA prescribed medication e.g. (HAART), 12 focused on Minorities. | MI / TAU, other counselling, health education session, Pharmacotherapy          | Medication adherence                                                          | MI improves medication adherence at different exposure times and counsellors' educational level. Results inconsistent. | M-A (UNCLEAR)    |
| Rueda et al (2006) [97]       | To conduct a systematic review of the research literature on the effectiveness of patient support strategies and education for improving adherence to highly active antiretroviral therapy (HAART) in people living with HIV/AIDS. | 19 (n = 2,159)     | General HIV-positive populations, women, Latinos, or adults with a history of alcohol dependence | MI control arm received usual or standard adherence support or an alternate intervention | Adherence to HAART at least 6 weeks after study initiation, electronic monitoring, pill counts, medication diaries, patient self-report, provider report, clinic and pharmacy records. | Interventions targeting practical medication management skills, interventions administered to individuals' vs groups, and those interventions delivered over 12 weeks or more were associated with improved adherence outcomes. | NR (LOW)         |
| Zomahoun et al (2017) [93]   | To assess whether MI interventions are effective to enhance medication adherence in adults with chronic diseases and to explore the effect of individual MI intervention characteristics. | 19 (n = 4,221)     | Patients with epilepsy, kidney disease, diabetes, HIV/AIDS, hypertension, schizophrenia, osteoporosis and psychotic disorder | MI / Control TAU, Education video, psychiatric interview, self-monitoring condition | Medication adherence and health-related behaviour                              | MI interventions might be effective at enhancing medication adherence in adults treated for chronic diseases. Interventions based on MI only were more effective than those based on MI plus other interventions. | M-A (LOW)        |
| Spencer and Wheeler (2006) [101] | To explore the use of (MI) interventions among cancer patients and survivors | 14 studies; 8 RCTs (n = 1,554) | Cancer patients or survivors. Most common Breast cancer. | MI / TAU or leaflet | Smoking cessation; body weight; physical activity; psychological measures; fatigue; self-care; pain; cancer related stress. | Solid evidence exists for the efficacy of MI to address lifestyle behaviors as well as the psychosocial needs of cancer patients and survivors. | NR (HIGH)        |
| Wagonera, & Kavookjianb (2017) [104] | To determine: 1) the extent to which MI impacts outcomes for those diagnosed with IBD, and 2) optimal MI methods used to achieve desired outcomes | 4 studies (n = 45 to 278 total 460) | Patients with IBS ulcerative colitis, age from 20 to 82 years-old | MI / unclear | Adherence, patient satisfaction with provider, quality of life, and patient perceived provider empathy. | MI can be effective in improving outcomes for individuals with IBD e.g. improved adherence rates, greater advice-seeking behavior, and perceived providers as having more empathy. | NR (UNCLEAR)  |
Table 4. Characteristics of included reviews of Motivational Interviewing (MI) and summary of findings for Domains 3 and 4. Abbreviations: MI = Motivational Interviewing, BMI = Brief Motivational Interviewing, RCT = randomised controlled trial, MET = Motivational Enhancement Therapy, HAART = Highly Active Antiretroviral Therapies, ETS = Environmental Tobacco Smoke, SUMSM = Substance-using men who have sex with men, T2D = Type 2 Diabetes, CVD = Cardiovascular disease, NVD = neurovascular disease, BMI = Body Mass Index, BCT = Behaviour change techniques.

Domain 3: Reviews focused on multiple health related problems and/or multiple health behaviour

| Review author          | Objective                                                                 | Type and Number of studies | Participants | Intervention / Comparison | Outcomes                                                                 | Summary of authors results                                                                 | Meta-analysis if M-A or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|------------------------|----------------------------------------------------------------------------|----------------------------|--------------|--------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Burke et al (2003) [106]| To review individually delivered interventions that incorporated the four basic principles of MI. | 30 trials (n = 6275), ranged from 22 to 952, mean of 206 | Multiple groups of people from different settings | Adapted MI (AMI) / varied AMI + relapse prevention (RP); RP alone, CRT; No treatment; placebo control; education booklet; brief feedback | Drinking frequency; BAC (peak) blood alcohol concentration exercise adherence and HIV risk behaviour | Only 11/30 studies produced statistically significant effect of MI. AMs were equivalent to other active treatments and superiority to no treatment or placebo controls for problems involving alcohol, drugs, and diet and exercise. | M-A (UNCLEAR) | No high quality evidence. For all behaviours combined there is Low quality evidence of small effects of MI judged against a “weak” comparison but no benefit over a “strong” comparison. Moderate quality evidence (assessed by GRADE) that MI increases physical activity participation in some populations, but the data is limited by small trials (See Tables S 3 & 4). |
| Dunn et al (2001) [107] | To examine the effectiveness of brief behavioural interventions adapting the principles and techniques of MI to four behavioural domains | 29 RCTs (n = 6330) ranged from 23-1726 | Mixed male/female; with health problems; substance abuse, smoking, HIV risk and diet/exercise problems | MI two treatment or a comparison treatment | Ringe drinking, exercise participation, drug usage, cigarette usage. | Only modest evidence that MI works at least as well as other treatments for clients with low baseline readiness. The evidence is inconclusive. | NR (UNCLEAR) | High quality trials are required and justified due to the large number of people who remain inactive. Focus should be on intervention fidelity. As the narrative reviews in this section are judged as high chance of bias, no further conclusion can be drawn with confidence. More research is needed to assess fidelity of technology assisted MI |
| Hettema et al (2005) [3] | To assess the effectiveness of MI across multiple behavioural problems | 72 RCTs and controlled studies. (n = 1426) | 16/37 (43%) were predominantly or entirely African American | MI no treatment or placebo; MI added to standard or specified treatment; standard or specified treatment | Alcohol use, treatment compliance | Large variation in effect size across studies. No relationship between outcomes and methodological quality or other outcomes e.g. time of follow-up assessment, comparison group type or provider. Manualised interventions yielded weaker effect. | M-A (UNCLEAR) | |
| Lundahl et al (2010) [108] | To investigate the unique contribution MI has on counselling outcomes and how MI compares with other interventions. | 119 studies (some RCTs) (n = 9618) | Majority sample were white, African American Or Hispanic. Other groups not recorded | MI: Waiting list/ control groups; TAU with a defined or specifically named treatment materials; an attention control group. | Multiple outcomes | Judged against weak comparison groups, MI produced statistically significant small effects. Judged against specific treatments, MI produced nonsignificant results | M-A (UNCLEAR) | |
| Martins et al (2009) [109] | To critically review the research in three emerging areas in which (MI) is being applied: diet and exercise, diabetes, and oral health. | 37 empirical studies:24 exercise and diet; 9 diabetes; 4 oral health (n = 15012) | Adult obese women, southern Asian women; adults with diabetes, smokers physically inactive adults. | MI / behaviour therapy | Varied weight loss, fat intake, oral health, exercise uptake. | MI effective in supporting health behaviour change for 3 health behaviour domains, Oral health, diabetes and diet and exercise. | M-A (HIGH) | |
| O’Halloran et al (2014) | To determine if MI leads to increased physical activity, cardiorespiratory fitness or functional exercise capacity in people with chronic health conditions. | 10 RCT or controlled trial (n = 981) | People 18 or over with a chronic health condition. | MI: Supervised exercise x 1; behavioured weight loss x 1; WLC x 2, Standard written information/ education x 2, usual care x 2 | Physical activity levels; cardiorespiratory Fitness; functional exercise capacity | Moderate quality evidence that MI may have a small positive effect on self-reported physical activity in people with chronic health conditions. | M-A (LOW) | |
| Babul et al (2005) [1] | To evaluate the effectiveness of MI as an intervention tool and to identify factors shaping outcomes in the areas reviewed. | 72 RCTs (19 meta-analysis) (n = 4173) | Mainly adults (older adolescents also included) | MI: Traditional advice giving e.g. patients’ problem is viewed from a biomedical perspective. | Health outcome: e.g. blood glucose, blood cholesterol; BMI, smoking cigs/day, Blood alcohol; BP; utilisation of healthcare services; length of hospital stay, subjective reports. | MI outperforms traditional advice giving in the treatment of a broad range of behavioural problems and diseases. A prolonged follow-up period increased the percentage of studies showing an effect. | M-A (UNCLEAR) | |
| Singleton et al (2017) [10] | To describe and evaluate the methods and efficacy of technology delivered MI interventions (TAMIs). | 41 studies most RCTs (34 adults’ population n = approx. 11000) | Mainly adults with substance abuse problems; other health and social problem e.g. weight gain, addiction, criminals, | Technology-delivered MI interventions (TAMI) (some combined with other therapy) / various TAU e.g. Follow-up with school nurse | Acceptability/ feedback regarding the intervention and/or behavioural or psychological change related to the target health behaviour | Limited data regarding efficacy. Strategies to deliver relational components remain a challenge. Future research should incorporate fidelity measures. TAMIs are feasible to implement and well accepted. | NR (HIGH) | |
| Thompson (2011) [110] | To review MI and to inform education, research and practice in relation to cardiovascular health. | 8 studies, 3 including MI (n = 546 (MI = 266) | Adults with at least one or more newly diagnosed or existing cardiovascular risk factors | MI / TAU | Obesity, Smoking, treatment non-compliance, physical inactivity medical outcomes e.g. BP. | MI is an effective approach to changing behaviour. It offers promise in improving cardiovascular health status. | NR (HIGH) | |

Domain 4: Reviews Focused on Behaviour Change Interventions in Specific Settings

(Continued)
Table 4. (Continued)

| Review author | Objective | Type and Number of studies | Participants | Intervention / Comparison | Outcomes | Summary of authors results | Meta-analysis (M-A) or Narrative review (NR) and overall Risk of Bias (ROBIS score) | Implication for clinical practice and research (Interpretation of authors of overview) |
|---------------|-----------|-----------------------------|--------------|---------------------------|----------|-----------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Kohler et al (2015) [112] | To examine changes in alcohol consumption after brief MI for young people with existing alcohol use problems, who were admitted to an emergency care unit alcohol positive, with an alcohol-related trauma, or with a history of elevated alcohol consumption. | 6 RCTs (2 specifically over 18; n = 1433 age 18-25) | Young people in emergency care who screened positively for past or present risky alcohol consumption. | BMI/standard care, including written information (e.g. alcohol-use risk handout, educational brochure). | Alcohol consumption, frequency and quantity | MI was never less efficacious than a control intervention. Two trials found significantly more reduction in one or more measures of alcohol consumption in the MI intervention group. | M-A (UNCLEAR) | Narrative reviews support the meta-analyses suggesting there is no difference in outcome between professional groups who deliver MI. High quality research assessing competency and fidelity of MI interventions is needed to confirm if any benefits are observed. |
| Knight et al (2006) [115] | To identify the extent to which MI has been used in different physical health settings and appraise the effectiveness of MI in these settings. | 4 RCTs, 1 non-random controlled trial and 3 pilot studies. | Hypertension, diabetes, asthma, hyperlipidaemia and heart disease. | MI/TAU (usual care) | Psychological, physiological and life-style change outcomes | MI has high face validity across several domains in physical health care settings. Recommendations for its dissemination in this area cannot yet be made. | NR (UNCLEAR) | |
| Lundahl, et al (2015) [116] | To investigate MI’s efficacy in medical care settings | 48 RCTs (n = 9618) | Reported as moderate analyses rather than general participant description | MI in medical setting/ 7 studies used a traditional waiting list group, (2) 16 studies used information only groups, 28 studies employed ‘treatment-as-usual’ | Prognostic markers, disease endpoints, risk reduction behaviours, physical functioning and quality of life, substance abuse, patient adherence to medical advice and patient approach to change. | The emerging evidence for MI in medical care settings suggests it provides a moderate advantage over comparison interventions and could be used for a wide range of behavioural issues in health care. | M-A (UNCLEAR) | |
| Merz et al (2015) [117] | To identify evidence to reduce alcohol use and prevent alcohol-related consequences in young adults (18–24 years old) admitted to the emergency department following acute alcohol intoxication. | 4 RCTs (n = 618) | Young adults (18–24), Brief MI/usual care (2 trials); 3 x personalised feedback + phone booster at 1 & 3 months, 1 x education brochure + 5 min discussion | Varius alcohol-related outcomes: change in alcohol consumption, reducing problems/tensions, smoking & driving | Inconclusive evidence. Most effective interventions include at least one therapeutic contact several days after the event. Successful interventions included booster sessions. Benefits were sustained over 12 months. | NR (LOW) | |
| Noordman et al (2012) [118] | To review effectiveness of face-to-face communication-related BCTs provided in primary care and to explore which health care provider is more effective in using face-to-face communication-related BCTs? | 50 RCTs, 9 include MI | 16+ years. People with risky lifestyle behaviour. Patients with heart or vascular disease | BCTs including MI/advise, pamphlets (or booklets) unstructured information, minimal care ‘usual care’ to no intervention. | Subjective (self-reported) and objective outcome measures related to patients’ lifestyle behaviour. | MI, education and advice can be used as effective communication-related BCTs delivered by physicians and nurses. | NR (LOW) | |
| Purdie, et al (2014) [119] | To review MI interventions used to elicit health literacy for change in smoking, nutrition, alcohol, physical activity and weight. | 8 RCTs and Pilot RCTs (n = 1388) | Older people. Average participant age was over 60 years | MI/ usual care; 4 x newsletter; 4 x usual care; 1 x tailored information; 1 x telephone information call | Weight loss, participation in physical activity; smoking cessation; fruit and vegetable consumption | MI may be effective when incorporated into health promotion and disease prevention interventions. | NR (UNCLEAR) | |
| Taggart et al (2012) [120] | To evaluate the effectiveness of interventions used in primary care to improve health literacy for change in smoking, nutrition, alcohol, physical activity and weight. | 52 studies | Adults aged 18 years and over. Mixed sex, different socioeconomic backgrounds | MI/ no description | Health literacy outcomes; Knowledge, Skills, Self-efficacy | Individual MI counselling and written materials were more effective in achieving impacts around smoking cessation compared to group education. | NR (LOW) | |
| Vanuizkirk et al (2014) [121] | Is MI effective in improving behaviour modification in patients seeking treatment for health conditions in primary care settings? | 12 RCTs varied from 26–515 (n = 3326) | Primary care patients, mixed race and sex. | MI/ no treatment; mailed pamphlet; usual care; usual care + pamphlet; anti-smoking advice. | Substance use outcomes; bodyweight reduction; physical activity, adherence. | MI is useful in clinical settings. MI session may be effective in increasing change-related behaviour on certain outcomes. | M-A (UNCLEAR) | |

**Smoking cessation.** One comparison from a review on smoking cessation was judged to provide moderate quality evidence. This review comparing Motivational Interviewing with usual care or brief advice, provides evidence of beneficial effects on abstinence from smoking, particularly when attention was paid to treatment fidelity[12].

**Substance abuse (drugs).** One comparison from a review of people with substance abuse dependency and addiction provides evidence of a benefit of Motivational Interviewing when compared with no intervention. The other four comparisons derived no benefit or harm when Motivational Interviewing was compared with usual care or any other treatment [56].
Physical activity. Four comparisons from a review of Motivational Interviewing for promoting physical activity participation were judged to provide moderate quality evidence when Motivational Interviewing was compared with a control or usual care. One out of the four comparisons provide evidence of benefits. No benefit was found for the other three comparisons, including outcomes for people with cardiovascular disease and obesity [111].

Sexual health. Four comparisons from one review provide moderate quality evidence of no benefit or harm of Motivational Interviewing relating to changing high risk sexual behaviours in men who have sex with men [84] when compared with a control.

Exploration of moderator variables

Of the six reviews that provide any evidence judged to be of moderate quality, three did not report the results of any subgroup analyses [56, 84, 111]. The three reviews that contain moderate quality evidence and report subgroup analyses are:

- Lindson-Hawley 2015 [12]—smoking cessation (Table A in S1 File)
- Foxcroft 2014 [49]—alcohol use in young people (Table B in S1 File)
- Vasilaki 2006 [58]—alcohol consumption (Table C in S1 File)

Exploration of the reported subgroup analyses provides consistent evidence which suggests that Motivational Interviewing is beneficial when compared to ‘weak’ comparison groups such as...
Table 5. Summary of reviews contributing data to comparison that provide moderate, low and very low quality evidence of effects of Motivational Interviewing (MI).

| Sub-groups | Reviews contributing data to overview | Reviews with data, but superseded by more up-to-date or higher quality review judged by overview authors using ROBIS | Reviews in which there was no data suitable for extraction | Moderate quality evidence relating to effect of MI | Low or very low quality evidence relating to effect of MI |
|------------|---------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| **Domain 1: Interventions aimed at stopping / preventing behaviour** |
| Smoking cessation | Lindson-Hawley et al 2015 [12] (update of Lai et al 2010) [119] Rabe et al 2013 (subgroup) [26] Hetta et al 2010 [23] (pregnancy subgroup) | Burke et al 2003 [106] Hetta et al 2005 [8] Rabe et al 2005 [9] Lundahl et al 2010 [108] Heckman et al 2010 [22] Ebbert et al (2015) Smokeless tobacco [21] Stead et al (2006) [27] | Small effect on smoking cessation compared with usual care or brief advice at 6–12 months follow-up | Small effect on smoking cessation in pregnant women and, in emergency departments |
| Substance abuse (Alcohol) | Foxcroft et al 2014 [69] Vasilaki et al 2006 [58] | Burke et al 2003 [106] Hetta et al 2005 [8] Rabe et al 2005 [9] Lundahl et al 2010 [108] Tanner-Smith (2015) [39] | Moderate effect on alcohol consumption. Small effect on binge drinking, frequency and quantity of drinking in mixed populations (including young people < 25) mainly in short term < 4 months. Evidence of no benefit or harm for drunk driving and risky behaviour relating to alcohol or binge drinking in the long term > 4 months | Small effects for short term reduction in drunk driving, average blood alcohol concentration (BAC), and alcohol related problems < 4months |
| Substance abuse (Drugs) | Darker 2015 [48] Lundahl et al 2010 [108] Smedslund et al 2011 [56] Terplan et al (2015) [38] | Burke et al 2003 [106] Terplan (2007) [57] Carey 2012 [43] (computer delivered alcohol interventions) | | Currently there is insufficient evidence to support the use of MI to reduce benzodiazepines use. Small effects on readiness to change and extent of substance abuse. Little evidence that psychosocial interventions reduce continued illicit drug use in pregnant women enrolled in drug treatment. |
| Substance abuse (Drugs) Marijuana | Lundahl et al 2010 [108] Lundahl et al 2013 (medical care settings) [6] Gates et al 2016 [41] | Burke et al 2003 [106] | | Small effects on abstinence and number of drugs taken in people attending general medical care settings. No intervention was consistently effective at nine-month follow-up or later. |
| Substance abuse (drugs or alcohol) | Smedslund et al 2011 [56] | Burke et al 2003 [106] | Small effects on drug /alcohol in mixed population e.g. college drinkers, outpatient alcohol clinics, and drink drivers at < 6 months when compared with no treatment. Evidence of no benefit or harm compared with other active treatment or treatment as usual | | |
| Gambling | Cowlishaw et al 2012 [30] Yakovenko 2015 [7] | Lundahl et al 2010 [108] | | Very low quality evidence of small effect on reducing gambling and financial loss at 3–12 months. Significant short-term benefit of MI in reduction of gambling symptoms. |
| Risk Behaviour (HIV risk) | Hetta et al 2005 [8] | Burke et al 2003 [106] | | Small effects on risk behaviour for HIV |
| **Domain 2: Interventions aimed at promoting specific health behaviour** |
| Physical activity promotion | O’Halloran et al 2014 [111] | | Small effect on self-reported physical activity in people with some, but not all, chronic health conditions immediately post intervention | Very low quality evidence of very small effect on cardiorespiratory fitness immediately post interventions |
| Weight loss management | Armstrong et al 2011 [71] | Burke et al 2003 [106] Hetta et al 2005 [8] Rabe et al 2005 [9] Lundahl et al 2010 [108] | | Greater reduction in body mass and BMI compared with controls |
| Management of metabolic disorders | Jones et al 2014 [77] | | | MI in the management of blood glucose levels is limited. Effects not statistically significant. MI aimed at helping people manage their diabetes may need to be re-examined. |

(Continued)
as no treatment, assessment only or non-specified treatment as usual, but Motivational Inter-
viewing is not beneficial when compared to other ‘strong’ interventions.

Generalisable conclusions relating to the most effective delivery of Motivational Interview-
ing (e.g. face-to-face or group), dose, or characteristics of provider or patient across beha-
vioural domains are difficult to draw.

**Results of narrative reviews**

Of the 104 reviews included in this synthesis, 65 did not combine any data within meta-analy-
sis. The main findings from the narrative reviews are summarised in Tables 1 to 4. The
Table 6. Summary of meta-analyses comparisons judged using the GRADE criteria to provide moderate quality evidence of effect of motivational interviewing.

| Health behaviour | Review authors | Comparison | Population | Outcome | Assessment times | No of studies | n (total) | Effect size | Confidence intervals | Effect | GRADE Reasons for downgrade (GRADE judgement made by review or overview authors) |
|------------------|----------------|------------|------------|---------|-----------------|---------------|-----------|-------------|----------------------|--------|-----------------------------------------------------------------|
| Alcohol         | Vasilaki et al 2006[58] | other treatments | Any | Reducing alcohol consumption | unclear | 9 | ? | ES 0.43 | [0.17, 0.70] | Beneficial | Downgrade 1* (overview) |
| Foxcroft et al 2014 [49] | No MI intervention comparison | young people (<25 years) | Average blood alcohol concentration (BAC) | 4+ months | 4 | 798 | SMD -0.08 | [-0.22, 0.06] | No benefit or harm | Downgrade 1* (review) |
|                  |                |            | Binge drinking | <4 months | 11 | 1340 | SMD -0.23 | [-0.42, -0.04] | Beneficial | Downgrade 1* (overview) |
|                  |                |            |                | 4+ months | 16 | 4028 | SMD -0.05 | [-0.12, 0.01] | No benefit or harm | Downgrade 1* (review) |
|                  |                |            | Drink driving | 4+ months | 4 | 1353 | SMD -0.11 | [-0.31, 0.09] | No benefit or harm | Downgrade 1* (review) |
|                  |                |            | Frequency of alcohol consumption | <4 months | 15 | 1928 | SMD -0.26 | [-0.44, -0.09] | Beneficial (decrease in drinking days) | Downgrade 1* (overview) |
|                  |                |            |                | 4+ months | 16 | 4390 | SMD -0.11 | [-0.19, -0.03] | Beneficial (decrease in drinking days) | Downgrade 1* (review) |
|                  |                |            | Peak BAC | <4 months | 5 | 753 | SMD -0.27 | [-0.44, -0.11] | Beneficial | Downgrade 1* (overview) |
|                  |                |            |                | 4+ months | 9 | 2042 | SMD -0.14 | [-0.23, -0.05] | Beneficial | Downgrade 1* (review) |
|                  |                |            | Quantity of alcohol consumed | <4 months | 22 | 2677 | SMD -0.25 | [-0.37, -0.14] | Beneficial (decrease in drinks consumed each week) | Downgrade 1* (overview) |
|                  |                |            |                | 4+ months follow-up | 28 | 6676 | SMD -0.14 | [-0.20, -0.08] | Beneficial (decrease in drinks consumed each week) | Downgrade 1* (review) |
|                  |                |            | Risky behaviour | <4 months | 6 | 1048 | SMD -0.09 | [-0.30, 0.13] | No benefit or harm | Downgrade 1* (review) |
|                  |                |            |                | 4+ months | 7 | 1781 | SMD -0.14 | [-0.30, 0.02] | No benefit or harm | Downgrade 1* (review) |
| Physical activity | O’Halloran et al 2014 [111] | Control (or usual care) | Any chronic health condition | Adherence | Immediately post-intervention | 8 | 921 | SMD 0.19 | [0.06, 0.32] | Beneficial | Downgrade 1d (review) |
|                  |                |            | Cardiovascular disease | Adherence | Immediately post-intervention | 2 | 115 | SMD 0.22 | [-0.15, 0.59] | No benefit or harm | Downgrade 1d (review) |
|                  |                |            | Overweight/obese people | Adherence | Immediately post-intervention | 4 | 498 | SMD 0.14 | [-0.06, 0.33] | No benefit or harm | Downgrade 1d (review) |
|                  |                |            | Chronic health conditions | Functional exercise capacity | Immediately post-intervention | 2 | 333 | SMD 0.13 | [-0.08, 0.34] | No benefit or harm | Downgrade 1d (review) |

(Continued)
### Table 6. (Continued)

| Health behaviour | Review authors | Comparison | Population | Outcome | Assessment times | No of studies | n (total) | Effect size | Confidence intervals | Effect | GRADE Reasons for downgrading evidence |
|------------------|----------------|------------|------------|---------|------------------|---------------|----------|-------------|---------------------|--------|--------------------------------------|
| **Sexual health** | Berg et al 2011 [84] | control | Men who have sex with men | Sexual partners | unclear | 3 | 4219 | SMD 0.01 | [-0.11, 0.13] | No benefit or harm | Downgrade 1* (overview) |
|                  |                |           |            |         | Unprotected anal intercourse | medium term | 3 | 4191 | SMD -0.04 | [-0.10, 0.02] | No benefit or harm | Downgrade 1* (overview) |
|                  |                |           |            |         | Unprotected anal intercourse | long term | 3 | 4021 | SMD -0.02 | [-0.08, 0.04] | No benefit or harm | Downgrade 1* (overview) |
|                  |                |           |            |         | Unprotected anal intercourse (UAI) with non-primary partner | unclear | 2 | 553 | RR 1.04 | [0.73, 1.47] | No benefit or harm | Downgrade 1* (overview) |
| **Smoking**      | Lindon-Hawley et al 2015 [12] | brief advice/usual care | Mixed | Abstinence (strictest definition) | longest duration | 28 | 16803 | RR 1.26 | [1.16, 1.36] | Beneficial | Downgrade 1* (review) |
|                  |                |           |            |         | no intervention | people with substance abuse, dependency or addiction | Extent of substance use | short follow-up (0–6 months) | 15 | 2327 | SMD 0.17 | [0.09, 0.26] | Beneficial | Downgrade 1* (review) |
|                  |                |           |            |         | other active intervention | people with substance abuse, dependency or addiction | Extent of substance use | short follow-up | 12 | 2137 | SMD 0.02 | [-0.07, 0.12] | No benefit or harm | Downgrade 1* (review) |
|                  |                |           |            |         | other active intervention | people with substance abuse, dependency or addiction | Extent of substance use | medium follow up | 6 | 1586 | SMD -0.02 | [-0.16, 0.13] | No benefit or harm | Downgrade 1* (review) |
|                  |                |           |            |         | treatment as usual | people with substance abuse, dependency or addiction | Extent of substance use | post-intervention | 9 | 1940 | SMD 0.01 | [-0.09, 0.11] | No benefit or harm | Downgrade 1* (review) |
|                  |                |           |            |         | treatment as usual | people with substance abuse, dependency or addiction | Extent of substance use | short follow-up | 10 | 2102 | SMD 0.01 | [-0.08, 0.10] | No benefit or harm | Downgrade 1* (review) |

**Reasons for downgrading evidence**

- a-serious limitation in the Risk of bias
- b-imprecision (e.g. wide confidence intervals or small sample size)
- c-Inconsistency (e.g. high I²)
- d-indirectness (e.g. variation in participants, intervention, comparisons or outcomes)
- e-publication bias.

**GRADE Working Group grades of evidence**

- **High quality**: Further research is very unlikely to change our confidence in the estimate of effect.
- **Moderate quality**: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
- **Low quality**: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
- **Very low quality**: We are very uncertain about the estimate.

† Berg (2011) reported that they GRADED the evidence as low or moderate quality but no details were available in the publication other than a note to contact the authors for more detail. Therefore the overview authors judged the evidence.

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majority focus on behaviour change in a general population, but also include people with specific mental and physical problems.

Narrative reviews of people with mental health problems include psychotic disorders\[33\], comorbid schizophrenia, combined mental health problems [31, 32, 35], general depression [10, 33–35, 69], post-stroke depression [36] and eating disorders [10, 69, 70]. One review in this category judged as low risk of bias suggests that Motivational Interviewing is important in psychiatric settings for reduction of substance use in the short term.

Narrative reviews of physical health problems include: cardiovascular problems (Motivational Interviewing for increasing physical activity) [83, 110]; musculoskeletal health (adherence with intervention for back pain) [103]; diabetes self-management (effect of smoking, blood-glucose control, diet and weight management [62, 75, 76, 78–80]; oral health hygiene [64–66, 68] (use of dental fluoride, increasing dental utilization and reducing sugar consumption); obesity (adherence to weight loss programmes); management of neurovascular disorders [82]. The most recent reviews report outcomes for the effectiveness of Motivational Interviewing for cancer care [101] and outcomes related to the treatment of irritable bowel disorder [104].

Quality of narrative reviews

In total 20 narrative reviews were judged as low risk of bias graded using the ROBIS tool [15] [11, 20, 25, 35, 42, 44, 47, 51, 53, 54, 59, 65, 83, 89, 92, 97, 98, 113–115]. Five of these reviews report positive effects of Motivational Interviewing. Rueda et al (2006) found beneficial effects of Motivational Interviewing for adherence to highly active antiretroviral therapy where there appears to be promising results for interventions delivered over 12 weeks or more [97]. Taggart et al (2012) found further support for benefits of Motivational Interviewing in achieving impacts around smoking cessation compared to other group education [115]. Cooper et al (2015) reported positive results for some but not all outcomes for reducing cannabis use [42]. Noordman et al (2012) conclude that Motivational Interviewing can be effectively delivered by physicians and nurses as a face-to-face communication-related behaviour change technique [114]. Reviews published since 2016 report mixed results. Kay et al (2016) suggest that Motivational Interviewing has potential for use in oral care [65]. Chatters et al (2016) report short term benefits for reducing cannabis use in younger adults [47]. However, most were unable to make firm conclusions about effectiveness of Motivational Interviewing [20, 44, 59, 89]. In a review of brief non face-to-face Motivational Interviewing interventions Jiang et al (2017) found promising evidence for telephone delivery in the treatment of substance abuse, but the results were not consistent for other alternative modalities such as text messages in groups or internet-based interventions.

Discussion

This overview is the first to integrate and systematically grade the quality of the evidence for the effectiveness of Motivational Interviewing interventions across a wide range of settings and populations for people with many different health problems and diseases. We have created a comprehensive map of all reviews relating to Motivational Interviewing to provide clarity relating to an intervention for which there have been multiple overlapping (and sometimes conflicting) reviews. Conflicting review evidence can create barriers and challenges to practitioners wanting to deliver evidence-based practice. This overview provides practitioners, policy makers and researchers with a summary of the quality and strength of the evidence for Motivational Interviewing. It signposts practitioners to the most up to date reviews, enabling them to efficiently access best review evidence to support clinical decisions. We found no
high-quality evidence from the meta-analysis data within any review, mainly due to methodological flaws in the reviews and poor quality of the included studies.

Motivational Interviewing appears to be most effective for stopping or preventing unhealthy behaviours (categorised as Domain 1) such as binge drinking, reducing the quantity and frequency of drinking, smoking and substance abuse. For gambling behaviour, low quality evidence of short to long-term effectiveness suggests that further research on the effectiveness of Motivational Interviewing is warranted to address this significant public health problem [62]. For promoting healthy behaviour (categorised as Domain 2) where people may have little desire to change, most of the evidence is inconclusive or of low quality. For example, there is low quality evidence for the effectiveness of Motivational Interviewing for weight loss outcomes in obese and overweight adults. The exception in Domain 2 is physical activity promotion where there is moderate quality evidence of beneficial effects of Motivational Interviewing for increasing physical activity in people with chronic health conditions. However, the trials assessing adherence to physical activity participation were small and further high quality research in this field is justified to investigate the effectiveness of Motivational Interviewing in different populations, settings and context.

Mode of delivery
The exploration of moderator variables from meta-analysis data does not provide enough data to be confident about the effects of different modes of delivery for Motivational Interviewing. Reviews that focus on the mode of delivery report inconsistent results [45, 51, 95, 105]. The TIDieR guidelines [14] capture some of the features that are relevant to intervention delivery but the mode of delivery is considered to be an important component of intervention and is not reported consistently in the literature [121]. Recent reviews have compared telephone [51] or technology-delivered Motivational Interviewing interventions (TAMIs) [105] and report inconsistent results or no beneficial effects. For example, Shingleton et al (2016) [105] found that TAMIs are feasible to deliver but there is limited evidence of effectiveness. For an intervention that relies on building and developing a relationship between client and provider it seems unlikely that this mode of delivery could be successfully adapted for Motivational Interviewing without considerable focus on training and fidelity measures.

Implication for clinicians and policy makers
The National Institute for Health and Care Excellence (NICE) guidelines [2] include Motivational Interviewing as a component associated with some effective interventions for behaviour change strategies. However, the NICE (2014) Programme Development Group (PH49) are cautious about making general recommendations due to lack of details of intervention components reported in this field of research [2].

This overview has identified clear gaps in the evidence in support of most of the interventions categorised in Domain 2 (e.g. weight loss programmes for obesity, oral health behaviour, management of diabetes and musculoskeletal disorders, adherence to medication and engagement with interventions). The high quality reviews on smoking cessation [12] and alcohol abuse [49] both recommend caution when interpreting results. However, the overall effect size reported by Lundahl et al [108] of 0.22 (95% CI 0.17 to 0.27) is similar to other complex behavioural intervention [122, 123]. If applied to the 1 million smokers in the UK, or the millions of physically inactive people globally [124], it is plausible that the impact of Motivational Interviewing on health at a population level may be larger. Further rigorous research is required to support this assumption.
Training and fidelity

Many different health care professionals including nurses, counsellors, physicians, medical students, social workers, and physiotherapists deliver Motivational Interviewing interventions, but there is little information about their training. Reviews that compared different health care providers found either no difference between groups [114] or reported limited conclusions due to small sample size [12].

Details of the fidelity of training of professionals delivering the interventions were generally poor although this is not unique to reporting of Motivational Interviewing. Training issues are fundamental to the success of any complex intervention and Motivational Interviewing, like other surgical, therapy or other behavioural interventions, requires practice of skills and a basic level of competency. There is no formal requirement for training in Motivational Interviewing or evaluation therefore practitioners can claim to use the approach without assessment, and competency is likely to influence outcome. Hall et al (2016) suggest that investment in training would need to be large to impact on change in practice [125].

It is difficult to comment on the cost effectiveness of Motivational Interviewing as it was not the focus of this overview, however we identified very little health economic data. Where cost data was available from a trial of smoking cessation in the UK, no clear conclusions could be drawn as the sustained quit rates did not reach statistical significance[12].

Strengths and limitations of the overview

This overview is the first to synthesise systematic review evidence on the effectiveness of Motivational Interviewing from a wide range of populations and settings with an aim to provide information that informs practice and policy. It highlights the discrepancy between the widespread recommendations of Motivational Interviewing as a universal behaviour change strategy and the available evidence supporting this approach. We carried out a comprehensive search with an inclusive selection criteria and it is unlikely that we missed any reviews written in English prior to our initial search, but this overview is not exhaustive.

The conclusions of this overview are highly dependent on, not only the quality of the reviews but the studies within the reviews. We extracted data according to the TIDieR guidelines [14] but many intervention details were missing, making it difficult to draw conclusions with confidence. This problem needs to be addressed in future trials to facilitate data synthesis and provide clear recommendation to all stakeholders. Our assessment of review quality (ROBIS) [15] and evidence quality (GRADE) [17] are subjective judgements and we used these judgements to categorise the evidence, concentrating our conclusions on those judged to be moderate quality (or low bias for narrative reviews). Some may consider our methods overly critical, but authors of the higher quality reviews are equally cautious with their recommendations [11, 12, 49].

Recommendations and implication for future research

The established Network of Trainers (MINT) alone have delivered Motivational Interviewing around the world to millions of people [126] but many questions remain unanswered regarding effectiveness.

Recommendations for clinical practice. Many different health professional groups are using Motivational Interviewing but the evidence for training reported in the literature is limited. The ‘Motivational Interviewing Treatment Integrity code’ (MITI) has evolved over the last 10 years [127] with an aim to standardise the delivery of Motivational Interviewing interventions. Guidelines for the minimum intervention content and training requirements for Motivational Interviewing are available and should be followed to standardise intervention delivery [127, 128].
Recommendations for future reviews. This overview has identified and brought together systematic reviews relating to Motivational Interviewing interventions; however further systematic reviews are warranted to inform clinical practice and future primary research in this field. Recommendations include, but are not limited to;

1. Research should address the fact that in clinical practice Motivational Interviewing is often delivered in combination with another psychological intervention. Systematic reviews exploring combined interventions were excluded from this overview; consequently, it is important to identify and appraise any existing systematic reviews relevant to this, prior to planning new reviews or primary research.

2. Future systematic reviews would benefit from the development of a taxonomy to ensure meaningful categorisation of the delivered intervention which considers the theoretical basis for Motivational Interviewing. Meaningful categorisation of Motivational Interviewing should be central to informing clinically relevant analyses and subgroup analyses.

3. A systematic review to explore the cost-effectiveness of Motivational Interviewing as an intervention for those health conditions where there is moderate quality evidence of a beneficial effect of Motivational Interviewing on patient outcomes.

4. A systematic review to explore the barriers and facilitators to delivery of Motivational Interviewing, focussed on those health conditions where there is moderate or high quality evidence of a beneficial effect.

5. A systematic review of qualitative evidence to explore the acceptability and perceptions of this intervention to people who are offered Motivational Interviewing.

6. Stakeholder involvement should be conducted in future reviews of the Motivational Interviewing literature particularly relating to categorising interventions and outcomes.

7. The use of reporting templates, recognised guidance and best practice for the conduct of systematic reviews and primary research is essential. e.g. PRISMA [129] and TIDieR [14].

Recommendations for future primary research.

1. Exploration of the effect of Motivational Interviewing should consider long-term outcomes and cost-effectiveness. Subgroup analyses should explore the length of intervention delivery and time since the end of the intervention.

2. Investment in training would need to be large to impact on change in practice [130] and this along with other issues relating to sustainability of the intervention e.g. context, should be considered in future trials.

3. To ensure avoidance of research waste [131, 132] it is essential that researchers are fully aware of existing reviews before embarking on further reviews, and that critical systematic reviews of evidence are completed prior to further primary research.

Conclusion

For the health problems that Motivational Interviewing was originally developed to address such as smoking cessation and alcohol misuse, the evidence provides some support for implementation particularly if fidelity of the intervention is prioritised. However, Motivational Interviewing has been implemented already for a wide range of other health and social problems where a “one size fits all” approach has been adopted with inconsistent effects.
Supporting information

S1 Checklist. PRISMA checklist.
(DOC)

S1 Table. Characteristics of interventions according to TIDIER checklist reporting guidelines.
(DOCX)

S2 Table. Quality assessment of included reviews based on ROBIS (risk of bias in systematic reviews) tools.
(DOCX)

S3 Table. Summary of comparisons judged to provide low or very low quality evidence.
(DOCX)

S1 File. Exploration of moderator variables.
(DOCX)

S1 Appendix. Medline search string.
(DOCX)

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Author Contributions

Conceptualization: Helen Frost, Pauline Campbell, Margaret Maxwell, Ronan E. O’Carroll, Stephan U. Dombrowski, Brian Williams, Helen Cheyne, Alex Pollock.

Data curation: Helen Frost, Pauline Campbell, Emma Coles, Alex Pollock.

Formal analysis: Helen Frost, Pauline Campbell, Margaret Maxwell, Alex Pollock.

Funding acquisition: Brian Williams.

Investigation: Helen Frost, Margaret Maxwell.

Methodology: Helen Frost, Pauline Campbell, Margaret Maxwell, Stephan U. Dombrowski, Alex Pollock.

Project administration: Helen Frost, Margaret Maxwell.

Supervision: Margaret Maxwell, Ronan E. O’Carroll, Brian Williams, Helen Cheyne, Alex Pollock.

Writing – original draft: Helen Frost, Pauline Campbell.

Writing – review & editing: Helen Frost, Pauline Campbell, Margaret Maxwell, Ronan E. O’Carroll, Stephan U. Dombrowski, Brian Williams, Helen Cheyne, Emma Coles, Alex Pollock.

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