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Systematic Review

Physical therapist-delivered motivational interviewing and health-related behaviour change: A systematic review and meta-analysis

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ABSTRACT

Background: Motivational interviewing (MI) promotes health-related behaviour change and improves patient health outcomes, but the effect of physical therapist-delivered MI is unclear.
Objective: To evaluate the effect of physical therapist-delivered MI on health-related behaviour change in adults attending physical therapy or rehabilitation.
Methods: CINAHL, Medline, PubMed, PEDro, Embase, and Cochrane databases were searched in August 2023. Randomised controlled trials evaluating physical therapist-delivered MI and health-related behaviour change were included. Internal validity was evaluated using the PEDro scale. GRADE approach was used for each meta-analysis.
Results: Ten publications from nine randomised controlled trials involving 909 participants were included. Physical therapist-delivered MI likely increased physical activity slightly (SMD 0.21, 95 % CI -0.05, 0.47) when compared to minimal intervention; however the evidence is very uncertain in relation to self-efficacy (SMD 0.51, 95 % CI -0.35, 1.38) and health-related quality of life (SMD 0.73, 95 % CI -0.64, 2.11). When physical therapist-delivered MI was combined with and compared to rehabilitation, there were no additional effects on physical activity (SMD 0.02, 95 % CI -0.37, 0.41), health-related quality of life (SMD 0.18, 95 % CI -0.27, 0.63), or endurance (SMD 0.15, 95 % CI -0.21, 0.52) and a likely small effect on self-efficacy (SMD 0.23, 95 % CI -0.1, 0.55).
Conclusion: Physical therapist-delivered MI is likely to produce a small improvement in physical activity, but only in the absence of other comprehensive rehabilitation. The most beneficial application of MI may be for patients who are not receiving rehabilitation or who have low levels of motivation and self-efficacy.

Introduction

As primary care practitioners specialising in prevention and management strategies, physical therapists are well positioned to align physical therapy practice with global health priorities towards adopting and sustaining positive health behaviours.[1] The prescription of therapeutic exercise and tailored education, hallmarks of physical therapy practice, are well established interventions to promote positive health behaviour change and improve patient health outcomes.[2] However, the efficacy of these interventions rely on patient adherence and the extent to which a patient is actively engaged with their therapy. While physical therapists traditionally rely on education to facilitate behaviour change, it is unclear how to best deliver education to improve patient health outcomes.[3] Poor adherence to treatment advices remains widespread within the patient population[4] suggestive that education alone is not sufficient to bridge the intention-behaviour gap.[5]

It has been proposed that initiating and sustaining behaviour change is not supported through the provision of expert advice alone, but rather

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through empowering individuals by enhancing their intrinsic motivation for behaviour change.[6] Motivational interviewing (MI) is an evidence-based patient-centred counselling approach that can bridge the gap between prescription and adherence by exploring and resolving ambivalence.[6] In this way, MI seeks to enhance an individual's intrinsic motivation for change towards positive health behaviours. Though originally developed in the addiction field and delivered by psychology-based professionals, MI has since been applied across a broad range of clinical populations to address several health behaviours. Of particular relevance to physical therapy practice is its ability to improve physical activity behaviour[7-8] and adherence to health recommendations.[9] Several positive patient health outcomes have also been demonstrated including improved health-related quality of life (QoL) and self-efficacy,[9] improved symptom management,[10] and reduced hospital admissions.[9]

Despite evidence to support the use of MI to facilitate outcomes in physical therapy, the efficacy of physical therapist-delivered MI has not been explored systematically. MI proficiency appears not to be correlated with the professional background of the therapist delivering the MI,[11,12] rather, (two-day workshop) led by a trainer accredited by the Motivational Interviewing Network of Trainers (MINT) coupled with individual feedback and coaching.[13] With training, physical therapists could potentially embed behavioural counselling methods such as MI into their daily practice. Despite this, MI is often considered as an adjunct to physical therapy, delivered by other trained health professionals. One systematic review investigated the addition of motivational interventions to physical therapy, but interventions were not limited to MI and were delivered by a physical therapist in only 3 of the 14 trials.[14] Several reviews exploring the role of MI and physical activity, arguably a core domain of physical therapy, include trials where MI was delivered by counsellors, researchers, and nurses.[7,8,15]

This review aims to determine the effectiveness of MI delivered by physical therapists on behaviour change and patient health outcomes compared to usual care or alternate intervention.

Methods

This systematic review and meta-analysis is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis guidelines[16] and was registered prospectively (March 2023) with PROSPERO (CRD42023408220).

Information sources and search strategy

A systematic literature search was conducted from inception until August 2023 in six databases: CINAHL complete (EBSCO), Medline (Ovid), PubMed central (PMC), Physiotherapy Evidence Database (PEDro), Embase (Ovid), and the Cochrane library (Central). The search terms and strategies were developed and piloted in consultation with the research team and a specialist health science librarian.

Keywords for motivational interviewing, physiotherapy/physical therapy and rehabilitation were mapped to medical subject headings and combined with keyword search results (including truncations to account for variations in spelling). Results for 'physical therapy'/ 'physiotherapy' "OR" 'rehabilitation' were combined with results for 'motivational interviewing' using the "AND" operator (see Supplementary material for full search strategies).

Eligibility criteria

The inclusion criteria followed the PICOs framework (population, intervention, comparator, outcome, study design).[17] Studies were included if they were peer-reviewed randomised controlled trials evaluating physical therapist-delivered MI focussed on health-related behaviour change (e.g. physical activity, dietary intake) in adults attending physical therapy / rehabilitation (including physical therapy) with or without co-intervention/usual care (full inclusion criteria provided in Supplementary material).

Trials evaluating MI for mental health conditions and/or addiction were excluded. Trials where MI was combined with other behavioural interventions, e.g. cognitive behavioural therapy, were excluded to enable this review to focus on the behavioural effect of MI. Studies that used motivational enhancement therapy, a brief therapeutic approach using MI principles, were also excluded.

Selection process

After removal of duplicates, two reviewers independently screened titles and abstracts and then the remaining full-text articles for inclusion via the online platform Covidence.[18] Agreement between reviewers was recorded. Disagreements between reviewers were resolved by a third reviewer, or through discussion within the team. Reference lists of included papers were screened to identify any additional papers for review. Authors of full-text papers were contacted to clarify if physical therapists provided the MI intervention if this was not clear.

Data items and collection process

Data extraction was completed independently by two reviewers (EW, CP). Data were extracted into a customised excel spreadsheet and included demographic factors (age, sex, country, year of study, health condition, setting), experimental and control interventions, primary (e.g. physical activity) and secondary outcomes (patient health outcomes) and time points, adverse events, and results. Because MI efficacy is associated with treatment fidelity,[19] MI treatment fidelity and methods to confirm proficiency of the MI physical therapists were also extracted. Where the required information was not clearly reported, lead authors of included papers were contacted to request additional detail.

Study risk of bias assessment

Internal validity of included trials were evaluated using the Physiotherapy Evidence Database (PEDro) scale; a valid, unidimensional measure of methodological quality of clinical trials.[20] The PEDro scale has demonstrated 'fair' to 'excellent' inter-rater reliability for physical therapy-related clinical trials,[21] and evidence of construct and convergent validity.[22] Studies scoring < 4 are considered to demonstrate 'poor' methodological quality, 4 to 5 considered 'fair', 6 to 8 are considered 'good', and 9 to 10 are considered 'excellent'.[23] For studies evaluating complex interventions such as MI, a PEDro score of 8/10 is often the highest score obtainable as blinding of therapists is not possible and blinding of participants is challenging.[20,21]

Two reviewers (EW and NT or KH) independently applied the tool, and disagreements between reviewers were resolved through discussion or by a third reviewer (CP) as necessary. Agreement between reviewers was recorded.

Data analysis

Standardised mean differences (SMD) and 95 % confidence intervals (CI) were calculated from pooled post-intervention means and standard deviations (SD). Where results were not reported as means and SDs, they were manually converted according to recommendations.[24] Clinically homogeneous data were synthesised using random effects models for outcomes using Revman software (Review Manager version 5.4).[25] Strength of the SMD was reported according to Cohen[26] where 0.2 represents a small effect, 0.5 a moderate effect, and 0.8 a large effect.[26] Trial results were synthesised for common outcomes including physical activity, health-related QoL, self-efficacy, and endurance (e.g. 6 min walk test [MWT]). If a trial reported several different measures of an outcome (e.g. physical activity), the common measure between the trials was used. Statistical heterogeneity was assessed using the I^2 statistic

with significant heterogeneity defined as I^2 >50 %.[27]

Certainty assessment

The GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) approach was applied to determine the certainty of evidence for each meta-analysis.[28] The GRADE approach considers four levels of certainty (very low to high) where randomised controlled trials begin with a high certainty and are downgraded if there are concerns about risk of bias, inconsistency, indirectness, imprecision, and publication bias.

Evidence was downgraded by one level: if there were concerns about the methodological quality (PEDro < 6)[23] of the majority of trials (i.e. >50 %) (risk of bias); if the statistical test for heterogeneity demonstrated substantial heterogeneity (I^2 >50 %)[29] (inconsistency); if there were significant concerns that the participants, intervention, comparator, or outcome were inconsistent with usual clinical practice (e.g. participants who wouldn't usually see a physical therapist) or if there was evidence of indirect comparisons (e.g. participants who are seeing a physical therapist vs healthy controls)[30] (indirectness); if the 95 % CI of the SMD was wide (i.e. >0.8) indicating imprecision (such that the lower band of the 95 % CI could indicate little or no effect while the upper band could indicate a large effect)[26] or if the CI crossed the null effect threshold[31] (imprecision); or if publication bias was strongly suspected, for example if the analysis included mainly small studies showing statistically significant results or inclusion of trials with industry influence.[32] Evidence was downgraded two places if both criteria for imprecision were met. Single trials were considered inconsistent and imprecise, thereby providing low certainty evidence. This could be further downgraded to very low certainty evidence if there was high risk of bias.

Results and certainty of the evidence have been reported according to the GRADE guidelines on informative statements to communicate the findings of systematic reviews.[33]

Results

Study selection

After duplicates were removed, 1608 articles were screened on title and abstract, of which 118 underwent full text screening. After excluding 108 ineligible articles (Supplementary material, full-text exclusions), 10 publications from 9 independent randomised controlled trials met the final eligibility criteria for inclusion (Fig. 1). Findings from one trial were reported in two separate papers, one reporting initial findings[34] and the other reporting 12-month follow up data.[35] For the purpose of this review, these publications will collectively be referred to as the primary trial by Arkkukangas.[34] Inter-rater agreement was 'moderate' at title and abstract screening ($k = 0.44$, 95 % CI 0.36, 0.52), and full text screening ($k = 0.57$, 95 % CI 0.34, 0.80). Two authors were contacted for the unadjusted post intervention data,[36,37] and one provided further data.[37]

Trial and participant characteristics

The nine randomised controlled trials were published between 2012 and 2022 (Table 1) and included 909 participants. Five trials were completed in Europe (Sweden, Belgium, Spain, Denmark,

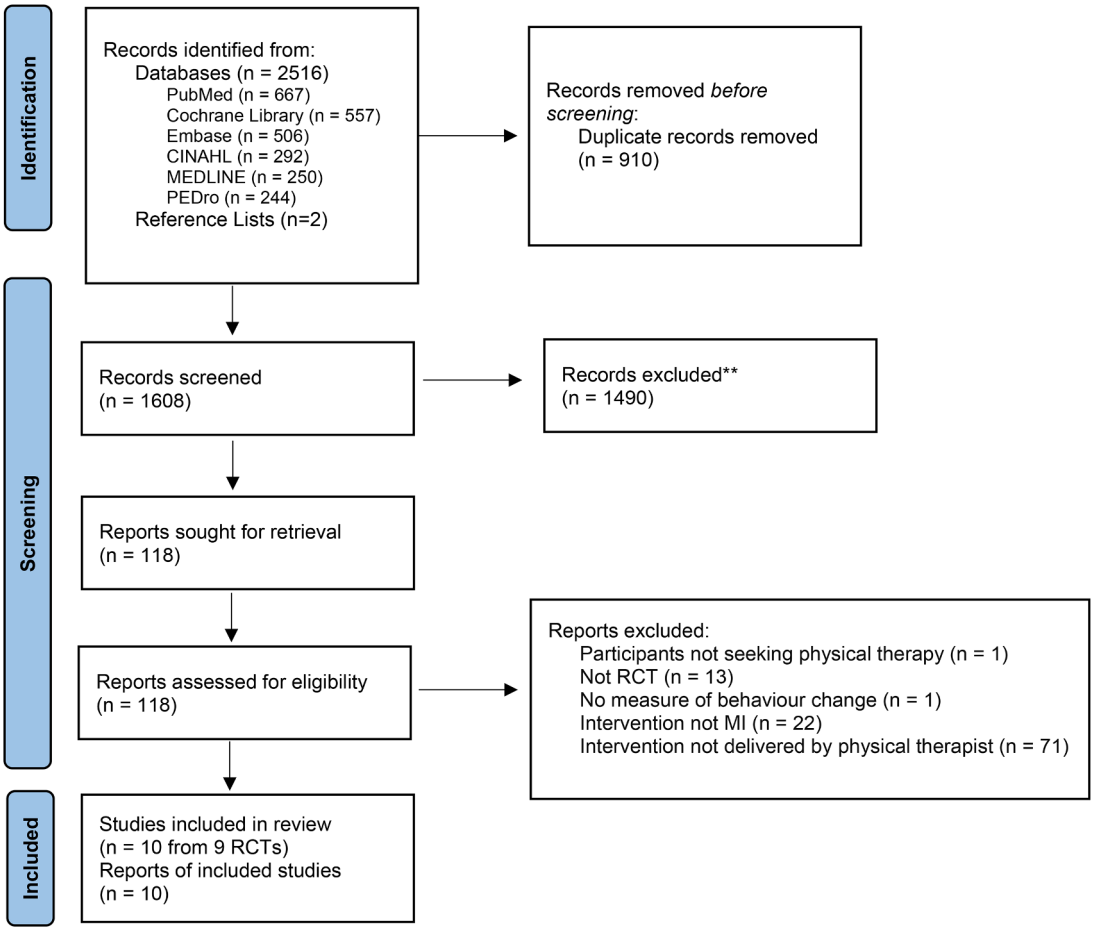

Fig. 1. Flow of trials through the review. MI, motivational interviewing; RCT, randomised controlled trial.

Table 1
Trial characteristics ($n = 9$).

Study, PEDro score	Clinical setting, Country	Population n= int:cont, diagnostic group, Mean (SD) age	Intervention	Control	Health related outcome/s and measures	Time points
Arbillaga-Etxarri et al.[38] 6/10	33 primary care centres and 5 hospitals, Spain	$n = 132:148$ COPD 69 (8) years 244 males (87 %)	1 × 1 hour in person MI session followed by 1–4 × 5–10 min telephone MI (based on motivation level) + URBAN TRAINING - walking ≥ 5 days/week, pedometer monitoring, written education, text messages, walking group, phone support + Usual standard management (as per control)	Usual standard pharmacological and/or non-pharmacological management for COPD, including pulmonary rehab.	PA: accelerometer Health-related QoL Endurance	Baseline 52 weeks
Arkkukangas et al.[34] and Tuvemo Johnson et al.[35] 8/10	Community dwelling, Sweden	$n = 58:61:56$* Older community dwelling adults 83 (5) years 53 males (30 %)	MI embedded into 5 × 1 hour home visits over 12 weeks + OTAGO exercise program (as per control)	OTAGO exercise program: written information and home exercise program including balance, strength training, and walking.	PA: Frandin/Grimby activity scale Mobility, strength, balance, exercise, adherence, self-efficacy	Baseline 12 weeks 42 weeks
Burtin et al.[36] 6/10	Pulmonary rehabilitation (hospital), Belgium	$n = 40:40$ COPD 66 (7) years 65 males (81 %)	8 × 20–30 min in person MI sessions over 6 months + Multidisciplinary pulmonary rehabilitation (as per control)	Multidisciplinary pulmonary rehabilitation: 3 x week for 3 months, then twice weekly for 3 months. + Sham attention program	PA: accelerometer	Baseline 12 weeks 26 weeks
Dennett et al.[40] 8/10	Outpatient oncology rehab, Australia	$n = 22:24$ Cancer 59 (12) years 17 males (37 %)	7 x~ 21-minute telephone MI delivered over 7 weeks + Oncology Rehabilitation (as per control)	Oncology Rehabilitation (twice weekly 7 weeks)	PA: accelerometer Health-related QoL Functional impairment Strength Endurance	Baseline 8 weeks
Larsen et al.[43] 8/10	Community dwelling, Denmark	$n = 32:38$ Community dwelling older adults 72 (3) years 28 males (40 %)	7 x ~18-minute telephone MI Delivered over 12 weeks + Usual care (as per control)	PA monitor and national PA recommendations	PA: accelerometer Health-related QoL Self-efficacy	Baseline 12 weeks
O'Halloran et al.[41] 6/10	Community dwelling, Australia	$n = 16:14$ Post hip fracture 83 (5) years 5 males (17 %)	8 × 30-minute telephone MI delivered over 8 weeks + Usual care (as per control)	Usual care e.g. general practitioner visits, community physical therapy	PA: accelerometer Health-related QoL Mobility Self-efficacy	Baseline 9 weeks
Rausch Osthoff et al.[39] 6/10	Pulmonary rehabilitation (hospital), Switzerland	$n = 17:25$ COPD 68 (8) years 21 males (50 %)	5 × 30-minute in person MI delivered over 12 weeks + Pulmonary rehabilitation (as per control)	Pulmonary rehabilitation - twice weekly over 12 weeks, weekly supervised Nordic walking	PA: accelerometer Health-related QoL Endurance	Baseline 12 weeks 24 weeks
Reid et al.[42] 7/10	Cardiac centre, Canada	$n = 69:72$ Coronary artery disease 61 (10) years 103 males (73 %)	1 × 25–35-minute in person MI + 8 × 10–15-minute telephone MI delivered over 52 weeks + Usual care (as per control)	Cardiology discharge booklet, advice about the importance of physical activity	PA: pedometer	Baseline 26 weeks 52 weeks
Pellegrini et al.[37] 5/10	Outpatient physical therapy, USA	$n = 24:21$ Post total knee replacement (TKR) 65 (7) years 18 males (40 %)	Approximately 12 x MI sessions embedded in usual care physical therapy 2–3 x week delivered over 5–6 weeks. + Usual care physical therapy following total knee replacement (as per control)	Usual care physical therapy following total knee replacement	PA: accelerometer Functional impairment Endurance Pain	Baseline 12 weeks

NB: *3 armed RCT – OTAGO exercise program +MI vs OTAGO exercise program vs control (minimal intervention).
COPD, chronic obstructive pulmonary disease; int:con, intervention:control; MI, motivational interviewing PA, physical activity; QoL: Quality of life; TKR, total knee replacement.

Switzerland),[34,36,38-39] two in Australia, ,[40,41] one in Canada,[42] and one in the USA.[37]

Three trials included participants with chronic obstructive pulmonary disease (COPD),[36,38,39] two recruited older adults from the community,[34,43] and single trials included participants with coronary artery disease,[42] cancer,[40] post hip fracture,[41] and post total knee replacement.[37] The mean age of participants ranged from 59[40] to 83 years old[34,41] and, overall, 61 % (554) were male (Table 1).

Intervention characteristics

Physical therapist-delivered MI was added to usual care and

compared to usual care alone in 8 of the 9 trials.[34,36-37,42,43] In three of these trials, usual care consisted of minimal intervention (such as written advice or routine general practitioner visits)[43,41-42] and in five trials, usual care consisted of comprehensive rehabilitation involving physical therapy with or without multi-disciplinary team care.[34,36-37,39-40] In one of the trials where MI was delivered as an adjunct to comprehensive rehabilitation, a third group received minimal intervention.[34]

The ninth trial was the only one which included a co-intervention. This trial examined physical therapist-delivered MI with a structured walking program and usual care management compared with usual care management alone.[38]

Mode of delivery of motivational interviewing

Motivational interviewing was delivered in person in four trials,[34,36-37,39] via telephone in three trials,[43,40-41] and in combination in two trials with MI initially delivered in person and subsequently delivered by telephone.[38,42] Physical therapists delivered between two[38] and 12[37] MI sessions over an intervention period ranging from seven[40] to 52 weeks (Table 1).[38,42]

Training

Four trials demonstrated the minimum recommended training requirements for MI proficiency,[34,39-41] including between two[40,41] and nine[39] days of training and feedback from a MINT trainer (Table 2). One trial provided individual training sessions by an experienced health psychologist,[36] and one provided minimal MI training led by the principal investigator (exercise physiology background).[37] Three studies did not report who provided the MI training.[38-43,42]

Fidelity

Four trials[39-41,43] confirmed MI fidelity with the validated Motivational Interviewing Treatment Integrity (MITI) Scale.[44] Of these, two confirmed proficiency via role play with a MINT accredited MI trainer prior to the study commencement.[40-41] Other fidelity measures included controlled coding during the study at a MI coding lab,[34] unannounced observations by trained reviewers against a fidelity checklist,[37] and review of audiotaped MI sessions by a health psychologist.[36] Two trials reported the use of training, support, periodic supervision, scripts, and checklists to maintain intervention fidelity (Table 2).[38,42]

Outcome measures

Eight trials measured the primary outcome of physical activity with an accelerometer or pedometer.[36-42] Six reported daily steps,[36,38-41] and one reported kilometres travelled over seven days.[42] Four trials reported minutes of moderate to vigorous physical activity (MVPA) using an accelerometer[37,40] or a physical activity questionnaire.[43,42] A single trial measured physical activity subjectively via a 6-point self-reported activity scale.[34] Two trials evaluated physical activity at long-term follow-up.[35,39] No included trials reported other behaviour change outcomes such as those related to diet or medication adherence.

Commonly reported secondary outcomes included health-related QoL (n = 5), self-efficacy (n = 4), and endurance (n = 5). Health-related QoL was measured using the Assessment of Quality of Life Instrument,[41] European Organization for Research and Treatment of Cancer QoL Questionaire-C30,[40] euroQol-5 Domain Quality of Life questionnaire,[43] chronic respiratory disease questionnaire (CRQ),[39] the clinical COPD questionnaire (CCQ),[38] and as a subset of the Knee Injury and Osteoarthritis Outcome Score (KOOS).[37] Self-efficacy was evaluated using the ambulatory self-confidence questionnaire,[41] physical activity appraisal inventory,[40] falls efficacy Swedish scale,[34] and the self-efficacy for exercise scale.[43] Endurance was measured via the 6MWT.[36–38,39–40.

Table 2
MI characteristics.

Study	MI training	Core components of MI reported	Fidelity measure and outcome
Arbillaga-Etxarri et al.[38]	Insufficient details provided to confirm minimal training requirements met	Relational component - spirit of MI Technical component (i.e. OARS)	Uncertain. Not confirmed with a validated MI fidelity measure: *Training sessions, support and supervision, periodic recording*
*Arkkukangas et al.[34] and *Tuvemo Johnson et al.[35]	Training meets minimal requirements to achieve proficiency: *3-day training with 2 x MINT trainer, 3 booster sessions*	Relational component - spirit of MI Technical component (i.e. OARS) Underlying principles of MI present throughout.	Confirmed with a validated MI fidelity measure (MI coding lab)
Burtin et al.[36]	Does not meet minimal training requirements: *3 × 60 min individual training sessions by an experienced health psychologist*	Relational component - spirit of MI Stage matched MI approach based on low/high scores of motivation (self-efficacy scale 0–10)	Uncertain. Not confirmed with a validated MI fidelity measure: *Interviews with patients video-taped and discussed with health psychologist in individual or group sessions in the first few months of the study*
Dennett et al.[40]	Training meets minimal requirements to achieve proficiency: *2-day workshop, online training, 1:1 coaching from a MINT trainer*	Relational component - spirit of MI Technical component (i.e. OARS)	Confirmed with a validated MI fidelity measure (MITI 4.1)
Larsen et al.[43]	Insufficient details provided to confirm minimal training requirements met: *4-day course with reading materials, discussion and role play exercises*	Relational component - spirit of MI Technical component (i.e. OARS)	Confirmed with a validated MI fidelity measure (MITI 4)
O'Halloran et al.[41]	Training meets minimal requirements to achieve proficiency: *2-day workshop, online training, 1:1 coaching from a MINT trainer*	Relational component - spirit of MI Technical component (i.e. OARS)	Confirmed with a validated MI fidelity measure (MITI 3.1.1)
Rausch Osthoff et al.[39]	Training meets minimal requirements to achieve proficiency: *9-day MI course with a MINT trainer with feedback to MI physios*	Relational component - spirit of MI Technical component (i.e. OARS)	Confirmed with a validated MI fidelity measure (MITI 4.2.1)
Reid et al.[42]	Insufficient details provided to confirm minimal training requirements met: *2-days training,*	MI processes - engage, evoke, action planning	Uncertain. Not confirmed with a validated MI fidelity measure: *Used scripts / checklists to*

(*continued on next page*)

Table 2 (*continued*)

Study	MI training	Core components of MI reported	Fidelity measure and outcome
	regular case discussions		*maintain intervention fidelity*
Pellegrini et al.[37]	Does not meet minimal training requirements: *Brief training on techniques aligned with principles of MI led by the PI (EP background)*	Relational component - spirit of MI Technical components (i.e. OARS)	MI fidelity not confirmed: *59/377 (15 %) physical therapy sessions checked for fidelity with unannounced observations of physical therapy session by 5 reviewers*

Abbreviations: EP, exercise physiologist; MI, motivational interviewing; MINT, motivational interviewing network of trainers; MITI, motivational interviewing treatment integrity; OARS, open questioning, affirming, reflecting and summarising; PI, principal investigator.

Risk of bias in studies

The mean PEDro score of the included trials was 6.7 out of 10, ranging from 5[37] to 8[34,43,40] (Supplementary material, PEDro methodological quality assessment). Eight of the 9 trials demonstrated good methodological quality (PEDro score 6–8)[34,36,38-41,42] with the remaining study demonstrating fair methodological quality.[37] All trials fulfilled random allocation, baseline comparability, reported between-group differences, and provided point estimates and estimates of variability. Eight trials used blinded assessors[34,36,38-42] and five trials followed an intention-to-treat analysis.[34,38-43,40,42] There was almost perfect agreement between reviewers who assessed methodological quality (kappa 0.96, 95 % CI 0.90, 1.00).

Effect of physical therapist-delivered motivational interviewing

MI with minimal intervention vs. minimal intervention alone

Meta-analysis of 3 trials[41-43] with 236 participants produced moderate certainty evidence that physical therapist-delivered MI likely results in a slight increase in physical activity when combined with minimal intervention and compared to minimal intervention alone (SMD 0.21, 95 % CI −0.05, 0.47, I^2 0 %) (Fig. 2, Table 3).

For the secondary outcomes, meta-analyses of two trials[40, 43] demonstrated physical therapist-delivered MI may increase self-efficacy (SMD 0.51, 95 % CI −0.35, 1.38, I^2 69 %, 95 participants) and health-related QoL (SMD 0.73, 95 % CI −0.64, 2.11, I^2 86 %, 95 participants) when combined with and compared to minimal intervention, but the evidence is very uncertain (Table 3).

MI and comprehensive rehabilitation vs. comprehensive rehabilitation alone

Meta-analysis of 3 trials[37,39,40] with 103 participants demonstrated that when combined with comprehensive rehabilitation, physical therapist-delivered MI likely results in no effect on physical activity (SMD 0.02, 95 % CI −0.37, 0.41, I^2 0 %) when compared to comprehensive rehabilitation alone (Fig. 2, Table 3).

Results from single trials that could not be included in the meta-analysis demonstrated little to no difference in physical activity between those who received MI with comprehensive rehabilitation and those who received comprehensive rehabilitation alone at the end of the intervention[34,36] and at long term follow-up.[35,39]

For the secondary outcomes, meta-analyses of two trials,[3440] demonstrated physical therapist-delivered MI likely improves self-efficacy slightly (SMD 0.23, 95 % CI −0.10, 0.55, I^2 0 %, 148 participants) when combined with and compared to rehabilitation alone, but had little to no effect on health-related QoL[39,40] (SMD 0.18, 95 % CI −0.27, 0.63, I^2 0 %, 78 participants) and endurance[37,39,40] (6MWT) (SMD 0.15, 95 % CI −0.21, 0.52, I^2 0 %, 117 participants) (Table 3).

MI as a co-intervention with rehabilitation vs. usual care management

When MI was delivered as a co-intervention with rehabilitation (structured walking program) compared to usual care in a single trial with 280 participants,[38] there was no effect on physical activity (SMD 0.04, 95 % CI −0.19, 0.28), health-related QoL (SMD 0.0, 95 % CI −0.24, 0.24), or endurance (6MWT) (SMD −0.05, 95 % CI −0.29, 0.19) at 12 months. However, the certainty of evidence from this single trial[38] was low after downgrading for inconsistency and imprecision.

Discussion

This review found that physical therapist-delivered MI likely improved physical activity slightly when compared to minimal intervention. When delivered with and compared to comprehensive rehabilitation, MI was unlikely to have an additional effect on physical activity. These findings are consistent with an overview of reviews that also found a small effect on behaviour change with MI, but adds to that review by taking into account the effect of the comparator intervention.[45] The observed effect on physical activity (SMD 0.21) in the

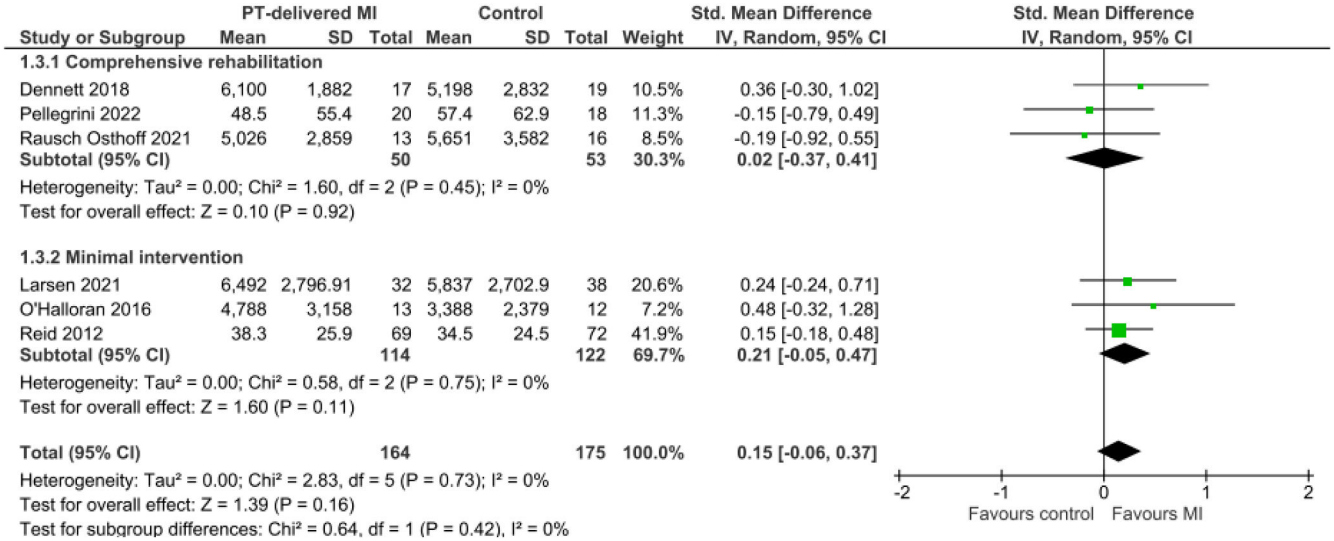

Fig. 2. Meta-analysis of the effect of physical therapy-delivered motivational interviewing (MI) on physical activity.

Table 3
Summary of findings and certainty of evidence GRADE.

Effect of physical therapist-delivered MI with minimal intervention vs. minimal intervention alone											
Certainty assessment							N° of patients		Effect	Certainty	Comments
N° of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Absolute (95 % CI)		
Physical activity											
3	randomised trials	not serious	not serious	not serious	serious[a]	none[b]	114	122	SMD 0.21 SD higher (0.05 lower to 0.47 higher)	⨁⨁⨁◯ Moderate	Physical therapist-delivered MI likely increases physical activity slightly when combined with and compared to minimal intervention
Self efficacy											
2	randomised trials	not serious	serious[c]	not serious	very serious[d]	none[b]	50	45	SMD 0.51 SD higher (0.35 lower to 1.38 higher)	⨁◯◯◯ Very low	Physical therapist-delivered MI may increase self-efficacy when combined with and compared to minimal intervention but the evidence is very uncertain
Health related QoL											
2	randomised trials	not serious	serious[c]	not serious	very serious[d]	none[b]	50	45	SMD 0.73 SD higher (0.64 lower to 2.11 higher)	⨁◯◯◯ Very low	Physical therapist-delivered MI may increase health-related quality of life when combined with and compared to minimal intervention but the evidence is very uncertain
Effect of physical therapist-delivered MI and comprehensive rehabilitation vs. comprehensive rehabilitation alone											
Physical activity											
3	randomised trials	not serious	not serious	not serious	serious[a]	none[b]	50	53	SMD 0.02 SD higher (0.37 lower to 0.41 higher)	⨁⨁⨁◯ Moderate	Physical therapist-delivered MI likely results in no difference in physical activity when combined with and compared to comprehensive rehabilitation
Self-efficacy											
2	randomised trials	not serious	not serious	not serious	serious[a]	none[b]	71	77	SMD 0.23 SD higher (0.1 lower to 0.55 higher)	⨁⨁⨁◯ Moderate	Physical therapist-delivered MI likely increases self-efficacy slightly when combined with and compared to comprehensive rehabilitation
Health related QoL											
2	randomised trials	not serious	not serious	not serious	very serious[c]	none[b]	34	44	SMD 0.18 SD higher	⨁⨁◯◯ Low	Physical therapist-delivered MI may result in little to no difference in

(*continued on next page*)

Table 3 (*continued*)

Effect of physical therapist-delivered MI with minimal intervention vs. minimal intervention alone											
Certainty assessment							N⁰ of patients		Effect	Certainty	Comments
N⁰ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention	Control	Absolute (95 % CI)		
									(0.27 lower to 0.63 higher)		health-related QoL when combined with and compared to comprehensive rehabilitation
6MWT											
3	randomised trials	not serious	not serious	not serious	serious[a]	none[b]	53	64	SMD 0.15 SD higher (0.21 lower to 0.52 higher)	⨁⨁⨁◯ Moderate	Physical therapist-delivered MI likely results in little to no difference in endurance when combined with and compared to comprehensive rehabilitation

CI, confidence interval; MI, motivational interviewing; QoL, quality of life; SMD, standardised mean difference.
Explanations.
a. Downgraded by 1 as the CI of the SMD includes the possibility of no effect.
b. Publication bias was undetected, though the included studies were small, no trials had industry influence and the included trials showed a range of positive and negative effects, therefore we did not downgrade for publication bias .
c. Downgraded by 1 due to substantial heterogeneity (I^2 >50 %).
d. Downgraded by 2 as the CI of the SMD is wide (i.e. >0.8) indicating imprecision and includes the possibility of no effect.
CI, confidence interval; MI, motivational interviewing; QoL, quality of life; SMD, standardised mean difference; 6MWT, 6 min walk test.
Explanations.
a. Downgraded by 1 as the CI of the SMD includes the possibility of no effect.
b. Publication bias was undetected, though the included studies were small, no trials had industry influence and the included trials showed a range of positive and negative effects, therefore we did not downgrade for publication bias.
c. Downgraded by 2 as the CI of the SMD is wide (i.e. >0.8) indicating imprecision and includes the possibility of no effect.

current review is similar to a previous review where the MI was mainly delivered by counsellors and educators (SMD 0.19).[7] These results suggest that physical therapists, with modest training and support, can deliver MI proficiently, further supporting previous findings that MI fidelity is not related to the professional background of the treating therapist, rather on achieving the recommended training and support.[12]

It is possible that adding MI to usual physical therapy management may not result in improved health behaviour (physical activity) because physical therapists may already be promoting behaviour change through patient centred approaches towards achieving specific and meaningful goals. The theoretical model of expert practice in physical therapy[46] encompasses many MI consistent principles; reflective listening, collaborative patient-centred care, and establishing mutual respect. It is possible that physical therapists delivering usual care rehabilitation may practice elements of MI through expert communication and establishing a collaborative therapeutic alliance.

Another possible explanation is that routine comprehensive rehabilitation programs were able to address and impact positive behaviour change through several mechanisms. While MI served to enhance the patient's intrinsic motivation for change, health behaviour is driven by complex interacting systems extending beyond motivation at the individual level, including the capability and opportunity for change.[47] Usual-care rehabilitation involving physical therapy is likely to have a positive impact on the patient's physical capacity and provide the opportunity to engage in regular physical activity, hence promoting behaviour change. In this way, all participants in the intervention and control groups in these trials were receiving evidence-based behaviour change interventions regardless of whether they were allocated to the intervention or control groups. It follows that behavioural counselling like MI may be most indicated for patients for whom low motivation and low self-efficacy is the major barrier to behaviour change rather than physical capacity or opportunity.[48,49]

A positive finding was that physical therapists can proficiently implement MI as intended with relatively modest training and support. MI was administered both in person and via the telephone in an embedded and adjunct model, with trials confirming MI fidelity through validated and reliable MI integrity tools. This finding suggests that MI can be integrated into routine clinical practice in a variety of ways.

Considering the trivial to small effects on physical activity observed when MI is added to physical therapy interventions, a possible clinical implication of these findings is that MI may be most applicable in the absence of other robust physical therapy intervention. MI applied on discharge from in person rehabilitation may enable continued improvements in physical activity even when most supportive care has ceased.[41] This approach may be particularly beneficial for patients where physical inactivity is predominantly driven by psychosocial rather than physical factors. Physical therapist-delivered MI may also enable an alternative option for patients who either cannot access or decline formal physical rehabilitation programs, where MI can be effectively delivered via telephone or telehealth.[42]

Strengths and limitations

This review and meta-analysis has been conducted in accordance with the PRISMA reporting guidelines for systematic reviews and meta-analysis.[16] All trials included in this review were peer reviewed randomised controlled trials, and predominantly good-quality trials. The GRADE approach[28] was applied to each meta-analysis to evaluate the level of certainty of each finding. A particular strength of this review is reflected through the robust MI eligibility criteria ensuring only trials which confirmed MI fidelity with a validated and reliable MI integrity tool were included.

A potential limitation of this review is the low number of trials and limited sample size in each meta-analysis, which may have contributed to imprecision in estimates of effect. In addition, few trials included long-term follow-up. Finally, it is possible that through the robust eligibility criteria regarding MI treatment fidelity, some trials may not have been included due to reporting, rather than the quality of MI within

the trial.

Conclusion

This review indicates that physical therapists can proficiently deliver MI to likely improve physical activity by a small amount when compared to minimal intervention. Comprehensive physical therapy rehabilitation appears to sufficiently address health-related behaviour change for patients who are ready for change with no additional benefit of MI demonstrated. Future research should consider the application of MI by physical therapists for patients identified with low baseline levels of motivation and self-efficacy, and for those who are no longer supported by rehabilitation programs.

Declaration of competing interest

The authors declare no competing interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.bjpt.2024.101168.

References

1. Dean E, Dornelas de Andrade A, O'Donoghue G, et al. The Second Physical Therapy Summit on Global Health: developing an action plan to promote health in daily practice and reduce the burden of non-communicable diseases. *Physiother Theory Pract*. 2014;30(4):261–275. https://doi.org/10.3109/09593985.2013.856977.
2. Dean E. Physical therapy in the 21st century (Part I): toward practice informed by epidemiology and the crisis of lifestyle conditions. *Physiother Theory Pract*. 2009;25 (5–6):330–353. https://doi.org/10.1080/09593980802668027.
3. Alexander J, Bambury E, Mendoza A, Reynolds J, Veronneau R, Dean E. Health education strategies used by physical therapists to promote behaviour change in people with lifestyle-related conditions: a systematic review. *Hong Kong Physiother J*. 2012;30(2):57–75. https://doi.org/10.1016/j.hkpj.2012.07.003.
4. Peek K, Sanson-Fisher R, Mackenzie L, Carey M. Interventions to aid patient adherence to physiotherapist prescribed self-management strategies: a systematic review. *Physiotherapy*. 2016;102(2):127–135. https://doi.org/10.1016/j.physio.2015.10.003.
5. Bassett S. Bridging the intention-behaviour gap with behaviour change strategies for physiotherapy rehabilitation non-adherence. *N Zeal J Physiother*. 2015;43:105–111. https://doi.org/10.15619/NZJP/43.3.05, 11/11.
6. Miller W.R., Rollnick S. *Motivational Interviewing : Helping People Change*. Third edition ed. The Guilford Press New York, NY; 2013. https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=488652.
7. O'Halloran PD, Blackstock F, Shields N, et al. Motivational interviewing to increase physical activity in people with chronic health conditions: a systematic review and meta-analysis. *Clin Rehabil*. 2014;28(12):1159–1171. https://doi.org/10.1177/0269215514536210.
8. Soderlund PD. Effectiveness of motivational interviewing for improving physical activity self-management for adults with type 2 diabetes: a review. *Chron Illn*. 2018; 14(1):54–68. https://doi.org/10.1177/1742395317699449.
9. Wang C, Liu K, Sun X, Yin Y, Tang T. Effectiveness of motivational interviewing among patients with COPD: a systematic review with meta-analysis and trial sequential analysis of randomized controlled trials. *Patient Educ Couns*. 2022;105 (11):3174–3185. https://doi.org/10.1016/j.pec.2022.07.019.
10. Ghizzardi G, Arrigoni C, Dellafiore F, Vellone E, Caruso R. Efficacy of motivational interviewing on enhancing self-care behaviors among patients with chronic heart failure: a systematic review and meta-analysis of randomized controlled trials. *Heart Fail Rev*. 2022;27(4):1029–1041. https://doi.org/10.1007/s10741-021-10110-z.
11. Lundahl B, Moleni T, Burke BL, et al. Motivational interviewing in medical care settings: a systematic review and meta-analysis of randomized controlled trials. *Patient Educ Couns*. 2013;93(2):157. https://doi.org/10.1016/j.pec.2013.07.012.
12. Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. *Br J Gen Pract*. 2005;55(513):305–312.
13. Rimayanti MU, Taylor NF, Shields N, Prendergast LA, O'Halloran PD. Health professionals can sustain proficiency in motivational interviewing with a moderate amount of training: an intervention fidelity study. *J Contin Educ Health Prof*. 2023. https://doi.org/10.1097/CEH.0000000000000522.
14. McGrane N, Galvin R, Cusack T, Stokes E. Addition of motivational interventions to exercise and traditional physiotherapy: a review and meta-analysis. *Physiotherapy*. 2015;101(1):1–12. https://doi.org/10.1016/j.physio.2014.04.009.
15. Akinrolie O, Barclay R, Strachan S, et al. The effect of motivational interviewing on physical activity level among older adults: a systematic review and meta-analysis. *Phys Occup Ther Geriatr*. 2020;38(3):250–263. https://doi.org/10.1080/02703181.2020.1725217.
16. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Bmj*. 2021;372:n71. https://doi.org/10.1136/bmj.n71.
17. Thomas J.K.D., McKenzie J.E., Brennan S.E., Bhaumik S. Chapter 2: determining the scope of the review and the questions it will address. . In: Higgins J.P.T.T.J., Chandler J., Cumpston M., Li T., Page M.J., Welch V.A. ed. *Cochrane Handbook for Systematic Reviews of Interventions version 64*. 2023. Accessed December 10, 2023. Available from www.training.cochrane.org/handbook.
18. Covidence Systematic Review Software VHI, Melbourne, Australia. Available at www.covidence.org.
19. Rimayanti MU, O'Halloran PD, Shields N, Morris R, Taylor NF. Comparing process evaluations of motivational interviewing interventions for managing health conditions and health promotions: a scoping review. *Patient Educ Couns*. 2022;105 (5):1170–1180. https://doi.org/10.1016/j.pec.2021.08.032.
20. de Morton NA. The PEDro scale is a valid measure of the methodological quality of clinical trials: a demographic study. *Austral J Physiother*. 2009;55(2):129–133. https://doi.org/10.1016/S0004-9514(09)70043-1.
21. Cashin AG, McAuley JH. Clinimetrics: Physiotherapy Evidence Database (PEDro) scale. *J Physiother*. 2020;66(1). https://doi.org/10.1016/j.jphys.2019.08.005, 59-59.
22. Macedo LG, Elkins MR, Maher CG, Moseley AM, Herbert RD, Sherrington C. There was evidence of convergent and construct validity of Physiotherapy Evidence Database quality scale for physiotherapy trials. *J Clin Epidemiol*. 2010;63(8): 920–925. https://doi.org/10.1016/j.jclinepi.2009.10.005.
23. Foley NC, Teasell RW, Bhogal SK, Speechley MR. Stroke rehabilitation evidence-based review: methodology. *Top Stroke Rehabil*. 2003;10(1):1–7. Spring.
24. Higgins JPTLT, Deeks JJ. Chapter 6: choosing effect measures and computing estimates of effect. In: Higgins JPTTJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA, eds. *Cochrane Handbook for Systematic Reviews of Interventions version 64 (updated August 2023)*; 2023. Accessed on September 12, 2023. Available from www.training.cochrane.org/handbook.
25. *Review Manager (Revman)*. Version 5.4. The Cochrane Collaboration; 2020.
26. J C. *Statistical Power Analysis for the Behavioral Sciences*. Routledge Academic; 1988.
27. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *Bmj*. Sep 6 2003;327(7414):557–560. https://doi.org/10.1136/bmj.327.7414.557.
28. Schünemann HJHJ, Vist GE, Glasziou P, Akl EA, Skoetz N, Guyatt GH. Chapter 14: completing 'Summary of findings' tables and grading the certainty of the evidence. In: Higgins JPTTJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA, eds. *Cochrane Handbook for Systematic Reviews of Interventions version 64 (updated August 2023)*. Cochrane; 2023. Accessed December 10, 2023. Available from www.training.cochrane.org/handbook.
29. Guyatt GH, Oxman AD, Kunz R, et al. GRADE guidelines: 7. Rating the quality of evidence–inconsistency. *J Clin Epidemiol*. 2011;64(12):1294–1302. https://doi.org/10.1016/j.jclinepi.2011.03.017.
30. Guyatt GH, Oxman AD, Kunz R, et al. GRADE guidelines: 8. Rating the quality of evidence–indirectness. *J Clin Epidemiol*. 2011;64(12):1303–1310. https://doi.org/10.1016/j.jclinepi.2011.04.014.
31. Schünemann HJ, Neumann I, Hultcrantz M, et al. GRADE guidance 35: update on rating imprecision for assessing contextualized certainty of evidence and making decisions. *J Clin Epidemiol*. 2022;150:225–242. https://doi.org/10.1016/j.jclinepi.2022.07.015.
32. Guyatt GH, Oxman AD, Montori V, et al. GRADE guidelines: 5. Rating the quality of evidence–publication bias. *J Clin Epidemiol*. 2011;64(12):1277–1282. https://doi.org/10.1016/j.jclinepi.2011.01.011.
33. Santesso N, Glenton C, Dahm P, et al. GRADE guidelines 26: informative statements to communicate the findings of systematic reviews of interventions. *J Clin Epidemiol*. 2020;119:126–135. https://doi.org/10.1016/j.jclinepi.2019.10.014.
34. Arkkukangas M, Söderlund A, Eriksson S, Johansson A-C. Fall preventive exercise with or without behavior change support for community-dwelling older adults: a randomized controlled trial with short-term follow-up. *J Geriatr Phys Ther*. 2019;42 (1):9–17. https://doi.org/10.1519/JPT.0000000000000129.
35. Tuvemo Johnson S, Anens E, Johansson A-C, Hellström K. The Otago Exercise Program with or without motivational interviewing for community-dwelling older adults: a 12-month follow-up of a randomized, controlled trial. *J Appl Gerontol*. 2021;40(3):289–299. https://doi.org/10.1177/0733464820902652.
36. Burtin C, Langer D, van Remoortel H, et al. Physical activity counselling during pulmonary rehabilitation in patients with COPD: a randomised controlled trial. *PLoS ONE*. 2015;10(12). https://doi.org/10.1371/journal.pone.0144989. e0144989-e0144989.
37. Pellegrini CA, Brown D, DeVivo KE, Lee J, Wilcox S. Promoting physical activity via physical therapist following knee replacement: a pilot randomized controlled trial. *Pm r*. 2023;15(8):965–975. https://doi.org/10.1002/pmrj.12895.
38. Arbillaga-Etxarri A, Gimeno-Santos E, Barberan-Garcia A, et al. Long-term efficacy and effectiveness of a behavioural and community-based exercise intervention (Urban Training) to increase physical activity in patients with COPD: a randomised controlled trial. *Eur Respir J*. 2018;52(4), 1800063. https://doi.org/10.1183/13993003.00063-2018.

39. Rausch Osthoff A-K, Beyer S, Gisi D, et al. Effect of counselling during pulmonary rehabilitation on self-determined motivation to be physically active for people with chronic obstructive pulmonary disease: a pragmatic RCT. *BMC Pulm Med*. 2021;21 (1):1–317. https://doi.org/10.1186/s12890-021-01685-2.
40. Dennett AM, Shields N, Peiris CL, et al. Motivational interviewing added to oncology rehabilitation did not improve moderate-intensity physical activity in cancer survivors: a randomised trial. *J Physiother*. 2018;64(4):255–263. https://doi.org/10.1016/j.jphys.2018.08.003.
41. O'Halloran PD, Shields N, Blackstock F, Wintle E, Taylor NF. Motivational interviewing increases physical activity and self-efficacy in people living in the community after hip fracture: a randomized controlled trial. *Clin Rehabil*. 2016;30 (11):1108–1119. https://doi.org/10.1177/0269215515617814.
42. Reid RD, Morrin LI, Higginson LAJ, et al. Motivational counselling for physical activity in patients with coronary artery disease not participating in cardiac rehabilitation. *Eur J Prev Cardiolog*. 2012;19(2):161–166. https://doi.org/10.1177/1741826711400519.
43. Larsen RT, Korfitsen CB, Keller C, et al. The MIPAM trial - motivational interviewing and physical activity monitoring to enhance the daily level of physical activity among older adults - a randomized controlled trial. *Eur Rev Aging Phys Act*. 2021;18 (1):12. https://doi.org/10.1186/s11556-021-00269-7.
44. Moyers TB, Rowell LN, Manuel JK, Ernst D, Houck JM. The Motivational Interviewing Treatment Integrity Code (MITI 4): rationale, preliminary reliability and validity. *J Subst Abuse Treat*. 2016;65:36–42. https://doi.org/10.1016/j.jsat.2016.01.001.
45. Frost H, Campbell P, Maxwell M, et al. Effectiveness of Motivational Interviewing on adult behaviour change in health and social care settings: a systematic review of reviews. *PLoS ONE*. 2018;13(10), e0204890. https://doi.org/10.1371/journal.pone.0204890.
46. Jensen GM, Gwyer J, Shepard KF. Expert practice in physical therapy. *Phys Ther*. 2000;80(1):28–43. discussion 44-52.
47. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6 (1). https://doi.org/10.1186/1748-5908-6-42, 42-42.
48. Dennett AM, Taylor NF, Mulrain K. Community ambulation after hip fracture: completing tasks to enable access to common community venues. *Disabil Rehabil*. 2012;34(9):707–714. https://doi.org/10.3109/09638288.2011.615371.
49. Rimayanti MU, Taylor NF, O'Halloran PD, Shields N. Gently steering - the mechanism of how motivational interviewing supported walking after hip fracture: a qualitative study. *PEC Innov*. 2022;1, 100078. https://doi.org/10.1016/j.pecinn.2022.100078.