

# BMJ Open Modifiable facilitators and barriers to exercise adherence in older adults with MCI/dementia using the Theoretical Domains Framework: a systematic review protocol

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## ABSTRACT

**Introduction** Exercise has multiple benefits on maintaining or improving cognitive function for people with mild cognitive impairment (MCI)/dementia. However, many older adults with MCI/dementia are not sufficiently active to achieve these benefits. Allowing for the current studies on exercise adherence in older adults with MCI/dementia still have some deficiencies. This paper aims: (1) to identify the modifiable facilitators and barriers to exercise adherence for older adults with MCI/dementia in terms of the perspectives of patients, caregivers and healthcare professionals; (2) to organise the identified factors of exercise adherence based on the Theoretical Domains Framework (TDF) among included studies.

**Methods and analysis** A systematic computerised literature search will be performed in the following online databases: PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure and Wan Fang Database, which published between January 1990 and June 2020. We will identify peer-reviewed publications which examined facilitators and barriers to exercise adherence. Searches will have no limitation in language publications using search terms related to exercise interventions, adherence and MCI/dementia. Two independent reviewers will screen titles, abstracts and full-text articles according to the predetermined inclusion and exclusion criteria. We will use the statistical software Nvivo V.12 to manage the information. Basing on the TDF, we will map identified modifiable facilitators and barriers of literature to the domains of TDF.

**Ethics and dissemination** This review will summarise modifiable facilitators and barriers to exercise adherence for older adults with MCI/dementia for the first time. Ethical approval is not required as no primary data are collected. We are going to disseminate our findings to the scientific and medical community in peer-reviewed journals. The review findings will facilitate adequate and accurate access to care and treatment to help older adults with MCI/dementia have a broader adoption to exercise.

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## Strengths and limitations of this study

- To the best of our knowledge, previous work did not systematically map and categorise modifiable facilitators and barriers to exercise adherence about older adults with mild cognitive impairment/dementia, referring to the Theoretical Domains Framework.
- Our systematic review will be the first attempt to summarise the currently available evidence on the insights of patients, caregivers and healthcare professionals.
- We will perform an all-round search of published and grey literature with no restrictions on language and geographical location.
- The main limitation of the study is that no meta-analysis or other statistical analysis will be performed in this review.

## BACKGROUND

### Description of the mild cognitive impairment (MCI)/dementia condition

MCI is the intermediate phase between normal cognitive function and dementia, characterised by a delay in cognitive decline that is larger than expected considering a person's age and education, though without marked interference in daily life activities.<sup>1</sup> The published prevalence of people with MCI is approximately 10%–20% worldwide depending on the sample and the follow-up duration of studies.<sup>2</sup> People with MCI have a heightened risk of further cognitive decline and progression to dementia. After an initial diagnosis of MCI, the incidence of dementia within 1, 5 and 9.5 years was 10–15, 60.5% and 100%, respectively.<sup>3</sup> Dementia is characterised by progressive and severe cognitive decline, motor deficits with or without behavioural problems causing a decrease in activities of daily living (ADL).<sup>4</sup> As life

expectancy is getting longer worldwide, the number of people affected by MCI and dementia is steadily growing.<sup>5</sup> According to estimates from the World Alzheimer Report, the number of people with dementia will dramatically increase in the coming decades, from 47 million in 2015 to 131.5 million by 2050.<sup>6</sup> These rapidly growing numbers will have a tremendous social impact, placing a high economic burden on the healthcare system.<sup>6,7</sup>

To date, there are no definite or disease-modifying therapeutic options for dementia and MCI. For the pharmacological interventions of dementia and MCI, these drugs may initially improve cognition and slow down the clinical progression of MCI/dementia. They are not capable of stopping the underlying pathological process of disease including amyloid accumulation, tau protein aggregation, synaptic loss and neuronal death.<sup>8,9</sup> Currently, many non-pharmacological treatments have reported benefits on cognitive function for older adults with MCI/dementia in multiple research studies.<sup>10,11</sup> As one of the significant recommendations for non-pharmaceutical interventions, exercise has been consistently proven to be associated with a reduced risk of developing MCI/dementia. Exercise (aerobic training, resistance training and mind-body practice, etc) is a promising strategy for preventing or delaying cognitive decline, and its salutary effects on cognitive function have been demonstrated in animal models and a growing number of clinical studies of older adults with MCI/dementia.<sup>12–14</sup>

Despite these positive findings, there remain concerns that older adults with MCI/dementia are physically inactive, and their adherence to exercise is poor.<sup>15,16</sup> One study with older adults with MCI showed that only 25% of participants continued to apply for the exercise programmes after the end of the 12-month randomised controlled trial (RCT).<sup>16</sup> Only 19% of the individuals with dementia completed more than two-thirds possible exercise sessions in the other 1-year long trial study, 52% of participants just finished less than one-third of possible practices and the mean adherence rate was  $33.2\% \pm 25.5\%$  in the whole sessions.<sup>15</sup> Thus, the adherence to exercise interventions was still not optimistic for older adults with MCI/dementia, and we would need to pay more attention to relevant researches of exercise adherence.

### The significance of doing this review

The positive effects of all exercise interventions depend highly on exercise adherence.<sup>17</sup>

Lowery *et al* also concluded that it is essential to identify factors influencing the participation among older adults with dementia in the community since only 30.7% participants have achieved the prescribed frequency of the exercise in their research.<sup>18</sup> To increase exercise adherence levels of older adults with MCI/dementia, there is a need to understand the factors better that affect exercise adherence in such populations. Specifically, identifying the facilitators and barriers to exercise will contribute to the implementation of the exercise intervention according to the initial protocol, which will promote

the rehabilitation for older adults with dementia. Some previous studies have established the factors associated with exercise participation in community-dwelling adults with dementia, including increased energy intake, resting metabolic rate, fat-free mass, gait speed, taking  $\geq$  four medications, dizziness, lower ADL function, a history of falls, delirium and so on.<sup>19,20</sup>

However, the current studies on exercise adherence in older adults with MCI/dementia still have the following deficiencies:

### The absence of research on discussing on exercise adherence in terms of different insights

The insights of patients, caregivers and healthcare professionals often differ regarding the facilitators and barriers to exercise adherence due to differing priorities and knowledge of the situation.<sup>21–28</sup> For patients, the complicity of symptoms can make it more difficult for older adults with MCI/dementia to participate in exercise programmes. Older adults with MCI/dementia can usually express their views and preferences about what is important to them when exercising, and it is morally and ethically necessary to consider those views.<sup>21,22</sup> In comparison to caring for older adults with normal cognitive function, the caregivers taking care of older adults with MCI/dementia face a substantially higher burden due to changes that are typically associated with dementia.<sup>23,24</sup> Relatively little is known on how caregivers of older adults with MCI/dementia manage their support arrangements, which strategies they follow and which ways are perceived as helpful or obstructive in exercise.<sup>24,25</sup> Therefore, opinions from caregivers should be taken into account. Furthermore, previous studies also highlighted the importance of support from healthcare professionals to encourage older adults with MCI/dementia to take part in the exercise.<sup>26,27</sup> The research has shown that participants' adherence to exercise is improved when the instructions they receive are specific and understandable from healthcare professionals.<sup>28</sup> In the meantime, many healthcare professionals were also concerned about participants' ability to access exercise programmes.<sup>16,27</sup> Caregivers may build bridges in following the instructions from healthcare professionals and monitoring exercise implementation better.<sup>23–25</sup> Teamwork and collaboration among patients, caregivers and healthcare professionals become paramount to improve the exercise adherence for older adults with MCI/dementia. Currently, the facilitators and barriers to exercise adherence among older adults with MCI/dementia in insights of different perspectives have not been studied.

### The lack of the utility of a theoretical framework to organise the potential facilitators and barriers to exercise adherence

Previous studies on facilitators and barriers to exercise adherence for older adults with MCI/dementia lacked the support or elaboration of behavioural theory framework. Behavioural theory can provide potential determinants and a corresponding structure for thinking

logically about these determinants and their relationships.<sup>29</sup> Applying a behavioural theoretical framework for assessing facilitators and barriers can effectively help develop tailored-informed strategies to support the effective implementation of evidence-based practices.<sup>30</sup> In this study, we will rely on Theoretical Domains Framework (TDF) to classify facilitators and barriers to exercise adherence for older adults with MCI/dementia. The TDF is a comprehensive framework that synthesises several behaviour change theories. It was developed with 12 domains and 128 constructs initially, and its validity was reevaluated by Michie *et al* with a refined version with 14 domains and 84 constructs.<sup>31 32</sup> This framework offers an appropriate structure for supporting an evidence synthesis of facilitators and barriers as it will help these factors to be linked to evidence-based behaviour change techniques. This theory has been used widely and successfully to assess facilitators and barriers, and provides a theory-driven guide for the further effective interventions.<sup>33–35</sup> Therefore, the TDF will contribute to overall understanding the facilitators and barriers to exercise adherence for older adults with MCI/dementia.

### The lack of systematic research on the modifiable factors that impact exercise adherence for older adults with MCI/dementia

It is recognised that the facilitators and barriers to targeted exercise among older adults with MCI/dementia are multifactorial.<sup>16–20</sup> Furthermore, these factors are partly unmodifiable or unavoidable that is difficult for us to change (eg, family history, sex and age). Identification of the potentially modifiable factors, which may improve or deteriorate exercise adherence is a critical approach to design interventions. This information will serve as a reminder that guides medical staff in refining target population and intervention methods theoretically, and then contributing to developing the adherence oriented exercise programmes in practice. Therefore, we first attempt to identify primary research findings of modifiable facilitators and barriers that may help to design exercise strategies to improve the effectiveness of exercise interventions further.

As summarised above, according to a broad-based theoretical framework for behaviour change, an overall understanding of the modifiable facilitators and barriers to exercise intervention in insights of the perspectives of patients, caregivers and healthcare professionals is needed. Thus, we aim to conduct a systematic review to collect and summarise the available evidence on modifiable facilitators and barriers to exercise adherence for older adults with MCI/dementia. Then this study will further categorise these modifiable factors into the domains presented in the TDF. These findings will provide medical staff recommendation with the individual-tailored exercise prescriptions and contribute to developing the strategies of long-term exercise adherence for older adults with MCI/dementia.

## METHODS/DESIGN

This protocol is written following the recommendation of the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P).<sup>36</sup> We plan to complete the systematic review with an expected completion date of 31 March 2021. This review has been registered with the international database of prospectively registered systematic reviews in health and social care.

### Eligibility criteria

#### Types of participants

Eligible studies will include any type of MCI/dementia. No limitations will be placed on the severity of MCI/dementia, length of time since diagnosis. No restrictions will be placed on the severity of depression, anxiety, psychological distress or mental health-related quality of life. These individuals will be included as follows:

1. The people aged 65 years or older.
2. For dementia: including studies involving people diagnosed with any type of dementia, according to the criteria in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-3); Fourth Edition (DSM-4); Text Revision (DSMIV-TR); Fifth Edition (DSM-5); International Classification of Diseases, Tenth Revision; Mini-Mental State Examination (MMSE)/Montreal Cognitive Assessment (MOCA) score available and other alternative validated diagnostic criteria or recorded in medical records.
3. For MCI: including studies involving people diagnosed with any type of MCI, according to the criteria in the DSM-5 criteria, Petersen's criteria, an alternative validated diagnostic criteria, MMSE/MOCA score available or where recorded in medical records.
4. These will be excluded: patients who have a severe visual or auditory impairment, serious medical conditions in major organs (heart, lung or kidney), illnesses affecting mobility or are unable to accept assessments or interventions that are required in this study for any reasons.

#### Types of exercise intervention

This systematic review will include all studies involving any one of exercise treatment or intervention. Exercise intervention is defined as a type of physical activity that is planned, structured and repeated over a while.<sup>37</sup> The eligible exercise can be categorised into resistance training, aerobic exercise, combined exercise and other types of training. Also, all organisational forms of exercise intervention (individual, group or mixed) are eligible for inclusion. Besides, supportive strategies (face to face, telephone, email) will be eligible for inclusion. There will be no limitations about the professional background of the person sustaining the exercise interventions, additionally unsustained (self-guided/self-administered) interventions will also be eligible for inclusion.



## Types of setting

Studies in any setting where exercise intervention is conducted, including healthcare institutions, community, home or in any geographical setting globally will be considered for inclusion.

## Types of outcome measures

Outcomes of studies that report facilitators and barriers influencing uptake/maintenance of exercise for older adults with MCI/dementia will be included.

## Types of studies

The searches are not limited to specific study design. Hence, all study designs using qualitative or quantitative methodologies will be included in the review. The papers will be categorised by study design using the following categories: RCT, quasi-controlled trial, cohort study, cross-sectional study and qualitative study.

## The language of studies

Searches will be no limitation in language publications.

## Publication year

Studies published between January 1990 and June 2020.

## Information sources

The following electronic databases: PubMed, Embase, Cochrane Library, Web of Science, China National Knowledge Infrastructure and Wan Fang Database will be searched from January 1990 to June 2020 about human studies. In order to improve the completeness of the literature, grey literature sources will be considered. We will further check the reference list of the included studies and relevant reviews.

## Search strategy

Based on key terms from previous literature reviews and Medical Subject Headings, our search will use both the

medical subject headings and text word and will combine concepts for the influencing factors of adherence. Our search strategy will consist of three parameters: disease (MCI/dementia), intervention (exercise) and outcome (adherence). The search strategy we will use for the retrieval of reports of trials from PubMed is summarised in [table 1](#). The search strategy will be modified as necessary for other databases.

## The selection process of studies

The study selection process will be reported according to the PRISMA flowchart.<sup>38</sup> First, removing duplicates using the reference manager software Endnote V.X7. Then titles and abstracts of articles will be screened. Selected full-text articles will be assessed for eligibility. The process will be carried by two independent researchers (HY and YC), disagreement will be solved by discussion. A third researcher (CG) will be invited in case of persistent contradiction. In the final, two other researchers (HC and JW) will assess potentially eligible full-text studies to make sure if they meet the criteria set for inclusion.

## Risk of bias (quality) assessment and meta-bias

Two independent reviewers will rigorously assess the quality of each paper. This study will use the Newcastle-Ottawa Scale<sup>39</sup> for evaluating the quality of the cohort studies, use the Agency for Health care Research and Quality<sup>40</sup> for assessing the quality of the cross-sectional studies and apply the Physiotherapy Evidence Database<sup>41</sup> Scale for estimating the quality of the RCTs. The Joanna Briggs Institute (JBI) critical appraisal checklist will be used to determine the quality of quasi-RCTs.<sup>42</sup> Qualitative research will adopt the tool that JBI made essential tools of appraisal for qualitative research in 2016.<sup>43</sup>

**Table 1** The search strategy of PubMed

Number	Search items
1	Dementia OR Cognitive Dysfunction OR Mild Cognitive Impairment* OR MCI OR VCI OR AAMI OR SMC OR ACMI OR ARCD OR CIND OR (nMCI or aMCI or mMCI or MCIa) OR MCD OR AACD OR MNCD OR Mild Neurocognitive Disorder* OR cogn* OR Cognitive impairment OR Alzheimer OR AD OR Alzheimer's disease
2	Ageing OR aging OR Elderly OR "Aged, 80 and over" OR "Old* age*" OR "middle age*" OR "old* adults" OR senior* OR senior citizens OR old people OR old person
3	Exercise OR Physical activit* OR Treadmill training OR Balance OR Strength OR Endurance OR Attention training sport* OR jogging OR physical therapy OR physiotherapy OR exercise* OR fitness OR rehabilitation OR flexibility OR aerobic training OR resistance training OR motor activit* OR leisure activit* OR strength OR balance OR aerobic* OR physical* OR training OR bicycling OR cycling OR swim* OR gym* OR walk* OR danc* OR yoga OR joga OR tai chi OR tai ji OR taichi OR Taijiquan OR tai-chi OR pilates OR movement OR recovery of function OR inactivit* OR sedentary OR physical inactivit* OR occupational therapy OR physical stimulation OR physical education OR physical medicine OR resistance OR mind-body OR Mind Body OR mind body OR mind-body training
4	barrier* OR enabler* OR motivators OR facilitators OR implementation OR adherence OR compliance OR support OR self-efficacy OR self efficacy OR self-efficiency OR motivation OR experience* OR perspective* OR factor* OR attendance OR predictor* OR preference*
5	1 and 2 and 3 and 4

## Data extraction and synthesis

Because of this expected significant heterogeneity in the included studies in terms of methods, participants, interventions and study types may limit our ability to conduct a meta-analysis. It will be the main limitation of the study. A narrative synthesis will be planned as informed by the published guidelines.<sup>44</sup> 'Narrative synthesis' refers to an approach to the systematic review and synthesis of findings from multiple studies that rely primarily on the use of words and text to summarise and explain the results of the integration.<sup>44</sup> Narrative methods have long been recognised as useful for investigating heterogeneity across primary studies and developing an understanding of which aspects of an intervention may be responsible for its success.<sup>45</sup>

Therefore, this review will adopt a narrative synthesis to synthesise all related qualitative and quantitative studies. After the full-text screening, all included studies will be imported into NVivo V.12 for data extraction using a line-by-line approach and coding of the data. The extracted information will consist of study characteristics and modifiable facilitators and barriers to exercise adherence in older adults with MCI/dementia. Study characteristics are as follows:

1. *Bibliographical information*: the journal name, title, first author's name, publication year, language of the study, country of the corresponding author.
2. *Study design*: the specific type of study, exercise intervention technique, duration, outcomes measured, instruments used to measure them, sample size and quality of the study.
3. *Participants' data*: type of disease, disease screening tools/diagnostic tools, setting, inclusion and exclusion criteria, sociodemographic characteristics (eg, age, ethnicity, country).
4. *Outcomes*: definition of adherence and rate of adherence. Adherence was defined as the percentage of attended sessions during the programmes as registered by the instructors in most studies.<sup>16</sup> Generally considering that participants meet the requirement of adherence when they complete more than 70% sessions of the whole programme.<sup>46–48</sup> Yet, there is not an accepted standard for exercise adherence. Grove and Spier defined adherence as the percentage of older adults who attended 90% of sessions.<sup>49</sup> Keogh *et al* described adherence as having attended one course a week over the previous 3 months.<sup>50</sup> It is acknowledged that there is a vast difference in the definition of exercise adherence. We will describe the meaning of exercise adherence in selected studies. It may be helpful for us to analyse the differences in research results and make the study more transparent.

The TDF is defined as a priori framework to reflect all coding of data. Coding of data will include such as authors' descriptions of the results and all relevant quotes from participants provided in the results section (or results tables) of included studies.<sup>51</sup> We will map the modifiable facilitators and barriers to exercise adherence

as the following 14 domains with 14 coding information according to the TDF: (1) knowledge, (2) skills, (3) social influences, (4) memory, attention and decision processes, (5) behavioural regulation, (6) professional/social role and identity, (7) beliefs about capabilities, (8) belief about consequences, (9) optimism, (10) intentions, (11) goals, (12) emotion, (13) environmental context and resources and (14) reinforcement. Any facilitator/barrier that does not match with the existing domains of the TDF will be organised into the 'Others' as the 15th domain.<sup>52</sup>

In the NVivo V.12, we will build three themes in terms of the perspective of the patients, caregivers and healthcare professionals to conform to the aim of our study. Each theme will be divided into two subthemes (modified facilitators and barriers). For each of these subthemes, we will create 15 domains. For example, if we extract the following text in a study 'Participant A reported that the intensity of the programme was too high that affected his/her maintenance', we will code it as 'Goals' in the 14 domains of the TDF. Then we will compare our coding to generate consensus about identified facilitators and barriers in the literature. It will be possible that the same sentence will be assigned more than one code. This process will be undertaken and will be discussed by two researchers (XZ, HC). Any disagreement between the two researchers will be resolved through further discussion and adjudication by a third reviewer (JW). When there is a disagreement in the different studies with the same factor affecting exercise adherence, we will evaluate the characters of the literature further, including the literature quality, types of research, sample size, and explain potential differences in results across studies. Poor methodological quality will not be included in the review that will affect the trustworthiness of the synthesis. Meanwhile, this study will take some measures to minimise all of the potential biases, including providing the equal weights to the studies with the comparable technical quality and providing a reasonable justification for not doing so.<sup>44</sup> We will also try our best to explore the influence of heterogeneity in this stage of the synthesis process.

## DISCUSSION

Understanding modifiable facilitators and barriers to exercise adherence for older adults with MCI/dementia is a complex process that needs to be fully explored if we hope to obtain the benefits of exercise intervention in greatest extent. To date, existing research has not studied this topic. This review will synthesise and report qualitative and quantitative data about exercise adherence in terms of the perspective of patients, caregivers and healthcare professionals.

This study will have several strengths and implications. First, the results will contribute to understanding the common influencing factors to focus on how to modify barriers best and enhance facilitators to increase the utility and appeal for the exercise intervention. Second, it will facilitate sufficient access to care and treatment to

help older adults with MCI/dementia have a broader adoption to exercise intervention. Third, it will have substantial implications for researchers, clinicians and policymakers to provide individually tailored care for older adults with MCI/dementia. We anticipate that this study will also be highly correlated to the public who want to engage with an exercise programme. Last but not least, this systematic review will be the first try that maps modifiable facilitators and barriers of exercise adherence for older adults with MCI/dementia to the domains of the TDF. In theory, TDF is a comprehensive framework that synthesises several behaviour change theories, which lower the risks of missing relevant theoretical constructs or including irrelevant ones.<sup>31</sup> Hence, it can be used for summarising the related factors of exercise adherence reported in the previous studies. The results will also provide a more in-depth insight into the influences on evidence-based behaviour change of exercise adherence. Findings based on the framework of the TDF can be used to inform the development of effective exercise adherence strategies and assist practitioners in selecting the most suitable evidence-based exercise programmes in clinical settings accordingly.

## Amendments

If we need to amend this protocol, the date of each amendment will be accompanied by a description of the change and the rationale.

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**Contributors** All authors contributed to the development of the study design and search strategy. XZ and LNW designed the study and wrote the protocol. XZ and HY wrote the search strategy. HY, YC and CG screened the literature. JW and HC checked the selected article. HT refined the English expression of this article. All authors provided feedback and approved the final protocol.

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