

Defining adherence to therapeutic exercise for musculoskeletal pain: A systematic review.

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ABSTRACT (248 words)

Objective: To establish the meaning of the term 'adherence' (including conceptual and measurement definitions) in the context of therapeutic exercise (TE) for musculoskeletal (MSK) pain.

Design: Systematic review using a search strategy including terms for: adherence, TE and MSK pain. Identified studies were independently screened for inclusion by two researchers. Two independent researchers extracted data on: study type; MSK pain population; type of TE used; definitions, parameters, measurement methods, and values of adherence.

Data sources: Seven electronic databases were searched from inception to December 2016.

Eligibility Criteria: Any study type featuring TE for adults with MSK pain and containing a definition of adherence, or a description of how adherence was measured.

Results: 459 studies were identified and 86 were included in the review. Most were prospective cohort studies and featured back and/or neck pain. Strengthening and stretching were the most common types of TE. A clearly identifiable definition of adherence was provided in 40% of the studies, with 12% using the same definition. Exercise frequency was the most commonly measured parameter of adherence, with self-report logs the most common measurement method. The most common value range used to determine satisfactory adherence was 80-99% of the recommended exercise dose.

Conclusion: No single definition of adherence to TE was apparent. We found no definition of adherence that specifically related to TE for MSK pain or described the dimensions of TE that should be measured. We recommend conceptualising adherence to TE for MSK pain from the perspective of all relevant stakeholders.

INTRODUCTION

There is strong evidence for exercise therapy as a treatment option for musculoskeletal (MSK) pain in primary care, with medium or large effect sizes for pain, function and quality of life outcomes¹. The effects of exercise compare favourably with other treatments including self-management, manual therapy, oral and topical pharmacological treatments, and surgery¹. Therapeutic exercise (TE) is an effective and safe treatment for MSK pain^{2,3,4} and is recommended in many clinical guidelines^{5,6,7,8}. However, the effectiveness of exercise is dependent upon the level of adherence to the recommended exercise protocol. A systematic review of 72 exercise treatments for low back pain (LBP) found that when adherence was encouraged to achieve a high dose of exercise, pain scores improved favourably compared to lower doses of exercise⁹. Higher exercise adherence can improve pain and physical function outcomes in patients with MSK pain and osteoarthritis (OA)^{10,11}. Adherence was identified by an expert consensus group as an important factor for determining outcomes from exercise in patients with knee or hip OA¹². To improve the effectiveness of exercise for MSK pain, various strategies to enhance adherence have been investigated, such as goal setting and automated reminders but with inconsistent results¹³.

Three recent systematic reviews of measures of exercise and self-management methods for MSK pain^{14,15,16}, found that measures of exercise adherence currently used within randomised controlled trials are highly variable (including questionnaires, diaries and class registers), lack evidence of a robust or considered development process, and demonstrate inadequate psychometric properties for reliability and validity. There is no existing measure of adherence that is fit for purpose^{14,15,16}. A valid and reliable measurement tool for adherence to TE for MSK pain is therefore required to enable interpretation of results from exercise trials and to robustly test the effectiveness of interventions intended to improve exercise adherence¹³⁻¹⁶.

To develop a measurement tool, the concept of interest must first be understood¹⁷ as the adequacy of an instrument will depend upon the conceptual framework from which it is developed¹⁸. However, exercise adherence is a multi-dimensional construct¹⁹, which is poorly defined¹⁶, with multiple synonyms used in the published literature to describe its meaning, such as: compliance, concordance, agreement, cooperation, partnership and therapeutic alliance²⁰. These terms are regularly used interchangeably, although arguably were originally intended to convey different meanings. Compliance and adherence both refer to the patient-healthcare practitioner (HCP) interaction, but adherence is viewed as reflecting a less paternalistic relationship, with the patient as an active decision maker rather than passive recipient. Similarly, concordance is seen to better reflect the creation of a therapeutic alliance between the patient and HCP²¹. A common definition of

adherence used in the healthcare literature is that created by Sackett and Haynes in 1976^{20,22}, with the following modified iteration published in the World Health Organisation's (WHO) Adherence Project (2003)²³: "the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider". This definition was not specifically developed for MSK pain or TE, nor does it provide any guidance for operationalising the measurement of adherence in this context.

Therefore, to inform the development of a new measurement tool, this review aims to establish the dimensions of adherence to TE for MSK pain in adults reported in the published literature. The dimensions of adherence to TE among adolescents and children may be different to adults and warrants separate investigation. In this review, we use the term 'dimension' to refer to any single element that contributes towards the concept of adherence. In order to establish relevant dimensions of adherence, our objectives were: 1. Identify specific definitions of adherence used in the context of TE for MSK pain; 2. Identify the parameters used to assess TE adherence (where a parameter is a measurable aspect of adherence); 3. Identify the methods used to measure TE adherence; 4. Identify values used to classify satisfactory TE adherence.

METHODS

Search strategy

To maximise the sensitivity of the search, three separate search strings were combined, including terms for MSK pain, therapeutic exercise, and adherence. The search strategy was adapted from a Cochrane review of interventions to improve adherence to exercise for chronic MSK pain in adults¹³. The adherence terms were limited to the title only to restrict the search to studies in which adherence was the primary focus. A pilot search was conducted to refine the focus of the strategy while maintaining sufficient sensitivity to identify key studies already known to the authors. The review was not registered a priori.

Data sources

Seven databases were searched from inception to December 2016 using the OvidSP and EBSCO interfaces: MEDLINE, AMED, EMBASE, PsychINFO, HMIC, CINAHL and SPORTDiscus. The Cochrane Database of Systematic Reviews was also searched and free text searching using Google Scholar was carried out. The reference lists of included studies were checked, and Web of Science was searched for papers that had cited included studies to identify further titles that may have met the inclusion criteria. Identified titles and abstracts, then subsequent full texts were screened by pairs of

researchers (DB, AB, MH, JQ) independently, and any conflicts were arbitrated by an additional researcher (NF).

Studies were eligible if they featured all of the following:

1. A definition of exercise adherence - either an explicit definition such as a quote or citation, or a description of how exercise adherence was or should be measured.
2. Adults with MSK pain - including back, neck, hip, knee, ankle, foot, shoulder, elbow, wrist or hand pain, MSK conditions with wider systemic effects such as fibromyalgia and rheumatoid arthritis, post-surgical pain patients where the surgery was for a MSK condition, individuals with a non-specific diagnosis of MSK pain, and those with a specific diagnosis (e.g. OA or adhesive capsulitis) with or without supporting imaging or other diagnostic test results.
3. Therapeutic exercise - defined as any form of supervised or unsupervised exercise or physical activity specifically provided to patients to treat their MSK pain condition. Any type of exercise was included, such as strengthening, stretching, aerobic or mixed, and exercise delivered by an HCP, trained lay representative, fitness instructor, or delivered as part of a multi-disciplinary package of care. All study types were eligible, not just those where therapeutic exercise was being assessed as an intervention.

Studies were excluded if they:

1. Were not published in English.
2. Comprised conference proceedings where only the abstract has been published.
3. Involved exercise for a non-MSK pain condition, such as cancer, falls prevention, stroke or cardiac rehabilitation.
4. Included participants under 18 years.
5. Included participants with no MSK pain.

Data extraction

Data were extracted independently by two researchers using customised forms. Extracted data were compared for inconsistencies and any corrections made following discussion by the researchers. A third researcher was consulted if needed. We extracted: details of the study (design, country, setting), participant details (age, sample size, population, inclusion/exclusion criteria, MSK pain condition), the TE intervention (type, dosage, adherence measure time-point, exercise prescriber, supervised or unsupervised exercise), definitions of adherence (quotes or citations were extracted verbatim), the parameters of exercise adherence assessed (e.g. number of repetitions, attendances or intensity of exercise), methods used for measuring adherence (e.g. class register or self-report diary), and quantification or values assigned to adherence (e.g. number of exercises that

should be completed to be classed as adherent). Systematic reviews and protocols were included if they met the above criteria as it was possible they could include information about how adherence is defined. However, only data on the definition of adherence was extracted from systematic reviews to avoid the over-representation of studies that may have been included in a systematic review as primary research in this review.

Analysis

Data from included studies were summarised in tables. Terms used for describing parameters and measurement methods were standardised and frequency and percentage counts applied. Values for quantification of adherence were standardised by converting to percentages for ease of comparison and grouped according to commonly observed ranges. We did not formally assess the risk of bias since the methodological quality of included studies would not have influenced the utility or relevance of the data that were extracted for the purposes of this systematic review.

RESULTS

We identified 459 references, which reduced to 199 following screening of titles and abstracts. Finally, 86 studies met the inclusion criteria and were included in the review (Figure 1).

Characteristics of included studies

Included studies were published between 1976 and 2016 and originated from 20 different countries (Table 1). Sixteen different study types were included and hospital outpatients was the most common study setting (n=31). Seventeen different categories of MSK pain conditions featured, most commonly back and/or neck pain (n=30). The type of TE could be broadly grouped as: strengthening, stretching, aerobic, postural or mind-body exercise²⁴ (e.g. yoga), with strengthening (n=43) and stretching (n=35) being the most common. The time-point at which exercise adherence was measured in the studies varied from 1 week to 5 years.

Definitions of exercise adherence

Adherence data findings extracted from included studies are shown in appendix 2. Sixty per cent of studies (n=52) did not provide a clearly specified definition of adherence. Most studies defined adherence by describing the parameters by which it had been assessed (n=73, 85% of 86).

Thirty-four studies (40%) provided at least one clearly specified definition, the most common of which are shown in Table 2. Five studies provided definitions that were the authors' own or were uncited. Frost et al. (2016)²⁵ provided their own definition in addition to that of the WHO. Their

definition, “the extent to which individuals undertake prescribed behaviour accurately and at the agreed frequency, intensity and duration” was based on the four parameters of adherence they believed characterised rehabilitation prescriptions, namely: frequency, duration, intensity and accuracy.

Table 2. Definitions of adherence used in studies

Definition and source	Studies citing definition
“The extent to which a person’s behaviour – taking medications, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider”. (WHO 2003)	Beinart et al. (2013) Ezzar et al. (2014) Hall et al. (2014) Holden et al. (2014) Frost et al. (2016) Jack et al. (2010) Jordan et al. (2010) Pisters et al. (2010) Thompson et al. (2016) Van Koppen et al. (2016)
“The extent to which the patient’s behaviour (in terms of taking medications, following diets or executing other lifestyle changes) coincides with the clinical prescription”. (Sacket and Haynes 1976)	Alexandre et al. (2002) Brus et al. (1997) Brus et al. (1998) Ferguson and Bole (1979) Hammer et al. (2007) Medina-Mirapeix et al. (2009) Robinson et al. (2004) Schneider et al. (1998) Wig et al. (2004)
“Adherence is defined by the active cooperation and the attitude of the patient during the therapy session and during home exercise execution”. “The term adherence refers to the extent to which patients follow the instructions of their healthcare providers”. “Adherence is defined as the extent to which the patient undertakes the clinic-based and home-based prescribed components of the physiotherapy programme”. (all attributed to Meichenbaum and Turk 1987)	Hugli et al. (2014) Huyser et al. (1997) Mannion et al. (2009)
“Where adherence implies active voluntary involvement in the planning and implementation of the treatment and is defined as the extent to which the patient undertakes the clinic-based and home-based prescribed components of the physiotherapy programme.” “Adherence, which denotes a more contemporary approach to decision making in which the client or patient is an active and equal partner with the health professional.” (both attributed to Carr 2001)	Mannion et al. (2009) Marks and Allegrante (2005)

Parameters used to assess exercise adherence

Frequency of exercise completion was the most commonly used parameter to assess adherence (n=47, 55%) (Table 3). Frequency was measured in different ways, including: exercise repetitions,

sets, or blocks of exercise time, and over different time-frames (e.g. exercises per day, week or month).

Behavioural parameters were measured to assess adherence in 16 studies (19% of 86). These included HCP assessed elements such as ‘following guidance’ and ‘receptivity to change’, as featured in the Sports Injury Rehabilitation Scale (SIRAS)¹⁹, and self-reported elements such as ‘barriers to exercise’. Session attendance, which required the patient to be present at a supervised exercise session, was assessed in 22 (26%) studies. This was slightly different to ‘session completion’ assessed in 11 (13%) studies, which was a self-reported or HCP observed completion of recommended exercises during an exercise session.

Exercise exertion or intensity was assessed in 13 studies (15%), subjectively in eight (9%) and objectively in five (6%). Seven studies (8%) assessed a parameter reflecting the quality of the patients’ replication of the recommended exercises, which was determined via HCP observation.

Table 3. Number of studies describing parameters used to assess TE adherence

Parameter of TE adherence measured	Number of studies using parameter (%)
Exercise frequency	47 (55%)
Session attendance	22 (26%)
Behavioural component	16 (19%)
Exercise time	15 (17%)
Sessions completed	11 (13%)
Exercise exertion (subjective measure)	8 (9%)
Exercise replication	7 (8%)
Exercise intensity (objective measure)	5 (6%)

(NB. Some studies described more than one parameter, hence totals do not sum to 100%)

Methods used to measure adherence

Of the 86 included studies, 74 (86%) described at least one method of measuring adherence. The most common measurement methods were self-report exercise logs (n=44, 51%), registers of

attendance (n=18, 21%) and an existing measurement scale (n=15, 17%). Thirty-three studies (38%) used more than one type of measurement method. Six studies used an objective measure of exercise adherence (e.g. pedometer) (Table 4). Within the category of ‘existing measurement scales’, 12 different measures of exercise adherence were identified. These included the SIRAS¹⁹, General Adherence Scale (GAS)²⁶ and Adherence to Physiotherapists Recommendation Scale (APRS)²⁷.

Table 4. Number of studies describing a method of measuring TE adherence

Measurement method	Number of studies using method (%)
Self-report exercise log	44 (51%)
Class register	18 (21%)
Existing measurement scale	15 (17%)
Healthcare practitioner observation	11 (13%)
Self-developed questions	12 (14%)
Objective measure	6 (7%)
Interview	6 (7%)

(NB. Some studies described more than one method, hence totals do not sum to 100%).

Values for adherence

Half of the studies (n=44, 51%) did not provide information about what they considered to be a satisfactory value for TE adherence. Forty-two of the studies (49%) described values indicating ‘satisfactory’ TE adherence (Table 4). These were grouped into four ranges as shown in Table 5 . The most common range of values for satisfactory adherence was between 80-99% completion of the prescribed exercise/s. Six studies (7%) provided values specifically describing ‘low adherence’. These varied between 0-79% completion of the recommended exercises. It was unclear in many of the studies whether cut-off points for satisfactory adherence were determined *a priori* or *post hoc*, as they were not described in the methods. Where cut-off points were stated, no references to required therapeutic dosages or other guidelines were mentioned. Some studies used the distribution of participants’ adherence data to assign a value of satisfactory adherence. For example, Granlund et al. (1998)²⁸ used the median value of participants’ adherence results to

dichotomise them into adherent or non-adherent groups, whereas Van Gool et al. (2005)²⁹ ordered the participants according to their adherence results, then divided them into three equally sized groups described as ‘low’, ‘intermediate’ or ‘high’ adherence.

Table 5. Number of studies stating values for satisfactory TE adherence

Value for satisfactory adherence	Number of studies using this level
100% of recommended dose	8 (9%)
80-99% of recommended dose	15 (17%)
60-79% of recommended dose	9 (10%)
14-59% of recommended dose	10 (12%)
No value given	44 (51%)

DISCUSSION

We aimed to establish the dimensions of adherence to TE for MSK pain, in other words, all information reported in relevant published literature that contributes towards the concept or meaning of adherence. This was achieved by identifying: specific definitions of TE adherence; the parameters used to assess TE adherence; the methods used to measure TE adherence and values for satisfactory adherence. We included studies from a wide range of countries featuring various methodologies, settings, MSK pain conditions, and TE interventions. Most commonly, study authors did not state a definition of TE adherence, even when this was a focus of their study. Where a definition was stated, most originated from the work of Sackett and Haynes (1976)²².

Exercise frequency was the most common parameter by which TE adherence was assessed, although it was commonly combined with other parameters. A variety of methods of TE adherence measurement were reported. A self-report exercise log was the most frequently used method, although the structure and implementation of these methods varied between studies. Most studies did not define what was considered a satisfactory level of adherence, however 80-99% completion of the recommended exercises was most frequently used as a surrogate of satisfactory adherence.

Definitions of adherence

Most studies did not state a definition of adherence. This may be because a definition of adherence that is explicitly related to adherence to TE does not exist. Alternatively, it might be that the meaning of adherence is so clear, having undergone so little development between the 1976 version by Sackett and Haynes to the 2003 version from the WHO, that there is an assumption that the term is tacitly understood among research and clinical communities. However, the lack of an agreed communicable definition of adherence is a problem, because without a clear picture of what adherence is, HCPs and patients cannot work together to achieve adherence as a shared goal, nor measure or monitor its variability.

The original definition by Sackett and Haynes (1976)²² used the term 'compliance' not 'adherence', and concerns therapeutic regimens generally, not specifically MSK pain or TE. While the more recent WHO iteration of this definition (2003)²³ uses the term 'adherence', to better reflect the autonomy of the patient and his/her role as an 'active partner' in the treatment process, it was developed by groups of experts focussing on adherence issues relating to chronic health conditions other than MSK pain (including hypertension, epilepsy, HIV and tuberculosis). Consequently, pharmacological intervention was the main treatment of concern for both these definitions, but it is not clear whether adherence to TE can be defined in the same way. These possible differences may explain why the WHO definition (2003)²³ has not been universally applied to TE for MSK pain. The WHO definition lacks specificity, providing no indication of the parameters of treatment adherence that should be assessed, how they should be measured, or what levels of adherence should be expected. This ambiguity means definitions can be interpreted differently, as shown by this review, where several interpretations of a single definition were associated with authors using different parameters, measurement methods and cut-offs.

It has been proposed that the term compliance should be used in efficacy trials where the intervention has been determined according to the desired outcome and target population, but not necessarily the individual patient or recipient³⁰. Adherence on the other hand, is proposed to reflect the effectiveness of TE in trials or real-life contexts³⁰. Adherence considers the individual's role in interpreting the appropriateness of the advised intervention and the influences upon their behaviour and motivation, such as the environment, society, previous experience, knowledge, symptoms, and resources. Adherence is a more complex measurement than simply comparing to a reference standard intervention dose³⁰. Until the message we are trying to convey with these terms is clarified by all those to whom it pertains, including patients, the uptake of existing definitions may remain inconsistent in MSK pain and TE literature.

The definition of adherence provided by Frost et al. (2016)²⁵ is specific to TE for MSK pain and identified the parameters of TE adherence that should be measured: frequency, duration, intensity, and accuracy. However, its development was based on stroke rehabilitation³¹, public health³², falls prevention³³ and the use of exercise sheets in physiotherapy,³⁴ not literature focussing specifically on TE prescription for MSK pain. Therefore, it is possible that the definition does not reflect the perceptions of patients with MSK pain or HCPs responsible for prescribing TE. While Frost et al. (2016)²⁵ offer the first operational definition of TE adherence, its four parameters are different to those identified as most commonly used in this review. Therefore, the concept of adherence to TE for MSK pain may require further refinement before the development of a new measure of adherence.

Parameters of adherence

We identified 8 categories of TE adherence parameters (measurable aspects of adherence). The most common was exercise frequency, a finding consistent with other reviews, suggesting it is a relevant dimension of TE adherence, or simply an easy parameter to measure. However, even exercise frequency was assessed in various ways (e.g. repetitions or blocks of time, per day or week), suggesting it is more complex than a simple representation of the total TE undertaken.

The accuracy with which patients replicated their exercises, or the quality of their exercise performance was included as a parameter in 7 studies. The scant attention paid to accuracy or quality of performance may be because it is not an important dimension of TE adherence, or that it is too challenging to incorporate into research, despite being a common parameter of adherence to assess in clinical practice¹⁵. HCP observation has been recommended in the assessment of TE adherence³⁵ and is a feature of one of the more commonly used measures: the SIRAS³⁶. For research purposes, the constraint of requiring an observer and its associated cost implications may be why these parameters have not been regularly assessed. While technology may be able to objectively measure certain parameters of TE³⁷, the expense of such equipment, the expertise required to operate it and the number of sensors required to measure more complex TE interventions, may limit its implementation³⁸. The acceptability of the equipment by patients may also limit its effectiveness as a measurement tool, as patients may not adhere to using the measurement device, despite adhering to the TE intervention. Natural adherence behaviour may also be affected by overt monitoring, such as wearing a measurement device, although similar changes may also be associated with subjective measurement methods.

Behavioural components featured in 16 studies, two of which, used self-reported barriers to exercise completion as a parameter of adherence^{39, 40}. This is an uncommon approach, as barriers are

normally seen as modifiers of adherence levels. However, poor treatment adherence has been associated with a greater perceived number of barriers⁴¹ indicating a potential role for barriers in the assessment of adherence. Some studies identified single parameters of TE adherence, whereas other studies identified combinations of parameters (e.g. exercise frequency and session attendance), without justification. These findings suggest there are multiple relevant parameters of adherence to TE, but no consensus as to their importance or relevance to a specific context. This may relate to non-specific definitions such as the WHO's focus on pharmacological interventions, whereas TE prescription may potentially have more parameters contributing to adherence, such as: frequency, intensity, time, accuracy or a behavioural component, which require different methods for their measurement.

Methods of measuring adherence

Multiple methods of measuring exercise adherence were identified, including self-report exercise logs, class registers and existing measurement scales, mirroring the findings from recent systematic reviews^{14,15,16}. However, different measurement methods were used across studies for the same adherence parameter. For example, the parameter of session attendance was measured using a class register, interview and self-report log. Such variation is understandable given the multiple parameters of adherence and the non-specific guidance provided by the WHO's adherence report²³, which suggests, "a multi-method approach combining self-reporting and objective measures". However, the lack of a single valid and reliable measurement tool of TE adherence means that the relative effectiveness of interventions is difficult to compare across studies^{13,14,15,16}.

There was large variability in time points at which adherence was measured, varying from 1 week to 5 years. As adherence is likely to change over time¹³, the point at which adherence is measured could substantially influence the rates of adherence observed. To improve the comparability of data, it may be useful to establish adherence measurement timescales (e.g. short, medium and long-term). There should also be improved clarity in the reporting of adherence measurement timing (e.g. whether measurements took place daily, weekly or monthly), and for studies where there are multiple deliveries of the TE intervention (e.g. weekly exercise classes), the time interval between the TE delivery and the adherence measurement.

Values of adherence

Fewer than half of included studies (49%) defined satisfactory adherence. Two approaches were used, either a pre-determined cut-off or a distribution method. Distribution-based methods result in the adherence of an individual being judged relative to the performance of other study participants, rather than any pre-determined target level of adherence. This explains why satisfactory adherence

levels ranged from 14-100% completion of prescribed exercises in this review. Only one study, Hammer et al. (2007)⁴² used pre-determined adherence categories justified from the literature.⁴³ However, the original source provides no explanation of how these categories were derived. In our review, satisfactory adherence was most commonly valued between 80-99% completion of the prescribed exercises (n=15, 17%). Furthermore, several studies described low adherence, providing ranges of prescribed exercise completion between 0 and 79%. This may suggest that 80% could be a reasonable threshold for satisfactory adherence.

If specific TE doses are unknown, it may be inappropriate and unhelpful to set arbitrary adherence cut-off points for TE interventions for MSK pain. A systematic review and meta-analysis of medication adherence showed that good adherence to placebo medication was associated with lower mortality, a so called 'healthy adherer' effect⁴⁴. Therefore, it may be beneficial for a patient to identify as adherent, even in the absence of a known therapeutic dosage. Identifying an MSK patient as non-adherent when the therapeutic dosage of TE is unknown, may deny the patient the benefits of the healthy adherer effect.

Research and clinical Implications

There is a need to focus on establishing a clear definition of adherence specifically relating to TE for MSK pain, and the best way to measure adherence. Patients must be involved as active, collaborative partners in future research so that the resulting construct of exercise adherence incorporates their views⁴⁵. In the absence of a valid, reliable and acceptable measure of TE adherence for MSK pain, the interpretation of results from trials investigating TE interventions or methods for improving TE adherence may be questioned. This underscores the importance of agreeing upon a satisfactory measure/s. From the clinician's perspective, if he or she cannot be sure of how to accurately define and measure adherence, it may be difficult to determine whether a patient's lack of progress despite treatment is due to inadequate engagement or ineffective treatment.

Limitations

We adopted an inclusive approach using a modified versions of an established Cochrane search strategy to include all study types and MSK pain conditions, however, it is possible that some studies relating to adherence to TE for MSK conditions may have been missed. To minimise error and bias, two independent reviewers assessed both title and abstract and full text papers for inclusion and data extraction. The search terms were limited to title, or title and abstract. Restricting the search in this way, ensured that the included studies were specifically focused on adherence in the context of TE for MSK pain and therefore more likely to be appropriate to this review. It is possible that some

relevant studies may have been missed that did not feature adherence in their title. However, different search strategies were piloted to achieve results with a focus on adherence while maintaining acceptable sensitivity.

Since a definition of adherence was not provided in the majority of included studies despite their title featuring a term for adherence, it is unlikely that articles not featuring an adherence term in their title would discuss the concept in any detail. Equally, the majority of definitions used were from the same source, and it is unlikely that this would change if more articles were reviewed. Six studies were excluded as they were not published in English. Consequently, our review is at risk of language bias, and the results may under-represent studies that are not published in English. The countries of origin of the excluded studies were still represented in the final 86 included studies. No low-income countries were studied. Therefore, our findings may only be generalisable to high income countries and their cultures.

CONCLUSION

Most studies did not state a definition of adherence. Definitions most commonly used in the context of TE for MSK pain were not developed specifically for TE or MSK pain, and did not describe the context specific dimensions of this concept. The variability of the parameters of adherence assessed, the wide variety of measurement methods used, and the seemingly arbitrary nature of determining values for satisfactory adherence, lack sufficient consistency and detail as to inform a definition of adherence or the required content of a suitable measure.

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SUMMARY

- Patients' adherence to therapeutic exercise prescribed for MSK pain is important for outcomes.
- The most commonly used definition of adherence was not developed specifically for MSK pain and lacks detail on the important dimensions or cut-point from which to determine satisfactory adherence.
- The meaning of adherence in the context of therapeutic exercise for MSK pain is unclear and should be conceptualised by relevant stakeholders.

