


BMJ Open Use of the nominal group technique to identify UK stakeholder views of the measures and domains used in the assessment of therapeutic exercise adherence for patients with musculoskeletal disorders

Ross Mallett ,¹ Sionnadh McLean,¹ Melanie A Holden,² Tanzila Potia,¹ Melanie Gee,³ Kirstie Haywood⁴

To cite: Mallett R, McLean S, Holden MA, *et al*. Use of the nominal group technique to identify UK stakeholder views of the measures and domains used in the assessment of therapeutic exercise adherence for patients with musculoskeletal disorders. *BMJ Open* 2020;**10**:e031591. doi:10.1136/bmjopen-2019-031591

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-031591>).

Received 13 May 2019
Revised 22 November 2019
Accepted 10 January 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Ross Mallett;
Ross.Mallett@shu.ac.uk

ABSTRACT

Objectives The objective was to undertake nominal group technique (NGT) to evaluate current exercise adherence measures and isolated domains to develop stakeholder consensus on the domains to include in the measurement of therapeutic exercise adherence for patients with musculoskeletal disorders.

Design A 1-day NGT workshop was convened. Six exercise adherence measures were presented to the group that were identified in our recent systematic review. Discussions considered these measures and isolated domains of exercise adherence. Following discussions, consensus voting identified stakeholder agreement on the suitability of the six offered adherence measures and the inclusion of isolated domains of exercise adherence in future measurement.

Setting One stakeholder NGT workshop held in Sheffield, UK.

Participants Key stakeholders from the UK were invited to participate from four identified populations. 14 participants represented patients, clinicians, researchers and service managers.

Results All six exercise adherence measures were deemed not appropriate for use in clinical research or routine practice with no measure reaching 70% group agreement for suitability, relevance, acceptability or appropriateness. Three measures were deemed feasible to use in clinical practice. 25 constructs of exercise adherence did reach consensus threshold and were supported to be included as domains in the future measurement of exercise adherence.

Conclusion A mixed UK-based stakeholder group felt these six measures of exercise adherence were unacceptable. Differences in opinion within the stakeholder group highlighted the lack of consensus as to what should be measured, the type of assessment that is required and whose perspective should be sought when assessing exercise adherence. Previously unused domains may be needed alongside current ones, from both a clinician's and patient's perspective, to gain understanding and to inform future measurement development. Further

Strengths and limitations of this study

- This is first UK-based patient-centred nominal group technique (NGT) workshop to investigate measures of therapeutic exercise adherence for patients with musculoskeletal disorders.
- The domains included for stakeholder consensus were derived from a recent robust systematic review of adherence measures.
- Participants were included in preworkshop dialogue to recognise their understanding of the topic area and to design the workshop to account for the discrepancy in mixed stakeholder knowledge and perceptions.
- The number of NGT workshop participants is a possible limitation, although agreement about what constitutes an optimum group size could not be found.
- Findings will need to be substantiated with similar mixed stakeholder groups in various socioeconomic and cultural populations alongside others' work to further conceptualise exercise adherence.

conceptualisation of exercise adherence is required from similar mixed stakeholder groups in various socioeconomic and cultural populations.

INTRODUCTION

Within the UK population, the prevalence of musculoskeletal disorders (MSDs) is estimated to be 38%.¹ Prevalence increases markedly with age¹ and is likely to continue to rise due to the ageing population and increasingly sedentary lifestyles.^{2,3} MSDs cause more functional limitations than any other group of disorders within the adult population and lead to vast healthcare expenditure and loss of work.⁴ Therapeutic exercise is commonly

recommended for the management of MSDs and may include strength and conditioning, aerobic exercise and functional activities.⁵ Adherence to therapeutic treatment, defined as 'the extent to which a person's behaviour corresponds with agreed recommendations from a health-care provider',⁶ has been shown to enhance the effectiveness of exercise programmes^{6,7} and to impede recurrent, persistent or disabling conditions.^{8,9} Conversely, non-adherence may be a missed opportunity for therapeutic benefit and may negatively affect treatment duration, the therapeutic relationship, waiting times, cost of care and may be responsible for non-significant research outcomes.¹⁰⁻¹³

Systematic reviews consistently show the beneficial effects of different types of exercise on key clinical outcomes, such as pain, physical function and quality of life,¹⁴⁻¹⁶ leading to clinical guidelines that advocate the use of exercise programmes to manage MSDs.^{17,18} Despite its importance, adherence to clinic-based exercise protocols is approximately 50%^{19,20} and is often lower for unsupervised home exercise programmes.^{21,22} Interventions exist that may potentially improve exercise adherence for MSDs.^{5,23-25} Although supportive evidence exists for the use of therapeutic exercise across many MSD conditions, no gold standard measure of exercise adherence currently exists,²⁶⁻²⁸ with many measures being unreproducible or exhibiting limited evidence of essential measurement and practical properties.²⁹⁻³¹

Our own recent systematic review³⁰ identified 238 different measures of exercise adherence in musculoskeletal settings. Of these, only six measures (Sports Injury Rehabilitation Adherence Scale (SIRAS), Rehabilitation Adherence Questionnaire (modified), Adherence to Exercise Scale for Older Patients, Hopkins Rehabilitation Engagement Rating Scale (HRERS), Community Healthy Activities Model Programme for Seniors and Pittsburgh Rehabilitation Participation Scale (PRPS)) had been evaluated, by 11 studies, for the specific purpose of measuring exercise adherence. The review concluded that there was inadequate evidence of theoretical, measurement or practical properties for any of the measures. The absence of evidence does not preclude the use of these measures, and further evaluation may still indicate that they are suitable measures of exercise adherence. Consequently, the primary aim of this study was to use the NGT with a mixed stakeholder group to discuss and rank the six measures of exercise adherence to reach consensus on their suitability for use in a variety of settings. A secondary aim was to reach a similar consensus by discussing and ranking which domains of exercise adherence should be included in future measures.

METHODS

A 1-day workshop brought together key stakeholders to discuss how adherence to therapeutic exercise for MSD should be assessed, specifically, the suitability of six exercise measures for use in research and clinical practice

settings (study protocol available³²). Therapeutic exercise was defined as 'the systematic performance or execution of planned physical movements, postures, or activities intended to enable the patients to remediate or prevent impairments, enhance function, reduce risk, optimise overall health, and enhance fitness and well-being'.³³

Nominal group technique (NGT) has been used to derive consensus by collating and ranking stakeholder views through its structured anonymous approach within face-to-face group meetings.^{34,35} The flexible methodology provides predetermined stages to develop participants' responses, therefore quickly representing a mixed group on complex issues by prioritising their perspectives.³⁶ A modified NGT was employed to reach stakeholder consensus regarding two questions:

1. How suitable are the six candidate measures of exercise adherence with respect to
 - ▶ Relevance (to their individual perspective)?
 - ▶ Feasibility (for use in research and/or clinical practice settings)?
 - ▶ Acceptability (to patients who are required to adhere to exercise regimes)?
 - ▶ Appropriateness (to the musculoskeletal population)?
2. Which domains should be included in future measures of exercise adherence?

Using existing professional networks, the study targeted four key stakeholder groups (patients, clinicians, researchers and service managers) within the UK. A formal electronic invitation to participate in the NGT workshop was sent to potential participants within all groups. The email included an information sheet detailing the study goals and research questions and offered the opportunity to ask questions about the study. Those who were willing and able to attend the workshop signed and returned a consent form. Prior to attending, participants received a further information pack summarising the results of our previous systematic review, a questionnaire, a copy of the six candidate measures and a list of the exercise adherence domains contained within these measures. The domains were extracted from the candidate measures by one author (RM) and peer reviewed by a second (SM). The questionnaire asked participants to rate each of the six candidate measures of exercise adherence for use in research/clinical practice and the relative importance of including each domain of exercise adherence contained. Respondents were also asked to add comments and to rate any additional domains that they felt were important but missing. Completed questionnaires were returned in advance of the workshop to inform the structure of the discussions (results not reported).

The 5-hour workshop was held in one room within a university environment in Sheffield, UK. First, an overview of the systematic review and a summary of the findings of the postal questionnaires were provided. Participants were assigned to two discussion groups: lay representatives (n=6) and all other participants (n=8). Members of the research team (SM, RM, MAH and KH) facilitated the group discussions. Two rounds of discussion focused

first on the candidate six measures then second on the isolated domains of exercise adherence. Throughout this second round, an iterative process was employed during discussions to reword suggested domains until agreement from the wider group was reached that the domain warranted consensus voting. Each round was concluded by a group spokesperson summarising their dialogue to all stakeholders, then finally a plenary semi-structured session was held before undertaking the final consensus voting.

Each round of voting asked one question that required a dichotomous yes/no response for the measure or domain being considered. All questions were mandatory. The voting was conducted anonymously and digitally on hand-held tablet devices using Google Forms to request and record responses in real time. Following the first round of discussion regarding the candidate six measures participants were asked, 'Are the following measures (1) relevant, (2) feasible, (3) acceptable, (4) appropriate or (5) overall suitable when assessing adherence to therapeutic exercise programmes?' Following the second round of domain discussion, the question posed was 'Should the following adherence domain be included in future measures of exercise adherence?' For all, voting a response was required for using the measure or domain in clinical trials and routine clinical practice. A final summary session was convened and the results of voting were fed-back to participants. The Standards for Reporting Qualitative Research checklist was used when writing this report.³⁷

Patient and public involvement

This research was developed and conducted in line with the INVOLVE framework.³⁸ The proposed aims, design and methods of this research proposal were informed by discussion with the Barnsley Consumer Research Advisory Group (CRAG) and the Allied Health Professionals special interest groups of the South Yorkshire Collaborative Local Research Network. Both groups agreed that the project would be valuable considering the scale of non-adherence to exercise for MSDs within physiotherapy practice. Several recommendations from the Barnsley CRAG group shaped the development and conduct of the project to facilitate the involvement of patient participants.

Data analysis

Voting responses were captured by Google Forms and automatically populated into electronic spreadsheets. Data were analysed separately for each required response using Microsoft Excel V.16. The data were ranked in percentage agreement of 'yes' responses for all participants for each required response regarding the measure or domain. Consensus was defined as 70% participant agreement level in keeping with criterion for consensus recommendations.^{39 40}

RESULTS

Fourteen participants consented to participate in the workshop, including lay representatives with experience of receiving exercise for an MSDr (n=6), clinicians who use therapeutic exercise for treating MSDs (n=3), researchers with expertise of exercise adherence or measurement (n=2) and service managers with accountability for musculoskeletal outpatient departments (n=3). All participants completed and returned the postal questionnaire, attended the consensus workshop and completed electronic consensus voting.

NGT: candidate exercise adherence measures

Three measures were deemed feasible to use with a consensus of greater than 70% being reached for completion of the SIRAS, HRERS and PRPS in routine clinical practice but not clinical trials. No other measure reached the consensus threshold for any other property of suitability (table 1). The results demonstrate that stakeholders almost unanimously agree that all measures lack the essential qualities of relevance, acceptability and appropriateness for application in all settings, and consequently, no measure is suitable for use in routine practice or clinical trials.

NGT: domains of exercise adherence

Nineteen exercise adherence domains were recognised and extracted from the six candidate measures and presented to the group alongside a further six proposed domains from the questionnaire. Following group discussion and domain development, four additional domains of exercise adherence that had not previously been used in existing measures were included alongside the existing 19 for consensus voting. Interpretation of the 23 domains highlighted two distinct categories of adherence domain: those which quantify the amount of exercise adherence and those which explored factors that influence exercise adherence and allowed some understanding of the patient experience. The second consensus vote was conducted using the distinguishing terms 'quantifying' and 'influencing' domains as judged by the research team for clarity.

Twelve of the 16 quantifying domains reached 70% or more consensus agreement (table 2), suggesting they should be included in the assessment of exercise adherence. Two were unanimously voted as important by all participants: the patient's perspective of both the amount and frequency of exercise completed and the accuracy of exercise completion. Stakeholders agreed that seeking perspective of calorie expenditure of a given exercise should not be included in the future measurement of exercise adherence. Thirteen of 30 influencing domains reached 70% or more consensus agreement (table 2), suggesting they should be included in the assessment of exercise adherence. Three were unanimously agreed as important: the patient's perception of their ability to complete exercise despite other commitments, their

**Table 1** Vote 1: result of nominal group technique stakeholder group consensus of six candidate measures' suitability for the assessment of exercise adherence

How suitable are the six candidate measures of exercise adherence with respect to	Relevance Yes (%)	Feasibility Yes (%)	Acceptability Yes (%)	Appropriateness Yes (%)	Overall suitability Yes (%)
HRERS in routine practice	7.1	85.7	7.1	7.1	14.3
HRERS in clinical trials	7.1	64.3	7.1	0.0	0.0
PRPS in routine practice	14.3	85.7	0.0	14.3	14.3
PRPS in clinical trials	7.1	50.0	7.1	0.0	0.0
RAQ in clinical trials	14.3	21.4	0.0	0.0	0.0
SIRAS in routine practice	14.3	85.7	7.1	7.1	7.1
SIRAS in clinical trials	7.1	64.3	14.3	0.0	0.0
AESOP in routine practice	0.0	7.1	0.0	0.0	0.0
AESOP in clinical trials	0.0	14.3	7.1	0.0	0.0
CHAMPS in routine practice	0.0	0.0	0.0	0.0	0.0
CHAMPS in clinical trials	0.0	21.4	0.0	0.0	0.0
RAQ in routine practice	7.1	0.0	0.0	0.0	0.0
RAQ in clinical trials	14.3	21.4	0.0	0.0	0.0

AESOP, Adherence to Exercise Scale for Older Patients; CHAMPS, Community Healthy Activities Model Programme for Seniors; HRERS, Hopkins Rehabilitation Engagement Rating Scale; PRPS, Pittsburgh Rehabilitation Participation Scale; RAQ, Rehabilitation Adherence Questionnaire (modified); SIRAS, Sports Injury Rehabilitation Adherence Scale.

understanding of the benefits of exercise and self-motivation of the patient during exercise.

DISCUSSION

As far as we are aware, this study describes the first consensus-based stakeholder evaluation of exercise adherence measurement for patients with musculoskeletal conditions. In the current study, multiple stakeholders, including patients, health professionals, researchers and service managers agreed that the six identified measures of exercise adherence were not suitable for use in routine practice or clinical trials due to their lack of relevance, acceptability and appropriateness. This is consistent with the findings of poor conceptual underpinnings in our and other earlier systematic reviews,^{29 31} which concluded that the evaluated exercise adherence measures in these reviews are of poor quality and are not fit for purpose. These reviews investigated exercise adherence measures for different purposes or environments and, coupled with our work, highlight the overall poor quality of these exercise adherence measures for all contexts and provide critical insight into the many failings of published measures of exercise adherence. However, we are aware that since this study was conducted, the Exercise Adherence Rating Scale (EARS) has been developed and preliminary testing of face and construct validity, internal consistency and reliability suggest that it is a promising new measure of exercise adherence in patients with MSK disorders.^{41 42} There remains a pressing need to prioritise further development of good quality measures that capture adherence to therapeutic exercise. Stakeholders agree that 25 of the

46 domains considered could make an important contribution to the measurement of exercise adherence. These domains sought to both quantify adherence to exercise (eg, the amount, frequency and accuracy of completed exercise) and to gain insight into the factors that influence adherence (eg, the patient's ability to complete exercise despite other commitments). This perspective is also supported by the recent research related to the development of the EARS.⁴²

Earlier qualitative work has highlighted differences in outcomes considered important by patients/carers versus health professionals,⁴³ and therefore a strength of this study was the inclusion of multiple stakeholders to provide different perspectives on adherence measures, the constituents of exercise adherence and how they should be assessed. The involvement of patients in the research process as research partners is increasingly viewed as enhancing the development and evaluation of relevant and acceptable patient-centred outcome assessment.⁴⁴ The variation in perspectives found in this study indicates the requirement for multiple stakeholder involvement in the future development of adherence measures which are suitable for use in research and clinical practice. An additional strength of the study was that measures and measurement domains considered by the stakeholder group were derived from a large rigorous systematic review³⁰ ensuring that at the time the most contemporary material has been presented for evaluation. It is recognised omissions exist as recently published work^{41 42} could not be included, although stakeholder proposed domains were added. The number of consensus

Table 2 Vote 2: ranked results of nominal group technique stakeholder group consensus of the inclusion of 'quantifying' and 'influencing' domains in the assessment of exercise adherence

Should the following quantifying domain be included in the future measurement of exercise adherence?	Yes (%)	No (%)
The amount and frequency of completed exercise (patient's perspective)	100.0	0.0
Accuracy of exercise completion (patient's perspective)*	100.0	0.0
The extent to which the patient follows a clinician's instructions (patient's perspective)	92.9	7.1
Attendance at rehabilitation sessions (clinician's perspective):	92.9	7.1
The extent to which the exercise works towards an agreed goal (patient's perspective)*	92.9	7.1
Accuracy of exercise completion (clinician's perspective)*	92.9	7.1
The amount and frequency of completed exercise (clinician's perspective)	85.7	14.3
The extent to which the patient follows a clinician's instructions (clinician's perspective)	85.7	14.3
Attendance at rehabilitation sessions (patient's perspective)	85.7	14.3
The extent to which the patient actively participates in exercise (patient's perspective)	85.7	14.3
The extent to which the exercise works towards an agreed goal (clinician's perspective)*	85.7	14.3
The extent to which the patient actively participates in exercise (clinician's perspective)	71.4	28.6
The signs of physical or mental demands during exercise (patient's perspective)	57.1	42.9
The signs of physical or mental demands during exercise (clinician's perspective)	42.9	57.1
Calorie expenditure of a given exercise (patient's perspective)	14.3	85.7
Calorie expenditure of a given exercise (clinician's perspective)	0.0	100.0
Should the following influencing domain be included in the future measurement of exercise adherence?		
The patient's ability to complete exercise despite other commitments (patient's perspective)*	100.0	0.0
The patient's understanding of the benefits of exercise (patient's perspective)	100.0	0.0
Patient/clinician agreement of exercise recommendations (patient's perspective)	100.0	0.0
Self-motivation of the patient during exercise (patient's perspective)	85.7	14.3
The patient's ability to complete exercise, although it is challenging (patient's perspective)	85.7	14.3
The patient's understanding of the benefits of exercise (clinician's perspective)	85.7	14.3
The patient's attitude toward exercise (patient's perspective):	85.7	14.3
Patient/clinician agreement of exercise recommendations (clinician's perspective)*	85.7	14.3
The level of patient support received from family and friends (patient's perspective)	78.6	21.4
The patient's ability to complete exercise despite other commitments (clinician's perspective)	78.6	21.4
The patient's ability to complete exercise although it is challenging (clinician's perspective)	78.6	21.4
The patient's attitude toward exercise (clinician's perspective)	71.4	28.6
The relationship between clinician and patient (patient's perspective)*	71.4	28.6
The patient's pain tolerance during exercise (patient's perspective)	64.3	35.7
Self-motivation of the patient during exercise (clinician's perspective)	64.3	35.7
The relationship between clinician and patient (clinician's perspective)*	64.3	35.7
The patient's pain tolerance during exercise (clinician's Perspective)	50.0	50.0
The patient's receptiveness to change in a therapeutic exercise programme (patient's perspective)	50.0	50.0
The extent to which the patient completes exercise without encouragement (clinician's perspective)	50.0	50.0
The patient's ability to resume exercise following a forced break (patient's perspective)	50.0	50.0
The patient's receptiveness to change in a therapeutic exercise programme (clinician's p)	42.9	57.1
The patient's enjoyment of exercise (patient's perspective)	42.9	57.1
The patient's ability to resume exercise following a forced break (clinician's perspective)	42.9	57.1
The level of patient support received from family and friends (clinician's perspective)	35.7	64.3
The extent to which the patient completes exercise without encouragement (patient's perspective)	35.7	64.3
The amount of prompting required to complete an exercise correctly (clinician's perspective)	21.4	78.6

Continued



Table 2 Continued

Should the following influencing domain be included in the future measurement of exercise adherence?

The suitability of the exercise environment for the patient's needs (patient's perspective)	21.4	78.6
The patient's enjoyment of exercise (clinician's perspective)	21.4	78.6
The amount of prompting required to complete an exercise correctly (patient's perspective)	14.3	85.7
The suitability of the exercise environment for the patient's needs (clinician's perspective)	14.3	85.7

Domains achieving the consensus threshold level of 70%+ are denoted in bold.

*Group developed domains.

group participants is a possible limitation, although agreement about what constitutes an optimum group size could not be found. Guidance on the appropriate mix of participants in a consensus workshop also does not exist; therefore, in line with advice received from our patient and public involvement group, the target sample was weighted to reflect the experiences and perspectives of patients.⁴⁵ The group was UK based, which may limit the generalisability of our findings to other settings. Understanding an international stakeholder's perspective of the components of exercise adherence is imperative if future measures are to be developed with global and cultural validity. It is also possible that the patient stakeholders who participated in this study might be considered adherent and therefore may not fully represent the views of non-adherent populations. Seeking the views of a non-adherent population would be ideal, although difficult to capture.

Further analysis of isolated voting patterns show simple quantification of exercise completion was viewed as important by all stakeholders but as insufficient by both physiotherapists and patient stakeholders. However, this view was not shared by researchers who indicated that simple quantification of adherence was the priority. The modified NGT was robust with workshop discussions not only reflecting domain development and voting patterns but also adding understanding throughout. Patient representatives alone would have reached consensus on 15 influencing domains as opposed to 10 by healthcare professionals indicating their belief of importance in understanding factors affecting adherence. This variance in perspectives points towards potential differences in the way that adherence instruments may be used within research and clinical practice. In clinical practice, understanding patient non-adherence and exploration of factors related to that non-adherence may inform a physiotherapist's reasoning and future management strategy to optimise therapeutic outcomes.

This study has identified that these six measures of adherence with therapeutic exercise lack validity, reliability and acceptability to clinicians, managers, patients and researchers and have to date been poorly conceptualised. There is a need for valid and reliable exercise adherence measures which are suitable and acceptable for use with musculoskeletal populations in both clinical and research settings. These findings do not provide

definitive domains for a new measure of exercise adherence, but they can form a foundation that may be evaluated alongside recent work by multiple stakeholders in international and varied socioeconomic settings in the future. It is evident that stakeholders were in unanimous agreement that to be acceptable, any measure should look at psychological and social determinants of adherence, not simple quantification of adherence. These contextual factors included cognitive factors (eg, the patient's understanding of the benefits of exercise and patient/clinician agreement of exercise recommendation), psychological factors (eg, self-motivation of the patient during exercise) and social factors (eg, the patient's ability to complete exercise despite other commitments and the level of patient support received from friends and family). This raises the prospect of an adherence profile which might consist of scales that (1) quantify adherence with therapeutic exercise and (2) measure important determinants of exercise adherence.

There is a significant shortfall between the way exercise adherence is currently assessed when compared against the emerging biopsychosocial conceptual framework described here. This study has confirmed the complex nature of exercise adherence; it is a construct with both observable and non-observable components. Consensus suggests that it can, and should, be understood from the perspective of several key stakeholders; the clinician, the researcher and the patient. However, adherence to exercise has not been clearly defined from the perspective of any of these stakeholders, and hence the conceptual underpinning which provides an essential framework for measurement is not available. The first step in the development of any future measure of adherence must be to establish or adapt recognised conceptual models and theoretical frameworks⁴² to the related domains within the concept of exercise adherence for MSDs.⁴⁶ Development of the conceptual model and framework will be required to address a wide range of issues, including the multifaceted nature of adherence, the focus of the measure (eg, evaluation, categorisation and prognostication) and issues of cross-cultural validity if the measure were to be applied across international settings. A patient-centred collaborative approach towards developing a measure of exercise adherence is essential to enable the true burden of exercise adherence to be described and the relative success of healthcare which seeks to prescribe exercise to be comprehensively understood.⁴⁷

CONCLUSION

At the time of undertaking, six measures of exercise adherence were available for incorporation within this study. Participants in the first UK-based patient-centred and NGT workshop unanimously rejected all six measures due to a perceived lack of suitability for routine practice or clinical trials. Exercise adherence must be clearly conceptualised to facilitate appropriate and robust assessment. Stakeholders in this study agreed on 25 domains of exercise adherence as a possible foundation for further research to develop a measure of adherence with therapeutic exercise. These domains indicate the possible requirement of an adherence profile which (1) quantifies adherence with therapeutic exercise and (2) measures important determinants of exercise adherence. Multiple stakeholders will need to take a patient-centred collaborative approach to develop any measure of exercise adherence that is of high quality, relevant and appropriate for universal use in routine clinical practice and/or clinical trials.

Author affiliations

¹College of Health, Wellbeing and Life Sciences, Sheffield Hallam University, Sheffield, UK

²Primary Care Centre Versus Arthritis, Keele University, Keele, UK

³Centre for Health and Social Care Research, Sheffield Hallam University, Sheffield, UK

⁴Warwick Research in Nursing, University of Warwick, Coventry, UK

Contributors MAH, KH, TP, MG and SM were responsible for the study conception and protocol manuscript. Study logistics and recruitment were completed by SM and RM. Data collection was facilitated by RM, SM, MAH and KH with analysis by RM and SM. All authors contributed to data interpretation. Drafting of the manuscript was undertaken by RM with all authors providing contributions and critical revisions to reach a final version.

Funding This work was supported by a grant from the Chartered Society of Physiotherapy Charitable Trust (grant number PRF 12/13).

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethics approval was gained from the Sheffield Hallam Health and Wellbeing Faculty Research Ethics Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data are available upon reasonable request for deidentified participant data from <https://orcid.org/0000-0001-8486-4452>. No additional information available.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Ross Mallett <http://orcid.org/0000-0001-8486-4452>

REFERENCES

- Parsons S, Breen A, Foster N, *et al*. Prevalence and comparative troublesomeness by age of musculoskeletal pain in different body locations. *Fam Pract* 2007;24:308–16.
- Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organ* 2003;81:646–56.
- Reginster JY. The prevalence and burden of arthritis. *Rheumatology* 2002;41 Supp 1:3–6.
- Walsh NE, Brooks P, Hazes JM, *et al*. Standards of care for acute and chronic musculoskeletal pain: the bone and joint decade (2000–2010). *Arch Phys Med Rehabil* 2008;89:1830–45.
- Jordan JL, Holden MA, Mason EEJ, *et al*. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults. *The Cochrane Library* 2010;6.
- World Health Organization. Adherence to long-term therapies: evidence for action 2003.
- Roddy Eet *al*. Evidence-based recommendations for the role of exercise in the management of osteoarthritis of the hip or knee—the MOVE consensus. *Rheumatology* 2005;44:67–73.
- McLean SM, May S, Moffett JK, *et al*. Prognostic factors for progressive non-specific neck pain: a systematic review. *Physical Therapy Reviews* 2007;12:207–20.
- Hayden JA, van Tulder MW, Tomlinson G. Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. *Ann Intern Med* 2005;142:776–85.
- Gucciardi E. A systematic review of attrition from diabetes education services: strategies to improve attrition and retention research. *Can J Diabetes* 2008;32:53–65.
- Martin C, Perfect T, Mantle G. Non-attendance in primary care: the views of patients and practices on its causes, impact and solutions. *Fam Pract* 2005;22:638–43.
- Weinger K, McMurrich SJ, Yi JP, *et al*. Psychological characteristics of frequent short-notice cancellers of diabetes medical and education appointments. *Diabetes Care* 2005;28:1791–3.
- Turk DC, Rudy TE. Neglected topics in the treatment of chronic pain patients — relapse, noncompliance, and adherence enhancement. *Pain* 1991;44:5–28.
- Fuentes C JP, Armijo-Olivo S, Magee DJ, *et al*. Effects of exercise therapy on endogenous pain-relieving peptides in musculoskeletal pain: a systematic review. *Clin J Pain* 2011;27:365–74.
- Gross A, Kay TM, Paquin J-P, *et al*. Exercises for mechanical neck disorders. *Cochrane Database Syst Rev* 2015;50.
- Fransen M, McConnell S. Exercise for osteoarthritis of the knee. *Cochrane Database Syst Rev* 2008:CD004376.
- Childs JD, Cleland JA, Elliott JM, *et al*. Neck pain: clinical practice guidelines linked to the International classification of functioning, disability, and health from the orthopedic section of the American physical therapy association. *J Orthop Sports Phys Ther* 2008;38:A1–34.
- Fernandes L, Hagen KB, Bijlsma JWW, *et al*. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. *Ann Rheum Dis* 2013;72:1125–35.
- McLean SM, Klaber Moffett JA, Sharp DM, *et al*. A randomised controlled trial comparing graded exercise treatment and usual physiotherapy for patients with non-specific neck pain (the GET UP neck pain trial). *Man Ther* 2013;18:199–205.
- Kolt GS, McEvoy JF. Adherence to rehabilitation in patients with low back pain. *Man Ther* 2003;8:110–6.
- Forkan R, Pumper B, Smyth N, *et al*. Exercise adherence following physical therapy intervention in older adults with impaired balance. *Phys Ther* 2006;86:401–10.
- Hardage J, Peel C, Morris D, *et al*. Adherence to exercise scale for older patients (AESOP): a measure for predicting exercise adherence in older adults after discharge from home health physical therapy. *J Geriatr Phys Ther* 2007;30:69–78.
- Beswick AD, Rees K, West RR, *et al*. Improving uptake and adherence in cardiac rehabilitation: literature review. *J Adv Nurs* 2005;49:538–55.
- Williams A, Manias E, Walker R. Interventions to improve medication adherence in people with multiple chronic conditions: a systematic review. *J Adv Nurs* 2008;63:132–43.
- Wens J, Vermeire E, Hearnshaw H, *et al*. Educational interventions aiming at improving adherence to treatment recommendations in type 2 diabetes: a sub-analysis of a systematic review of randomised controlled trials. *Diabetes Res Clin Pract* 2008;79:377–88.
- Treuth MS. Applying multiple methods to improve the accuracy of activity assessments. physical activity assessments for health-related research. *Champaign: Human Kinetics* 2002:213–25.
- Hawley-Hague H, Horne M, Skelton DA, *et al*. Review of how we should define (and measure) adherence in studies examining older adults' participation in exercise classes. *BMJ Open* 2016;6:e011560.
- Hall AM, Kamper SJ, Hernon M, *et al*. Measurement tools for adherence to non-pharmacologic self-management treatment for chronic musculoskeletal conditions: a systematic review. *Arch Phys Med Rehabil* 2015;96:552–62.
- Bollen JC, Dean SG, Siegert RJ, *et al*. A systematic review of measures of self-reported adherence to unsupervised home-



- based rehabilitation exercise programmes, and their psychometric properties. *BMJ Open* 2014;4:e005044.
- 30 McLean S, Holden MA, Potia T, *et al.* Quality and acceptability of measures of exercise adherence in musculoskeletal settings: a systematic review. *Rheumatology* 2017;56:426–38.
- 31 Frost R, Levati S, McClurg D, *et al.* What adherence measures should be used in trials of home-based rehabilitation interventions? A systematic review of the validity, reliability, and acceptability of measures. *Arch Phys Med Rehabil* 2017;98:1241–56.
- 32 Holden MA, Haywood KL, Potia TA, *et al.* Recommendations for exercise adherence measures in musculoskeletal settings: a systematic review and consensus meeting (protocol). *Syst Rev* 2014;3:10.
- 33 American Physical Therapy Association. Guide to physical therapist practice. American physical therapy association. *Phys Ther* 2001;81:9.
- 34 Harvey N, Holmes CA. Nominal group technique: an effective method for obtaining group consensus. *Int J Nurs Pract* 2012;18:188–94.
- 35 Foster NE, Dziedzic KS, Windt DAWMvander, *et al.* Research priorities for non-pharmacological therapies for common musculoskeletal problems: nationally and internationally agreed recommendations. *BMC Musculoskelet Disord* 2009;10:3.
- 36 Gallagher M, Hares TIM, Spencer J, *et al.* The nominal group technique: a research tool for general practice? *Fam Pract* 1993;10:76–81.
- 37 O'Brien BC, Harris IB, Beckman TJ, *et al.* Standards for reporting qualitative research: a synthesis of recommendations. *Academic Medicine* 2014;89:1245–51.
- 38 INVOLVE N. Public involvement in research: values and principles framework 2015.
- 39 Tugwell P, Boers M, Brooks P, *et al.* OMERACT: an international initiative to improve outcome measurement in rheumatology. *Trials* 2007;8:38.
- 40 Williamson PR, Altman DG, Blazeby JM, *et al.* Developing core outcome sets for clinical trials: issues to consider. *Trials* 2012;13:132.
- 41 Meade LB, Bearne LM, Sweeney LH, *et al.* Behaviour change techniques associated with adherence to prescribed exercise in patients with persistent musculoskeletal pain: systematic review. *Br J Health Psychol* 2019;24:10–30.
- 42 Newman-Beinart NA, Norton S, Dowling D, *et al.* The development and initial psychometric evaluation of a measure assessing adherence to prescribed exercise: the exercise adherence rating scale (ears). *Physiotherapy* 2017;103:180–5.
- 43 Mayer M. Seeking what matters: patients as research partners. *Patient* 2012;5:71–4.
- 44 Haywood K, Brett J, Salek S, *et al.* Patient and public engagement in health-related quality of life and patient-reported outcomes research: what is important and why should we care? findings from the first ISOQOL patient engagement symposium. *Qual Life Res* 2015;24:1069–76.
- 45 Haywood KL, de Wit M, Staniszewska S, *et al.* *Developing patient-reported and relevant outcome measures*. Patient involvement in health technology assessment: Springer, 2017: 103–20.
- 46 Bailey DL, Holden MA, Foster NE, *et al.* Defining adherence to therapeutic exercise for musculoskeletal pain: a systematic review. *Br J Sports Med* 2018;098742.
- 47 Staniszewska S, Haywood KL, Brett J, *et al.* Patient and public involvement in patient-reported outcome measures. *Patient* 2012;5:79–87.