Nazari, Bobos, MacDermid

The effectiveness of virtual interventions targeting mental health in people with chronic musculoskeletal pain: A Systematic Review, Intervention Mapping and Network Meta-Analysis – DRAFT MANUSCRIPT

Article category: Network Meta-analysis and Intervention Mapping

Title:


Authors:

Goris Nazari PhD(C),1-2 Pavlos Bobos PhD(c),1-2 Joy C MacDermid PhD1-3

Affiliations:

1School of Physical Therapy, Faculty of Health Science, Western University, London ON Canada.

2Collaborative Program in Musculoskeletal Health Research, Bone and Joint Institute, Western University, London ON Canada.

3Roth McFarlane Hand and Upper Limb Centre, St. Joseph’s Hospital, London, ON Canada.

Corresponding Author:

Joy MacDermid, School of Physical Therapy, Faculty of Health Sciences, Elborn College
Western University, London, ON, Canada. Tel: 519 661 2111 x 88912 Email: jmacderm@uwo.ca

Acknowledgements:

This work was supported by the Canadian Institutes of Health Research (FRN: CMS-171742). Joy C MacDermid was supported by the Dr. James Roth Research Chair in Musculoskeletal Measurement and Knowledge Translation. Pavlos Bobos is supported by Canadian Health
Nazari, Bobos, MacDermid
The effectiveness of virtual interventions targeting mental health in people with chronic musculoskeletal pain: A Systematic Review, Intervention Mapping and Network Meta-Analysis – DRAFT MANUSCRIPT
Research Institute’s Doctoral Award scholarship. Goris Nazari is supported by the Transdisciplinary Bone & Joint Training Award, The Collaborative Training Program in Musculoskeletal Health Research (CMHR), Western University London ON Canada, and CIHR Fellowship award 2019.

Funding source:

Trial Registration Number:
Under review in PROSPERO.

Ethical Approval:
Not Applicable (network meta-analysis).

Conflict of Interests:
Authors declare no conflict(s) of interests.
INTRODUCTION

The coronavirus (COVID-19) infected 3,526,178 people worldwide by April 5, 2020.\textsuperscript{1} While mild and symptomatic cases exist, severe cases of COVID-19 may lead to pneumonia, multiple organ failure and death.\textsuperscript{2-3} Given the lack of any treatment, governments enacted highly restrictive social distancing policies.\textsuperscript{4} These policies have placed non-emergency traditional treatment programs on hold, and clinicians have struggled to provide interim services without clear direction on how these should be delivered remotely.

One of the most challenging non-emergency issues is what to do with the large number of people living with chronic musculoskeletal (MSK) conditions that have persistent physical and psychosocial symptoms. Our management of this population is challenged by complex and persistent physical and mental health symptoms, high rates of persistent opioid use, frequent lack of access to primary care, 80\% unemployment rates and complicated family/social relationships.\textsuperscript{5-6} These patients require physical, cognitive, and social treatments delivered by a multidisciplinary team or that integrate physical and mental health approaches.\textsuperscript{7-18} Pre-COVID-19, some of these patients were provided intensive multimodal treatment, while others lingered on wait-lists due to lack of system capacity. The complexity of these problems is challenging to transfer to a virtual/telemedicine format and a recent systematic review has only assessed such delivery in a traditional format.\textsuperscript{19} These patients, who are already marginalized by their health conditions and lack of system capacity, are even more at-risk in a pandemic as the physical and social activities/services that support their well-being become difficult or impossible. Therefore, we aimed to evaluate the effectiveness of virtual biopsychosocial interventions in comparison to sham, traditional, or alternative virtual treatments in these patients using a network analysis approach.
Protocol Registration:

Our protocol is under review in PROSPERO.

Eligibility criteria:

RCTs, quasi-randomized trials or cohort studies comparing biopsychosocial interventions where at least one treatment arm was provided virtually and compared to an alternative (sham, non-intervention, traditional treatment or alternative virtual treatment), that included patients who had chronic MSK pain, and where >60% had a mental health comorbidity or the analysis was disaggregated by mental health comorbidity.

Information Sources:

We searched the Cochrane Central Register of Controlled Trials, CINAHL, EMBASE, LILACS database, MEDLINE, and PSYNDEX from inception to current date. We screened reference lists of all obtained articles, including relevant reviews, and searched ClinicalTrials.gov for trials in progress.

Study Selection & Data collection:

Two investigators independently screened (assess eligibility) in a 2-stage process (title/abstracts and full-texts) using DistillerSR software. Disagreements at the title/abstract stage did undergo full review. Duplicate extraction to achieve mapping and synthesis objectives was conducted using a standardized, piloted web-based data management tool for systematic reviews, accompanied by a codebook. We extracted trial design; trial size; details of the intervention
including treatment components, targeting of interventions to mental or physical health components of illness, virtual platforms used, dose and treatment duration. Potential mediators extracted were patient characteristics such as mean age, sex/gender, duration of symptoms/follow-up, and type/source of financial support. Outcomes extracted were changes in mental health symptoms (e.g., depression, anxiety), pain, mobility, quality of life, and opioid use.

Quality of Intervention Reporting

The quality of reporting of the interventions is critical to implementation and was assessed using the Template for Intervention Description and Replication (TiDIER) checklist. The checklist was also used to inform the data extraction.

Intervention Mapping

Intervention mapping is a five-step process: (1) creating a matrix of proximal program objectives, (2) selecting theory-based intervention methods and practical strategies, (3) designing and organizing a program, (4) specifying adoption and implementation plans, and (5) generating program evaluation plans. We integrated this review with an intervention mapping process by conduct a mixed methods study of patient preferences (separate publication) and map components of the interventions to their direct and indirect mechanism of action, underlying theoretical framework (where presented), and platform rationale to establish a narrative mechanistic synthesis. Concept maps that link mechanisms to intervention components and patient preferences were co-created by knowledge users and researchers.

Risk of bias and Quality:
Risk of bias for each study was assessed with the Cochrane Risk of Bias tool (completed independently by 2 raters, resolved by consensus). Overall quality and recommendations were defined using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines and software. Rater agreement was assessed with (weighted) kappa statistics.

Summary Measures and Analysis:

For statistical analysis, a Bayesian random effects model based on Markov chain Monte Carlo methods with minimally informative prior distributions was used, which fully preserves randomized treatment comparisons within trials and allows for multiple follow-up times. Effect sizes of mental health outcomes was illustrated with caterpillar plots and 95% credible intervals (Crls) for all intervention arms. We assessed the goodness of fit of the model to the data by calculating the number of means of standardized node-based residuals within 1.96 of the standard normal distribution; visually inspecting the distribution of residuals on Q–Q plots; calculating the heterogeneity of treatment effects estimated from the posterior median between trial variance τ²; and calculating the consistency of the network (determined by the difference in effect sizes derived from direct and indirect comparisons). Treatment ranking was assessed with cumulative ranking curve (SUCRA) values. We fit all models in OpenBUGS using the continuous distribution for mental health outcomes, uninformative prior distributions for the treatment effects, and a minimally informative prior distribution for the common heterogeneity SD. We assumed uninformative priors—i.e., N (0,1000)—for all meta-regression coefficients.

Assessment of Inconsistency, Heterogeneity, and Transitivity:
Potential between-trial heterogeneity and inconsistencies between direct and indirect comparisons was carefully monitored and explored using subgroup analyses, Bucher method and meta-regression. Heterogeneity was assessed with tau squared statistic ($\tau^2$). The transitivity assumption underlying network meta-analysis was evaluated by comparing the posterior distribution of clinical and methodological variables that could act as effect modifiers (e.g., sex, age, disease severity) across treatment comparisons.

RESULTS (preliminary)

Study Selection
Our search identified 147 articles. We then carried out Title and Abstract screening; leaving 28 articles selected for full text review. Of these, 16 clinical trials were deemed eligible for this network meta-analysis.

Quality of Reporting
TiDIER checklist indicated a lack of description on the ‘tailoring’ (i.e. If the intervention was planned to be personalized, titrated or adapted, then describe what, why, when, and how). Furthermore, the modification item – if the intervention was modified during the course of the study, describe the changes (what, why, when, and how), was not clearly indicated.

Intervention characteristics
Interventions assessed included telerehabilitation, home exercise programs, telephone supervision/sessions which were usually compared to in-clinic (standard) programs.
The EP displays a detailed quality assessment and includes a judgment of each factor that determined the quality of evidence for each outcome. The SoF tables include an assessment of the quality of evidence for each outcome. Overall, quality of evidence per for pain, quality of life, function, disability outcomes ranged from very low to moderate quality.

Network meta-analysis Treatment effects (in progress)

DISCUSSIONS (in progress)

This review found a limited pool of evidence describing the effects of virtual/remote biopsychosocial treatment of concomitant chronic MSK pain and mental health conditions. The treatments provided virtually included: telerehabilitation, home exercise programs, telephone supervision/sessions, which was typically compared to in-clinic (standard) programs. The quality of reporting was substandard making it difficult for knowledge users to implement the results of the clinical studies. There was no high-quality evidence, however, low to moderate-quality evidence supported and indicated small to moderate positive effects in terms of improving pain levels, quality of life, function and disability.

Due to heterogeneity in the types of treatments provided a network meta-analysis was indicated. This provided additional insights (discussion to be elaborated pending results).

CONCLUSIONS (in progress)
References:


6. Miller J, MacDermid JC, Richardson J, Walton DM, Gross A. Depicting individual responses to physical therapist led chronic pain self-management support with pain science education and


