Feasibility of a combined field and tele-rehabilitation exercise program for musculoskeletal pain in rural Iraqi female agrarian labourers

Viabilidad de un programa combinado de ejercicios de campo y tele-rehabilitación para el dolor musculoesquelético en trabajadoras agrícolas iraquíes rurales

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Received: 29-10-25
Accepted: 26-12-25

How to cite in APA

Fathe, M. A., Machfer, A., Karash, S., Bouzid, M. A., Moalla, W., & Chtourou, H. (2026). Feasibility of a combined field and tele-rehabilitation exercise program for musculoskeletal pain in rural Iraqi female agrarian labourers. *Retos, 76*, 554-562. https://doi.org/10.47197/retos.v76.117997

Abstract

Introduction: Chronic musculoskeletal pain significantly impacts the quality of life and physical productivity of women engaged in agrarian labour within rural settings. This study examined the efficacy of a hybrid rehabilitation approach specifically designed for this demographic in low-resource environments.
Objective: This study aimed to evaluate a hybrid rehabilitation program combining field-based activities and tele-exercises to manage pain and improve functional muscle strength among rural Iraqi women.
Methodology: A quasi-experimental pre-test–post-test cohort study was conducted among sixty-six women who had extensive histories of agrarian labour in the Hamdaniya District. The twelve-week intervention integrated home-based exercises delivered via mobile video applications with twice-weekly field sessions featuring culturally familiar games, while physical assessments utilized a hand-held dynamometer and the Numeric Rating Scale-11.
Results: The data indicated that the majority of participants suffered from severe lower back and extremity pain at baseline. Following the intervention, significant improvements in muscle strength were recorded across all targeted regions, and pain levels transitioned from severe to either moderate or mild, with several cases reaching complete resolution.
Discussion: These findings aligned with previous studies suggesting that supervised exercise programs effectively mitigate chronic occupational pain. The results contrasted favourably with traditional clinical models by demonstrating that culturally adapted physical activity increases participant adherence and social engagement in rural communities.
Conclusions: The hybrid rehabilitation program successfully reduced chronic pain and enhanced the functional capacity of rural Iraqi women. The model presents a feasible, low-cost therapeutic strategy for improving musculoskeletal health in resource-limited settings.

Keywords

Iraq; musculoskeletal pain; rural women's health; tele-exercises.

Resumen

Introducción: El dolor musculoesquelético crónico impacta significativamente la calidad de vida y la productividad física de las mujeres dedicadas a labores agrícolas en entornos rurales. Este estudio examinó la eficacia de un enfoque de rehabilitación híbrido diseñado específicamente para este grupo demográfico en entornos de escasos recursos.
Objetivo: La investigación tuvo como objetivo evaluar un programa de rehabilitación híbrido que combinó actividades de campo y tele-ejercicios para controlar el dolor y mejorar la fuerza muscular funcional en mujeres rurales iraquíes.
Metodología: Se realizó un estudio de cohorte cuasi-experimental de pre-test y post-test con sesenta y seis mujeres en el distrito de Hamdaniya que tenían amplios antecedentes de trabajo agrícola. La intervención de doce semanas integró ejercicios en el hogar enviados mediante aplicaciones de video móvil con sesiones de campo bisemanales que incluyeron juegos culturalmente familiares, mientras que las evaluaciones físicas utilizaron un dinamómetro manual y la Escala de Calificación Numérica-11.
Resultados: Los datos indicaron que la mayoría de las participantes sufrían dolor severo en la zona lumbar y en las extremidades al inicio. Tras la intervención, se registraron mejoras significativas en la fuerza muscular en todas las regiones evaluadas y los niveles de dolor pasaron de severos a moderados o leves, con varios casos alcanzando la resolución completa.
Discusión: Estos hallazgos coincidieron con la literatura previa que sugiere que los programas de ejercicio supervisados mitigan eficazmente el dolor ocupacional crónico. Los resultados contrastaron favorablemente con los modelos clínicos tradicionales al demostrar que la actividad física adaptada culturalmente aumentó la adherencia de las participantes y la participación social en las comunidades rurales.
Conclusiones: El programa de rehabilitación híbrido redujo con éxito el dolor crónico y mejoró la capacidad funcional de las mujeres rurales iraquíes. Este modelo representa una estrategia terapéutica factible y de bajo costo para mejorar la salud musculoesquelética en entornos con recursos limitados.

Palabra's clave

Dolor musculoesquelético; Irak; salud de la mujer rural; tele-ejercio.

Introduction

In rural Iraqi contexts, women face a complex dual burden shaped by both occupational demands and social health determinants. In addition to extensive domestic responsibilities including childcare and household maintenance, many women engage in strenuous agrarian labour. This continuous exposure to repetitive tasks and physical overexertion leads to cumulative musculoskeletal strain, typically manifesting as persistent pain in the lower back, neck, and extremities. Activities such as prolonged standing, kneeling, and heavy lifting are recognized risk factors for work-related musculoskeletal disorders (WMSDs). These conditions significantly impair productivity, functional capacity, and general well-being (Abreu et al., 2025).

High prevalence rates in the cervical and lumbar regions are further exacerbated by poor postural habits, inadequate job design, and age-related functional decline (Barreto-andrade, 2025; Ganesh et al., 2016; Hulshof et al., 2021). Previous research studies indicate that back pain affects more than 60% of agrarian labourers, with substantial morbidity reported in the limbs (Osborne et al., 2010; Walker-Bone & Palmer, 2002).

Although it reinforces cultural identity and social resilience, agrarian labour, generates significant health vulnerabilities (Firman, 2025). Rural women often navigate intersecting economic and social constraints, where limited financial resources and reduced health literacy restrict access to specialized rehabilitation or ergonomic education. Traditional gender roles frequently prioritize family care over personal health, while psychosocial stressors related to economic insecurity further intensify chronic strain. Furthermore, geographic isolation and inadequate infrastructure create additional barriers to healthcare access. Consequently, rural populations exhibit higher musculoskeletal pain prevalence than urban residents owing to these lifestyle factors and restricted preventive care (Alonso et al., 2018; Fathe et al., 2022; Hogg et al., 2021). Globally, rural residents performing heavy manual labour are disproportionately affected by WMSDs resulting from long working hours, heavy lifting, and sustained awkward postures (Akbar et al., 2023; Mesa-Castrillon-Beckenkamp, et al., 2024), particularly in relation to long working hours, heavy loads, and sustained awkward postures (Ganesh et al., 2016; Osborne et al., 2010).

In response to these systemic challenges, telerehabilitation emerges as a viable strategy for delivering flexible care in resource-limited settings (Abdullah Fathe et al., 2024). Telemedicine-based interventions demonstrate improved adherence and convenience for underserved populations (Bashshur et al., 2014; Rockwell & Gilroy, 2020).

Accordingly, this research evaluates a hybrid rehabilitation program that integrates clinical exercises with culturally familiar games to manage musculoskeletal pain among rural Iraqi women. The inclusion of gamified elements enhances motivation and social engagement, which is essential for long-term adherence. Evidence suggests that gamified interventions effectively reduce pain intensity while promoting social participation (Henriques et al., 2025).

By addressing both physical function and contextual social factors, this study proposes a context-sensitive model to mitigate chronic musculoskeletal conditions in rural environments, highlighting a scalable solution for improving regional public health.

Method

Study Design This research followed a quantitative approach with a quasi-experimental design, specifically utilizing a pre-test and post-test model without a control group. This design was selected to evaluate the efficacy of the intervention within a specific, hard-to-reach population where establishing a separate control group was not logistically feasible.

Participants

The study population consisted of female residents associated with the Church of the Sisters of the Virgin Mary in the Hamdaniya district, Nineveh, Iraq. From an initial group of 550 women who attended a health awareness lecture, a purposive sample of 66 participants was selected based on their voluntary

interest and reported musculoskeletal symptoms. The average age of the participants was 46 years. Demographic data revealed that 81.81% were housewives and 18.19% held external jobs; however, all participants had a history of 18–23 years of demanding agrarian labour. Inclusion was based on the presence of chronic pain in the limbs, back, or neck. This link is referred to as the activities of the church: https://www.acimena.com/amp/news/2668/mltk-akhoat-mrym-albtol-yftth-mhrganh-alsabaa-baanoan-alknys-alsryanyw-aamk-otarykh-okdas

Procedure

The intervention consisted of a twelve-week Combined Rehabilitation Program (CRP). This program integrated two distinct components: tele-exercise and field-based sessions. The tele-exercise portion comprised 24 therapeutic units delivered via 28 instructional videos through the WhatsApp platform. This allowed for remote supervision and provided a flexible solution for women whose domestic responsibilities hindered daily travel. Simultaneously, field-based sessions were conducted twice weekly at a local facility. These 45–60-minute sessions utilized culturally familiar popular games (PGs) to improve motor skills and social motivation. Exercise was progressively intensified and maintained within a pain-free range to ensure participant safety.

Instruments

Muscle strength across the upper extremities, trunk, and lower extremities was quantified in kilograms using a handheld MicroFET2 dynamometer (Micro-Fit) (Versteegh et al., 2012). Physical flexibility was also measured for the major muscle chains. To evaluate the impact of pain on daily living, the 11-point Numeric Rating Scale (NRS-11) was employed, allowing participants to self-report the intensity of their symptoms during functional activities (Hjermstad et al., 2011).

Physical Activity and Body Composition

Baseline anthropometric measurements were collected, including height, weight, and Body Mass Index (BMI), were collected. Assessments specifically targeted the strength and flexibility of the anterior and posterior thigh muscles, the cervical region, and the muscle groups acting on the shoulder, elbow, and wrist. These metrics provided a comprehensive profile of the participants' functional health prior to and following the 12-week intervention.

Data Analysis

Statistical analysis was performed using IBM-SPSS version 24 and SAS software version 9.4. Descriptive statistics, including means and standard deviations, were calculated for all variables. To evaluate the changes between pre-test and post-test measurements, paired sample t-tests were utilized. This method was chosen to minimize individual variability by using each participant as their own control. Results were reported with 95% confidence intervals, and statistical significance was set at a threshold of $p < 0$

Ethical Considerations

The study protocol received formal approval from the Scientific Committee of the College of Physical Education and Sport Science at the University of Mosul (Approval No. S-1/24). The trial was also registered at ClinicalTrials.gov (NCT07129356). Due to the high rate of illiteracy among the target population, informed consent was obtained verbally after a full explanation of the study objectives, in strict accordance with the Declaration of Helsinki. https://clinicaltrials.gov/study/NCT07129356

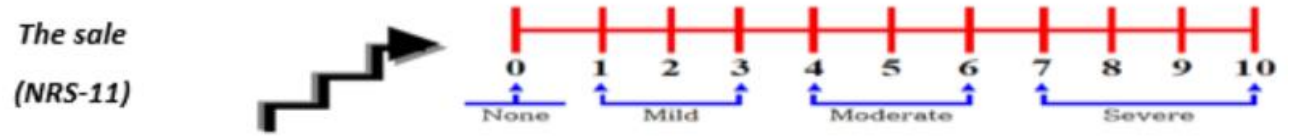
Results

Table 1 referees the outcomes of pain level for participant pre and post 12 weeks postimplementation of the HRP. The numbers of participants who suffered from pain in a variety of level for four areas of body. According to (NRS-11) of pain, the measures indicate all participants agreed that they suffer from lower back pain. However, it seems from results, all participant had severe pain in lower back in pre-test and the pain reduced for (n = 38, 57.6%) to mild level in post-test, and (n = 22, 33.3%) of them the pain became in moderate level, and (n = 5, 7.6%) of them their pain is disappeared, but (n = 1, 1.5%) participant her pain has still in severe level. In addition, the results indicate only (n = 18, 27.3%) of participants had suffered from neck pain and their pain were in level severe in pre-test, the post-tests

indicate that (n = 2, 4.6%) of them had disappeared the pain, and (n = 9, 20.9%) of them their pain had reduced to mild level, while (n = 7, 16.3%) of them their pain became in moderate level.

Table 1. It shows the pain levels of participants before and after the rehabilitation program across four body areas according to (NRS-11) scale, df = 65.

Pain Position	Time	None	Mild	Moderate	Severe
Lower Back	Pre-test	0	0	0	66 (100%)
	Post-test	5 (7.6%)	38 (57.6%)	22 (33.3%)	1 (1.5%)
Neck	Pre-test	0	0	0	18 (27.3%)
	Post-test	2 (4.6%)	9 (20.9%)	7 (16.3%)	0
Upper Extremities	Pre-test	0	0	0	43 (65.1%)
	Post-test	9 (20.9%)	22(51.2%)	11(25.6%)	0
Lower Extremities	Pre-test	0	0	0	45 (68.2%)
	Post-test	6 (13.3%)	25 (55.5%)	8 (17.7%)	1 (2.2%)



In the upper extremities, (n = 43, 65.1%) of the participants had suffered from severe pain in the pre-test, after the end of the HRP (n = 9, 20.9%) their pain had disappeared (n = 22, 51.2%) and reduced to mild pain, and (n = 11, 25.6%) had moderate pain. In the lower extremities (n = 45, 68.2%) of the participants had suffered from severe pain in the pre-test, after the end of the HRP (n = 6, 13.3%) their pain had disappeared and (n = 25, 55.5%) their pain had reduced to mild levels, and (n = 8, 17.7%) of them had moderate pain. (Figure 1) shows the pain tests according to (NRS-11) of pain (Alghadir et al., 2018).

Figure 1. It shows number of participants experiencing different levels before and after the rehabilitation program across four body areas.

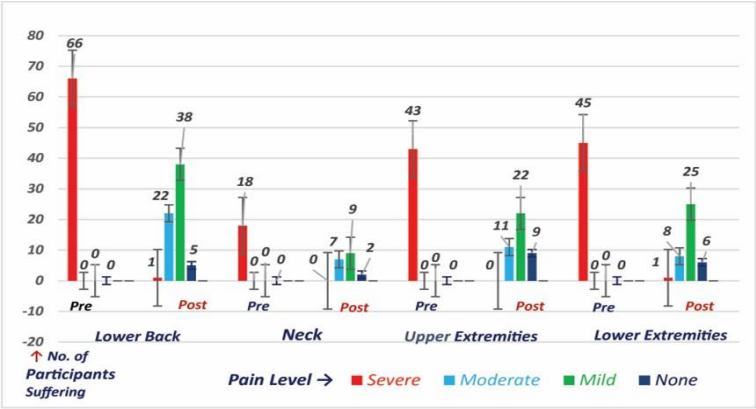


Table 2 shows the statistical analysis of participants' physical variables before and after CRP, along with the normality test results. The data indicated a notable improvement in strength and flexibility, as evidenced by the increased mean scores of the post-tests. Specifically, the range of mean values for the strength tests increased from (3.561 ± 7.063) to (30.606 ± 4.461), to post-tests range of (10.015 ± 6.131) to (34.667 ± 5.064). The Kolmogorov-Smirnov test confirmed the normal distribution of all variables prior to CRP ($p < 0.05$).

Additionally, slight reductions in body weight and BMI were observed. The mean weight decreased from (78.935 ± 10.561) kg to (77.161 ± 10.804) kg post of CRP, and the BMI decreased from (32.017 ± 4.307) to (31.313 ± 4.543). Despite this change, BMI remained within the same World Health Organization (WHO) classification.

Table 2. Descriptive statistics and Kolmogorov–Smirnov normality test for physical variables before and after the CRP (N = 66, df = 65).

Variable	Time	Mean	SE	SD	K-S test	P Value
Rt. Knee Extending	Pre	21.974	0.789	6.406	0.079	0.200*
	Post	30.264	0.827	6.721	0.073	0.200*
Lt. Knee Extending	Pre	20.936	0.844	6.860	0.085	0.200*
	Post	29.312	0.790	6.417	0.089	0.200*
Rt. Knee Flexion	Pre	14.423	0.320	2.601	0.044	0.200*
	Post	18.485	0.331	2.690	0.065	0.200*
Lt. Knee Flexion	Pre	14.562	0.380	3.083	0.057	0.200*
	Post	18.136	0.343	2.783	0.060	0.200*
Rt. L. Limb Abducting	Pre	13.770	0.412	3.345	0.075	0.200*
	Post	17.964	0.311	2.524	0.088	0.200*
Lt. L. Limb Abducting	Pre	13.677	0.371	3.012	0.062	0.200*
	Post	17.926	0.294	2.386	0.105	0.070*
Rt. L. Limb Adducting	Pre	14.633	0.322	2.613	0.050	0.200*
	Post	21.352	0.376	3.051	0.083	0.200*
Lt. L. Limb Adducting	Pre	14.985	0.386	3.136	0.075	0.200*
	Post	20.202	0.410	3.333	0.057	0.200*
Rt. Upper Limb Abducting	Pre	12.752	0.296	2.405	0.078	0.200*
	Post	16.556	0.258	2.094	0.089	0.200*
Lt. Upper Limb Abducting	Pre	12.518	0.353	2.870	0.106	0.063*
	Post	16.421	0.343	2.786	0.070	0.200*
Rt. Shoulder Flexion	Pre	14.015	0.304	2.470	0.064	0.200*
	Post	17.561	0.297	2.412	0.064	0.200*
Lt. Shoulder Flexion	Pre	13.480	0.353	2.870	0.077	0.200*
	Post	17.388	0.385	3.127	0.110	0.047
Rt. Shoulder Extension	Pre	15.038	0.374	3.035	0.088	0.200*
	Post	19.717	0.312	2.536	0.096	0.200*
Lt. Shoulder Extension	Pre	14.600	0.357	2.899	0.066	0.200*
	Post	19.386	0.375	3.047	0.079	0.200*
Hyper Extend of Lower back from S.P.	Pre	30.606	0.549	4.461	0.141	0.002
	Post	34.667	0.623	5.064	0.095	0.200*
Hyper Flexed of Lower back from L.S.P.	Pre	3.561	0.869	7.063	0.087	0.200*
	Post	10.015	0.755	6.131	0.083	0.200*
Weight	Pre	78.935	1.300	10.561	0.094	0.200*
	Post	77.161	1.330	10.804	0.089	0.200*
BMI	Pre	32.017	.295	4.307	.060	0.200*
	Post	31.313	.295	4.543	.084	0.200*

Note: SD, Standard Deviation; SE, Standard Error Mean; K-S, Kolmogorov–Smirnov test; Rt, right; Lt, left; S.P, Supine Position; L.S, Long Sitting Position; BMI, Body mass index; N, Number of participants; P, Significant value; *Significant at $p < 0.05$. The unit measurement of strength tests was (kg).

Table 3 shows the paired differences between pre-post-tests for study variables after the end of HRP, which measured under 95% confidence interval (CI) in the lower range (0.779-9.540) and in the upper range (2.770-7.211) for all study variables. The table also indicates that according to the t-test, there is a significant difference between pre and post-tests in all study variables to favor the post-tests, and the range of mean differences was (0.705, ±0.219-8.376, ±4.736), t(3.220-23.348) = 65, (p = 0.000-0.002). Additionally, the results indicate that the participants lost some weight at the end of CRP. Although, the CRP did not aim to lose weight directly, it was positive in shrinkage of fat mass due to the improvement of muscle metabolism as a result of exercises.

Table 3. Paired t-test results for study variables before and after the CRP (df = 65).

Study Variables		Paired Differences					t	*P Value*
		Mean Diff	*SD*	*SE*	95% CID Lower	95% CID Upper		
Pair 1	Rt. Knee Extending	8.289	4.931	0.607	9.502	7.077	13.658	0.000*
Pair 2	Lt. Knee Extending	8.376	4.736	0.583	9.540	7.211	14.367	0.000*
Pair 3	Rt. Knee Flex	4.062	2.472	0.304	4.670	3.454	13.348	0.000*
Pair 4	Lt. Knee Flex	3.574	2.844	0.350	4.273	2.875	10.211	0.000*
Pair 5	Rt. Limb Abducting	4.194	2.090	0.257	4.708	3.680	16.300	0.000*
Pair 6	Lt. Limb Abducting	4.248	2.112	0.260	4.768	3.729	16.341	0.000*
Pair 7	Rt. Lower Limb Adducting	6.718	2.355	0.290	7.297	6.139	23.171	0.000*
Pair 8	Lt. Lower Limb Adducting	5.217	3.033	0.373	5.962	4.471	13.975	0.000*
Pair 9	Rt. Upper Limb Abducting	3.804	1.408	0.173	4.150	3.458	21.948	0.000*
Pair 10	Lt. Upper Limb Abducting	3.903	2.297	0.283	4.468	3.338	13.802	0.000*
Pair 11	Rt. Shoulder Flex	3.545	2.078	0.256	4.056	3.035	13.861	0.000*
Pair 12	Lt. Shoulder Flex	3.908	2.383	0.293	4.493	3.322	13.322	0.000*
Pair 13	Rt. Shoulder Extend	4.679	2.544	0.313	5.304	4.053	14.940	0.000*
Pair 14	Lt. Shoulder Extend	4.786	2.280	0.281	5.347	4.226	17.057	0.000*

Pair 15	Hyper Extend of Lower back from S.P.	4.061	1.413	0.174	4.408	3.713	23.348	0.000*
Pair 16	Hyper Flexed of Lower back from L.S.P.	6.455	3.888	0.479	7.410	5.499	13.488	0.000*
Pair 17	Weight	1.775	4.050	0.498	0.779	2.770	3.560	0.001*
Pair 18	BMI	0.705	1.777	0.219	0.268	1.141	3.220	0.002*

Note: SD, Standard Deviation; SE, Standard Error Mean; CID, Confidence Interval of the Differenced, Differences; Rt, right; Lt, left; S.P, Supine Position; L.S, Long Sitting Position; BMI, Body mass index; P, Significant value; *Significant at $p < 0.05$. The unit measurement of strength tests was (kg).

Discussion

This study was motivated by direct community engagement that revealed unmet rehabilitation needs among rural women in the Nineveh Plains. During a health awareness activity conducted as part of the University of Mosul's outreach initiatives, many women reported persistent musculoskeletal pain that limited functional movement and daily activities. Access to services remained constrained by geographic, social, and caregiving barriers. These observations highlighted the need for a feasible, low-cost, and context-appropriate approach, leading to the development of the present combined field-based and tele-exercise program. Previous studies confirm the effectiveness of distance rehabilitation; for instance, Hassan et al. found that tele-rehabilitation is a feasible alternative to conventional care, particularly for patients with limited access to in-person therapy (Hassan et al., 2025).

Furthermore, the CRP provided meaningful improvements in pain reduction across the four areas addressed by this study. This serves as evidence for the efficacy of remote exercise combined with "population games," which facilitated significant changes in muscle strength and body weight. This result similar to what concluded Lombard et al. that a low intensity lifestyle program can prevent the persistent weight gain observed in women and Key features included community integration, self-weighing, including a mix of group, phone, and SMS text reminders (Lombard et al., 2016). Regarding pain reduction, these results are consistent with Scriven et al. who confirmed that participants benefit from pain management programs and maintain positive perceptions of telehealth models (Scriven et al., 2019). The present findings support the use of telehealth to deliver specialist care for persistent musculoskeletal and joint pain to individuals in remote communities. The model also demonstrated that the positive elements of group treatment can be successfully achieved through telehealth (Widyaningsih et al., 2021).

Additionally, Mesa-Castrillon et al. confirmed that physiotherapist-delivered eHealth interventions provide clinically meaningful improvements in function compared to usual care for rural populations. Their findings highlight the potential of eHealth to improve access to evidence-based exercise (Mesa-Castrillon- Simic et al., 2024). Similarly, eHealth-delivered interventions have proven beneficial for individuals with low back pain and knee osteoarthritis (OA) (Mesa-Castrillon et al., 2021; Hulshof et al., 2021). Allworth et al. also found that eHealth physiotherapy is highly acceptable to patients in rural Australia, mirroring the acceptance seen in our Iraqi cohort (Allworth et al., 2025).

Furthermore, the decrease in weight among participants—an indirect effect of the CRP on improving muscle mass and decreasing fat mass—suggests improved metabolic function. This aligns with González-Rocha et al. who concluded that resistance exercise positively affects muscle, fat, and bone mass. Furthermore, Lombard et al. noted that community involvement, simple health messaging, and a mix of group and mobile-based support are effective strategies for combating obesity among rural women (González-Rocha et al., 2022). In addition, Lombard et al. concluded the community involvement, simple health messages, small behavior changes, low burden, self-weighing, and a mix of group, phone, and SMS all of them support the strategies to combat obesity for rural women (Lombard et al., 2016).

While Bradford et al. that telemedicine primarily serves specific use cases: rural healthcare access, specialty care in underserved areas, and virtual urgent care (Bradford et al., 2016). Additionally, Kichloo et al. concluded that telemonitoring significantly reduces illness severity and improves overall health outcomes. (Kichloo et al., 2020).

In this study, the CRP proved effective in improving participants' moods and social interactions by the midpoint of the intervention. Participants became more interactive within their families and communities, reflecting a positive psychological impact. These effects align with Song et al. who found that rural

adults are particularly vulnerable to the negative effects of psychological distress on osteoarthritis symptoms (Song et al., 2024). Notably, participants-maintained contact with the researchers after the study concluded, expressing a strong interest in future physical activity programs due to the substantial health and social benefits they experienced.

Study limitations

One of the key limitations is the widespread cultural and societal resistance encountered in rural-communities, and lack of awareness about therapeutic exercise programs may lead to low participation. Additionally, traditional customs and social norms pose challenges for researchers implementing and evaluating such interventions. However, it is recommended that future work should consider similar requirements in other countries that have been able to achieve greater awareness of the health benefits of therapeutic exercise, activities and recreational games for health promotion. Moreover, it incorporated psychological and social indicators to evaluate participant engagement and assess the broader impact of such rehabilitation programs on rural women's functional productivity, social participation, and overall quality of life.

Conclusions

CRP proved effective in alleviating musculoskeletal pain among rural women, while also yielding additional benefits in terms of weight reduction, improved BMI, and enhanced psychosocial well-being. Furthermore, participants reported a more favorable perception of the long-term value of exercise as a sustainable approach to pain management, particularly when compared to conventional methods such as pharmacological treatments.

Acknowledgements

The authors wish to extend their sincere gratitude to the Cultural and Social Center of the Syriac Catholic Sisters of the Virgin Mary Forum, with special recognition to its spiritual leader, Father Momika, for their invaluable support. The authors also express profound appreciation to all participating women for their dedication, cooperation, and patience throughout the study period. We would also like to thank Editage (www.editage.com) for the English edition.

Financing

The authors did not receipt any fund. The work was done by self-funding of author.

References

Abdullah Fathe, M., Farhat, F., Karim, S. K., & Moalla, W. (2024). Feasibility Telerehabilitation at Home on Body Composition, Anthropometric Measures and Muscular Strength After Interruption 4–5 Years of Spinal Cord Injury: Serial Cases Study on Islamic State of Iraq and Syria War Survivors in Iraq. *Telemedicine and E-Health*, *30*(8), 2181–2193. https://doi.org/10.1089/tmj.2024.0078

Abreu, F., Almeida, M., Rosa, M., & Technology, H. (2025). Breaking the backbone of productivity: work-related musculoskeletal pain among KSAU-HS employees and its impact on performance and rehabilitation strategies Dolor musculoesquelético laboral en empleados de KSAU-HS: impacto en el rendimiento y estrategias. *Retos*, *2025*(70), 1209–1225. https://doi.org/10.47197/retos.v70.116889

Akbar, K. A., Try, P., Viwattanakulvanid, P., & Kallawicha, K. (2023). Work-Related Musculoskeletal Disorders Among Farmers in the Southeast Asia Region: A Systematic Review. *Safety and Health at Work*, *14*(3), 243–249. https://doi.org/10.1016/j.shaw.2023.05.001

Alghadir, A. H., Anwer, S., Iqbal, A., & Iqbal, Z. A. (2018). Test-retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement

of osteoarthritic knee pain. *Journal of Pain Research*, *11*, 851–856. https://doi.org/10.2147/JPR.S158847

Allworth, I., Luscombe, G., Ferreira, P., & Mesa-Castrillon, C. (2025). Exploring participant satisfaction with an eHealth intervention for low back pain and knee osteoarthritis: Enhancing physiotherapy access in rural Australia. *Musculoskeletal Science and Practice*, *76*(November 2024), 103252. https://doi.org/10.1016/j.msksp.2024.103252

Alonso Monteiro Bezerra, M., Hellwig, N., Da Rocha Castelar Pinheiro, G., & Souza Lopes, C. (2018). Prevalence of chronic musculoskeletal conditions and associated factors in Brazilian adults - National Health Survey. *BMC Public Health*, *18*(1), 1–10. https://doi.org/10.1186/s12889-018-5192-4

Barreto-andrade, J. A. (2025). Determining factors and diagnostic methods of musculoskeletal disorders related to the spine in administrative workers . Bibliographical review Autores Factores determinantes y métodos de diagnóstico de los trastornos musculoesqueléticos de la columna ver. *Retos*, *2025*(63), 165–176. https://doi.org/10.47197/retos.v63.105501

Bashshur, R. L., Shannon, G. W., Smith, B. R., Alverson, D. C., Antoniotti, N., Barsan, W. G., Bashshur, N., Brown, E. M., Coye, M. J., Doarn, C. R., Ferguson, S., Grigsby, J., Krupinski, E. A., Kvedar, J. C., Linkous, J., Merrell, R. C., Nesbitt, T., Poropatich, R., Rheuban, K. S., … Yellowlees, P. (2014). The empirical foundations of telemedicine interventions for chronic disease management. *Telemedicine and E-Health*, *20*(9), 769–800. https://doi.org/10.1089/tmj.2014.9981

Bradford, N. K., Caffery, L. J., & Smith, A. C. (2016). Correction: Telehealth services in rural and remote Australia: A systematic review of models of care and factors influencing success and sustainability [Rural and Remote Health, 16, (2016) 4268]. *Rural and Remote Health*, *16*(4), 1–23. https://search.informit.org/doi/10.3316/informit.206937797420021

Fathe, M. A., Hasan, M. S., & Karash, S. J. (2022). The Effectiveness of a Rehabilitative Program on the Cervical and Lumbar Pain Relief for Rural Women. *Annals of Applied Sport Science*, *10*(1), 1–8. https://doi.org/10.52547/aassjournal.985

Firman, A. (2025). Everyday agrarian labor as physical activity : gender , health , and community cohesion in rural Indonesia How to cite in APA Keywords Resumen Palabras clave. *Retos*, *2025*(72), 1115–1132. https://doi.org/10.47197/retos.v72.117586

Ganesh, S., Chhabra, D., & Kumari, N. (2016). The effectiveness of rehabilitation on pain-free farming in agriculture workers with low back pain in India. *Work*, *55*(2), 399–411. https://doi.org/10.3233/WOR-162403

González-Rocha, A., Mendez-Sanchez, L., Ortíz-Rodríguez, M. A., & Denova-Gutiérrez, E. (2022). Effect Of Exercise on Muscle Mass, Fat Mass, Bone Mass, Muscular Strength and Physical Performance in Community Dwelling Older Adults: Systematic Review and Meta-Analysis. *Aging and Disease*, *13*(5), 1421–1435. https://doi.org/10.14336/AD.2022.0215

Hassan, M. G., Mohamed Ali, A. F., Samy, H., Hamdy, M., Abdelkarim Attia, A. S., El-Din, S. S., Mahmoud Ahmed, S. S., Mabrouk Bondok, S. M., Abdelaziz, S. S., Hassan, E. J., & Hassan, S. S. (2025). Telerehabilitation for carpal tunnel syndrome: a new treatment style with new possibilities: a randomized controlled trial. Retos, 72, 1141-1150. https://doi.org/10.47197/retos.v72.117333

Henriques, B., Abreu, F., Jesus, L., Almeida, M., Silva, C. G., & Rosa, M. (2025). Impact of a game-based intervention on chronic low back pain considering the interference of kinesiophobia in middle-aged and older adults. Retos, 72, 1209-1225. https://doi.org/10.47197/retos.v72.117762

Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., Fainsinger, R., Aass, N., & Kaasa, S. (2011). Studies comparing numerical rating scales, verbal rating scales, and visual analogue scales for assessment of pain intensity in adults: A systematic literature review. *Journal of Pain and Symptom Management*, *41*(6), 1073–1093. https://doi.org/10.1016/j.jpainsymman.2010.08.016

Hogg, M. N., Kavanagh, A., Farrell, M. J., & Burke, A. L. J. (2021). Waiting in Pain II: An Updated Review of the Provision of Persistent Pain Services in Australia. *Pain Medicine (United States)*, *22*(6), 1367–1375. https://doi.org/10.1093/pm/pnaa374

Hulshof, C. T. J., Pega, F., Neupane, S., Colosio, C., Daams, J. G., Kc, P., Kuijer, P. P. F. M., Mandic-Rajcevic, S., Masci, F., van der Molen, H. F., Nygård, C. H., Oakman, J., Proper, K. I., & Frings-Dresen, M. H. W. (2021). The effect of occupational exposure to ergonomic risk factors on osteoarthritis of hip or knee and selected other musculoskeletal diseases: A systematic review and meta-analysis

from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and In. *Environment International*, *150*, 106349. https://doi.org/10.1016/j.envint.2020.106349

Kichloo, A., Albosta, M., Dettloff, K., Wani, F., El-Amir, Z., Singh, J., Aljadah, M., Chakinala, R. C., Kanugula, A. K., Solanki, S., & Chugh, S. (2020). Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. *Family Medicine and Community Health*, *8*(3), 1–9. https://doi.org/10.1136/fmch-2020-000530

Lombard, C., Harrison, C., Kozica, S., Zoungas, S., Ranasinha, S., & Teede, H. (2016). Preventing Weight Gain in Women in Rural Communities: A Cluster Randomised Controlled Trial. *PLoS Medicine*, *13*(1), 1–20. https://doi.org/10.1371/journal.pmed.1001941

Mesa-Castrillon, C. I., Beckenkamp, P. R., Ferreira, M., Simic, M., Davis, P. R., Michell, A., Pappas, E., Luscombe, G., Noronha, M. De, & Ferreira, P. (2024). Global prevalence of musculoskeletal pain in rural and urban populations. A systematic review with meta-analysis. Musculoskeletal pain in rural and urban populations. *Australian Journal of Rural Health*, *May*, 864–876. https://doi.org/10.1111/ajr.13161

Mesa-Castrillon, C. I., Simic, M., Ferreira, M. L., Bennell, K. L., Luscombe, G. M., Gater, K., Beckenkamp, P. R., Michell, A., Bauman, A., de Luca, K., Bunker, S., Clavisi, O., & Ferreira, P. H. (2024). Effectiveness of an eHealth-Delivered Program to Empower People With Musculoskeletal Pain in Rural Australia: A Randomized Controlled Trial. *Arthritis Care and Research*, *76*(4), 570–581. https://doi.org/10.1002/acr.25272

Mesa-Castrillon, C. I., Simic, M., Ferreira, M. L., Hatswell, K., Luscombe, G., de Gregorio, A. M., Davis, P. R., Bauman, A., Bunker, S., Clavisi, O., Knox, G., Bennell, K. L., & Ferreira, P. H. (2021). EHealth to empower patients with musculoskeletal pain in rural Australia (EMPoweR) a randomised clinical trial: study protocol. *BMC Musculoskeletal Disorders*, *22*(1), 1–11. https://doi.org/10.1186/s12891-020-03866-2

Osborne, A., Blake, C., McNamara, J., Meredith, D., Phelan, J., & Cunningham, C. (2010). Musculoskeletal disorders among Irish farmers. *Occupational Medicine*, *60*(8), 598–603. https://doi.org/10.1093/occmed/kqq146

Rockwell, K. L., & Gilroy, A. S. (2020). Incorporating telemedicine as part of COVID-19 outbreak response systems. *American Journal of Managed Care*, *26*(4), 147–148. https://doi.org/10.37765/ajmc.2020.42784

Scriven, H., Doherty, D. P., & Ward, E. C. (2019). Evaluation of a Multisite Telehealth Group Model for Persistent Pain Management for Rural/Remote Participants. Rural and Remote Health, 19(1). https://doi.org/10.22605/RRH4710

Song, S., Graham-Engeland, J. E., & Kim, J. (2024). Associations Between Psychological Stress and Hand Pain Among Rural and Urban Adults: Findings From the KoGES Community Cohort Study. *Journal of Pain*, *25*(2), 362–375. https://doi.org/10.1016/j.jpain.2023.08.016

Versteegh, T. H., Beaudet, D., Greenbaum, M., Hellyer, L., Tritton, A., & Walton, D. (2015). Evaluating the reliability of a novel neck-strength assessment protocol for healthy adults using self-generated resistance with a hand-held dynamometer. *Physiotherapy Canada*, *67*(1), 58–64. https://doi.org/10.3138/ptc.2013-66

Walker-Bone, K., & Palmer, K. T. (2002). Musculoskeletal disorders in farmers and farm workers. *Occupational Medicine*, *52*(8), 441–450. https://doi.org/10.1093/occmed/52.8.441

Widyaningsih, S. W., Yusuf, I., Prasetyo, Z. K., & Istiyono, E. (2021). The development of the hots test of physics based on modern test theory: Question modeling through e-learning of moodle lms. *International Journal of Instruction*, *14*(4), 51–68. https://doi.org/10.29333/iji.2021.1444a

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