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REVIEW ARTICLE

A Scoping Review on Back Care Education Strategies for Farmers with Low Back Pain.

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Abstract

Background: Farmers frequently experience low back pain (LBP), which arises from the physically demanding nature of their work combined with multiple contributing factors. Hence, it is important to provide tailored back care education (BCE) to manage pain and enhance functionality effectively. **Objective:** This scoping review aims to identify, map, and synthesize the evidence on back care education (BCE) strategies designed to reduce pain and improve function for farmers with LBP. **Materials and methods:** The literature search was conducted in PUBMED, Scopus, and Web of Science to identify articles published between 2012 and 2024. The eligibility criteria included studies focusing on BCE in farming populations with LBP regardless of study design. **Result:** From 1,395 articles initially screened, only nine studies met the inclusion criteria. Thematic analysis identified three main BCE components: (1) ergonomic training for agricultural tasks, (2) prescribed therapeutic exercise, and (3) pain science and self-management education. Multi-component BCE programs were generally effective in reducing pain and improving function, although intervention protocols and outcome measures varied substantially. **Conclusion:** This review demonstrates that BCE is a promising strategy for the management of low back pain in farmers, particularly when adapted to the specific demands of agricultural work. Nevertheless, the heterogeneity of the interventions identified indicates the need for further research to formulate standardized and context-specific protocols, as well as to apply consistent outcome measures to build a more robust evidence base.

Keywords: *Back care education, ergonomic, farmers, low back pain, patient education.*

Introduction

Among musculoskeletal disorders, low back pain (LBP) occurs with the highest frequency worldwide, affecting a large number of individuals, regardless of the nature of their activities. Agricultural farmers are among the most affected populations, with a prevalence of LBP ranging from 23.7 to 71.2%. [1-3] LBP among farmers can result in recurring pain, decreased functions, frequent hospital visits, work absenteeism or loss of employment, and reduced quality of life. [4-6] Farmers, in particular, have a likelihood of experiencing LBP, perhaps due to the physical demands of their work or biomechanical factors that require repetitive activities such as bending, twisting, and heavy lifting. [1,7,8] Furthermore, several studies have shown that LBP among farmers is a complex multifactorial condition that is influenced by a combination of occupational and non-occupational factors such as stress (psychological factors) and social factors (e.g., work environment). [9,10] Addressing these issues through musculoskeletal disorder-focused interventions can raise awareness among agricultural farmers, empowering them to effectively mitigate this disorder within the agricultural sector. Hence, intervention for LBP among farmers must be tailored to address the unique occupational context within the biopsychosocial (BPS) aspects of LBP framework. [11]

This multidisciplinary approach is supported by high-quality evidence; for example, a systematic and meta-analysis concluded that multidisciplinary BPS rehabilitation interventions are more effective than usual care (moderate-quality evidence) and physical treatments (low-quality evidence) in reducing pain and disability in people with LBP. [12,13] Another recent systematic review found that BPS interventions that prioritize psychosocial components, including pain cognition, modification of maladaptive beliefs, adaptive coping mechanisms, and the establishment of personalized goals, are more effective than education or advice alone and as effective as physical activity interventions for managing LBP. [14] Presently educational efforts often take a backseat to drug treatments, manual therapy, and surgery; hence, healthcare services should prioritize implementing strategies to educate individuals with pain, as well as employers, insurance systems, policymakers, and society as a whole. [15]An education-based paradigm should begin by offering information on functional recovery, tailored to patients' needs, while being backed by evidence-based practices. [8] Furthermore, comprehensive education should be integrated into treatment plans that emphasize restoration through measures and rehabilitation programs. [16] Therefore, a new definition of back care education (BCE) should encompass not only advice or cognitive behavioral change, but it should include physical activity or exercise training with empowerment and goal setting for patients to perform as a life-long lifestyle.

Developing BCE for agricultural farmers may be more complex due to their physically demanding nature of their activities. Several factors need to be considered that may tailor management guidelines specific to the nature of farming. For instance, some may need to use ergonomically designed tools that minimize strain on the lower back. [17] Generalized recommendations may not fully address the specific challenges for those who perform labor-intensive tasks such as bending, twisting, and repetitive movements, especially among farmers involved in planting and harvesting. Current LBP guidelines may not fully address biopsychosocial aspects of LBP, especially for agricultural farmers. While guidelines like NICE recommend self-management and pacing techniques, these are challenging to implement for farmers whose work is dictated by seasonal demands and unpredictable weather, often precluding the ability to pace activities or avoid strenuous tasks like harvesting. [18] Strategies also include maintaining activity levels, employing pacing techniques, and utilizing methods to protect the back from further injury. [19]

Based on this gap, we propose that BCE for agricultural farmers with LBP should include several key components, such as educating clients on the importance of physical activity and specific exercises, goal-setting, cognitive behavioral therapy, and ergonomic practices. The existing literature highlights the necessity for guidelines to extend beyond general recommendations and incorporate strategies that address the unique physical demands and ergonomic challenges encountered by farmers, encompassing the biopsychosocial factors. Therefore, this scoping review aims to map the current efficacy and strategies of BCE for farmers (Population) in managing LBP. We will analyse interventions compared to general or no intervention (Comparison), with the primary focus on outcomes related to pain reduction and functional improvement or quality of life. Studies published within the last decade were included to capture recent developments in BCE (Time). Consolidating evidence-based practices may provide physiotherapists and other healthcare professionals with tools to plan prevention and rehabilitation programs tailored to farmers with LBP. Moreover, the insights gained from this review are crucial for guiding research scholars toward areas that require in-depth investigation. From a policy-making standpoint, these findings establish a foundation for formulating and refining the biopsychosocial strategies that can be delivered via a series of BCE programs specifically designed for agricultural farmers.

Materials and methods

The scoping review was performed as the optimal methodological choice to comprehensively map the extent, nature, and characteristics of evidence regarding Back Care Education (BCE) for farmers with low back pain (LBP), identify knowledge gaps, and clarify conceptual frameworks within this field. This approach was selected due to the expected heterogeneity in interventions, outcomes, and study designs across the existing literature. [20] The review followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines, ensuring transparency, reproducibility, and methodological rigor. The methodological framework was informed by the recommendations of Peters et al. (2015) and incorporated into the following subsections. [21] The protocol consists of four stages; (1) Formulating the research question for the scoping review using PICOT (Table 1) as recommended. [22]; (2) Developing inclusion criteria; (3) Defining the search strategy; and (4) Summarizing the findings.

ELEMENT PICOT	Description
Population	Farmers with low back pain, back pain, particularly engaged with agricultural task (e.g., planting, harvesting, heavy lifting, grass, etc)
Intervention	Back education, back care education, self-care management, education, exercise component (e.g., stretching exercise, strengthening), patient education.
Comparison	Not applicable for scoping reviews; studies with or without a comparator were considered.
Outcome	Pain intensity, functional disability, quality of life, mental health, psychological health.
Time	Studies published between 2012 to 2024.

We focused our study on farmers who experience LBP, examining the strategies employed by patients and healthcare teams in their respective settings. To guide our research, we formulated the following review questions;

1. How effective is BCE in managing pain and enhancing functions among farmers?
2. What are the delivery methods used to provide BCE for farmers?
3. What specific topics are covered in BCE for farmers?

To identify studies, we established criteria for inclusion as the following;

1. The methodologies discussed should aim to promote BCE.
2. Studies were eligible if they specifically addressed BCE as an intervention for farmers with LBP, included comparative outcomes with other interventions or no intervention,

and reported pain, functionality, or quality of life measures as outcomes.

3. The target audience of these methodologies should be farmers with LBP (For this review, ‘farmer’,refers to individuals engaged in labour-intensive agricultural tasks such as planting, harvesting, and handling heavy materials regularly).
4. Studies must be written in English.
5. The effects of the BCE interventions should be reported.

We excluded studies that were:

1. Not specifically addresses BCE or interventions for managing LBP among farmers.
2. Non-farmer populations.
3. Case reports, case series, narrative reviews, opinion pieces, and editorials.
4. Non-English language studies, due to language constraints in the review process.
5. Absent of clear outcomes related to pain management, function, or quality of life.

To search for the relevant studies, we utilized PubMed, Scopus, and Google Scholar as databases from 2012 to 2024. We utilized the Medical Subject Headings (MeSH) and relevant keywords to ensure we obtained the targeted search. We combined terms using Boolean operators such, as "AND" and "OR". Our search string was structured as follows; ("Low Back Pain". "Farmers". "Health Education". Back Care Education") AND ("Program Development" OR "Intervention"). Our approach aimed to cover a range of literature while staying focused on the main topics of interest. Studies were included if they addressed BCE as part of a broader intervention, allowing a comprehensive review of education’s role within diverse approaches to LBP management. While BCE was the main intervention of interest, studies incorporating complementary interventions were included if they provided distinct outcomes relevant to back care and functional improvement.

We initially identified a total of 1,395 records. Mendeley software was used to manage these records effectively and eliminate duplicates. The data from the final studies included in the review were then extracted and charted to discern themes and issues from each study. We developed a data extraction table following the recommendations of Peters et al (2015).(21) The table consisted of details of the following; the author(s), year of publication, country of origin, study objectives, population, research design, the BCE intervention regimes (such as frequency, intervals between sessions, and responsible parties), as well as the study outcomes.

To guarantee that our data extraction and analysis processes were consistent and dependable, and to limit potential biases in the review, we implemented a two-phase screening. Firstly, we involved two independent reviewers to perform a thorough examination of the information and address any inconsistencies through dialogue. A third researcher was engaged for further consultation, if additional clarification was required.

Results

Our initial search found a total of 1395 papers; however, after evaluating their titles and abstracts, only 18 papers were included for a full review (Fig.1). We independently read through the texts of these 18 papers, but eventually, we found 9 studies met the inclusion criteria. Among the excluded studies, one was not published in English and therefore did not meet the language inclusion criteria. Five studies did not specifically focus on farmers with low back pain (LBP) and thus did not align with the target population. The remaining three studies were excluded due to their non-experimental nature; these were narrative reviews that did not involve any form of intervention, which was a core inclusion criterion for this review. The included studies varied considerably in terms of design (randomized controlled trials, quasi-experimental studies), intervention type (e.g., BCE only vs. BCE combined with exercise or ergonomic adjustments), and target populations (e.g., rice farmers, clam farmers, general rural farmers).

Table 1 shows the 9 studies included in this scoping review; three were randomized controlled trials, [23-25] one was semi-experimental, [26] one was a quasi-experimental, [27] one was experimental, [28] one was a survey and educational intervention, [29] and two were pilot studies.[30,31]

The majority of the included studies have examined the use of BCE or patient education as an intervention for farmers. [23-25,27-29,31] These studies compared BCE with a control approach. In contrast, one study focused exclusively on evaluating the outcomes of self-management strategies as the intervention.[30] The considerable heterogeneity among the included studies—in terms of study design, intervention modalities, target populations, and geographical settings—substantially affects the interpretability and generalizability of the findings. This variability limits the ability to make direct comparisons across studies or to draw firm conclusions regarding the effectiveness of Back Care Education (BCE) among farmers with LBP. Nevertheless, such diversity underscores a critical research gap and emphasizes the necessity for more standardized, rigorously controlled, and contextually tailored research. Accordingly, this heterogeneity should not only be viewed as a limitation but also as a strong research justification for conducting further research, including the implementation of structured BCE programs tailored to specific populations, such as Indonesian rice farmers, to generate more consistent and applicable evidence.

How effective are BCE in managing pain and enhancing functions among farmers?

The included studies in the review consistently demonstrated the effectiveness of BCE in improving clinicals outcomes (Table 2). Pain reduction was a significant finding across multiple studies, with one reporting a 24% decrease in pain scores,[26] and another noting a significant reduction in pain intensity following a linguistically-adapted BCE program.[23] Functional improvement was also widely reported, with interventions leading to decreased functional disability,[23] and enhanced LBP prevention behaviors.[27] Furthermore, participatory ergonomic approaches were found to be feasible and effective in simultaneously reducing pain and improving productivity. [30]

What are the delivery methods used to provide BCE for farmers?

The delivery methods for BCE varied among the studies (Table 3). BCE delivery methods were diverse and could be categorized into three main approaches. 1) Face-to-Face Education: The most common method involved direct interaction, often delivered in the farmers' local language and enhanced with practical demonstrations, lectures, and visual aids.[23,25,31] 2) Technology-Assisted Delivery: Some studies utilized modern technology, including mobile applications for self-exercise programs.[24] and video-based feedback for developing self-management strategies.[30] 3) Multi-Modal Approaches: Several interventions combined methods, integrating face-to-face discussions with educational materials like booklets and audio-visual content.[27,31] This diversity highlights the adaptability of BCE to varying contexts, resources, and literacy levels.

What specific topics are covered in BCE for farmers?

The specific topics covered in BCE varied among the studies (Table 3), reflecting the diverse needs and settings of the farming populations. The content of BCE programs was comprehensive, generally encompassing three thematic domains. 1) Biomechanical and Ergonomic Principles – This domain emphasized job-specific ergonomics, including proper lifting techniques, postural correction during farming tasks, and working behave modification tailored to agricultural work demands.[23,27,30] 2) Therapeutic Exercise – Programs frequently incorporated active components, such as stretching routines, core stabilization exercises, and motor control training aimed at improving functional capacity and reducing injury risk.[25-27] 3) Psychosocial and

Self-Management Education – Education in this domain addressed fundamental spinal anatomy, the neuroscience of pain, postural hygiene, and self-management strategies to foster autonomy and long-term adherence.[25,31]

Discussion

This scoping review shows that while ergonomic and physical interventions are crucial, back pain management in farmers may benefit from a holistic approach that incorporates psychological and social support, as stress coping mechanisms and access to resources also influence pain and disability outcomes.[9,10,15] BCE interventions appear generally effective in reducing pain and improving functionality, particularly when delivered through participatory, hands-on approaches and tailored to the farming context.[30] Rostami et al demonstrated improvements in productivity and pain reduction through active learning and ergonomic strategies—findings consistent with broader occupational health literature, which emphasizes participatory and context-specific approaches for optimal health outcomes.[33]

Significant reductions in back pain and functional disability, as reported in culturally adapted programs for Thai rice farmers,[23,26] highlight the role of behavioral and physical conditioning components in enhancing back health.[33] However, the absence of a formal quality assessment in this review limits the strength of conclusions, and the diversity of interventions and populations underscores the need for methodological rigor in future research.

Compared with other occupational groups, farmers seem to benefit more consistently from BCE, possibly because agricultural work allows for immediate application of ergonomic and exercise-based strategies. Nevertheless, the variation in program delivery—from active learning and face-to-face lectures to mobile applications—reflects a growing recognition of the need for flexibility and accessibility in rural communities.[24] Technology-based approaches offer potential to extend program reach, but their effectiveness relative to traditional methods remains uncertain. Evidence from e-health and m-health interventions suggests promise for promoting healthy behaviors and self-management, yet their applicability to farming populations warrants further evaluation.[33] Face-to-face interventions may have advantages for complex lifestyle changes, offering real-time feedback, tailored messaging, and trust-building between educator and participant. A meta-analysis comparing face-to-face and remote interventions found higher adherence and greater behavioral change in face-to-face formats for interventions requiring significant lifestyle adjustments.[34] These insights suggest that BCE delivery should balance accessibility with the level of engagement needed to achieve meaningful outcomes.

The range of topics in BCE programs—ergonomic strategies, self-management, anatomy, postural hygiene—reflects the multifaceted nature of LBP prevention in farming,[27,30,35] Yet, notable content gaps remain. For example, Ayanniyi and Ige (2015) focused on back anatomy and biomechanics but omitted definitions and causes of LBP, farming ergonomics, self-care strategies, and specific exercises. Including these elements alongside physical training could create a more comprehensive approach. The variation in content points to a lack of standardization, which limits comparability and generalizability across studies. Demographic and regional differences further complicate implementation, as farming practices, environmental conditions, and cultural norms can shape both LBP risk and intervention effectiveness. Tailoring BCE to regional agricultural contexts, while identifying core universal components, may improve both relevance and impact.

LBP poses significant disability and economic challenges for farmers.[32] Understanding regional variations in farming practices is critical to identifying activity-specific causes and consequences of LBP and developing multifaceted prevention and treatment strategies. Although specific guidelines for LBP management in farming are scarce, the findings of this review offer a preliminary evidence base for integrating BCE into occupational health programs. Such initiatives could be supported through agricultural cooperatives, community health networks, and local extension services to enhance adoption and sustainability.

This review did not include a formal quality appraisal of included studies, limiting the strength of evidence. Heterogeneity in study designs, intervention content, and outcome measures also restrict comparability. Many studies were conducted in homogeneous populations within single regions, and follow-up periods were generally short. Future research should: Develop standardized BCE frameworks with core components adaptable to local contexts. Incorporate psychological and social support strategies into BCE content. Compare the long-term effectiveness of technology-based, and face-to-face delivery modes among farming populations. Conduct high-quality trials with diverse farming groups and longer follow-up periods. By addressing these gaps, BCE interventions can be made more targeted, impactful, and scalable, ultimately reducing the burden of LBP among farmers.

Conclusion

The findings of this review suggest that BCE, particularly when tailored to the physical demands of farming, holds promise for reducing pain intensity and enhancing functionality among agricultural farmers. However, due to the heterogeneity and methodological limitations of the included studies make it difficult to draw definitive conclusions about efficacy. Furthermore, the under-representation of key aspects such as home-based exercises, ergonomic training, self-care strategies, and occupationally relevant advice indicates an area deserving of future research.

While the review indicates that BCE can reduce pain and improve function among farmers, the heterogeneity in study designs and populations and interventions suggests a need for more targeted, context-specific research. Future studies should aim to standardize intervention components to better compare BCE efficacy across different agricultural settings while addressing the biopsychosocial aspects of the development of BCE. Healthcare providers and policymakers should consider integrating BCE into routine health education for farmers to reduce the burden of LBP and improve functional outcomes. Especially within the policy sector, government-driven actions are essential, and it is important for agricultural workers to recognize that safety and ergonomic considerations hold equal significance to productivity concerns. This review has several limitations, including the restriction to English-language studies and the potential variability in the methodological quality of the included studies.

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Authors' contributions

All authors contributed to the conception, design, data collection, analysis, and writing of the manuscript. All authors reviewed and approved the final version.

Conflict of interest

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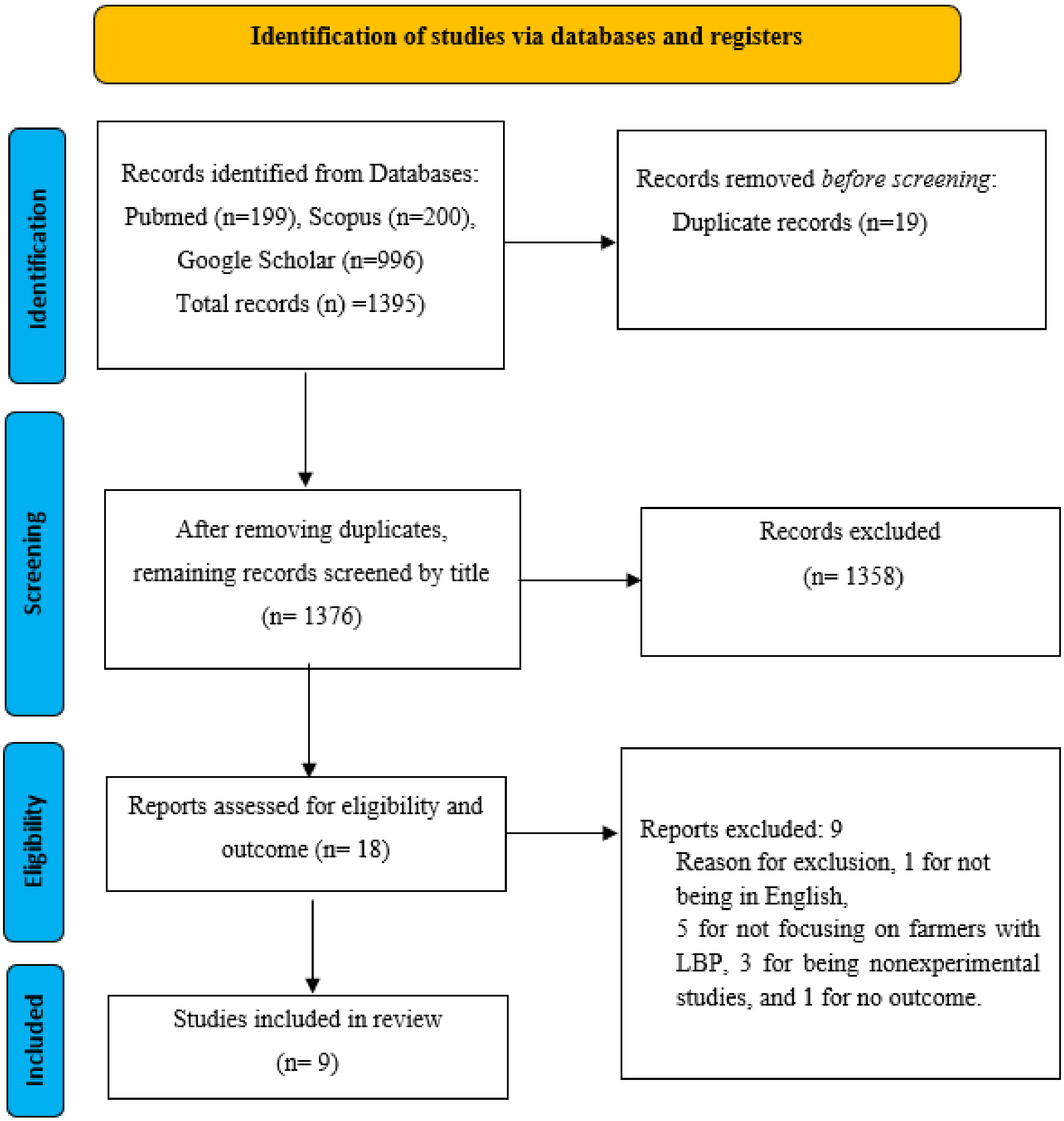

Figure 1. PRISMA flow diagram showing the literature search and selection of studies.

Table 1. Characteristics of study included in the scoping review (Target population, Delivery design sample size, results)

Authors	Study Design	Location/Setting	Target Population	Delivery Design	Sample Size	Results	Research Gaps
Dunleavy et al., (2021)	Pilot Study	Florida, America	Agriculture and Aquaculture clam farmers Age 34 years with 9.5 years of experience Male Farmers	Active learning using video examples and feedback. A rapid prototype participatory ergonomic approach was utilized to design self-management strategies tailored to the specific work context. Methods for adapting lifting techniques and mitigating repetitive stress were conveyed through video presentations, live demonstrations, and interactive discussions within the workplace	N=19	Team strategies were preferred, yet individual methods were used more frequently. They were easy to use, accepted, and consistently applied, improving productivity and reducing pain. Challenges included changing habits, culture, and team dynamics.	Potential gaps need stronger methodological approach, such as randomized control trial to expanding the sample size or designing the study with a more precise control group according to strict inclusion and exclusion criteria
Baek et al., (2020)	Two-phase randomized control trials (MODE-I and MODE-II).	Rural areas in Gangwon-do, South Korea	Female farmers, aged 41-70 years, using smartphones.	Delivered through a mobile application (app) and booklets, providing a tailored self-exercise program for musculoskeletal health.	200 participants planned, divided into experimental and control groups in both phases.	No publications containing the results of this study have been published or submitted to any journal. The study aims to assess the effectiveness of the app-delivered self-exercise program compared to traditional booklets, and the additional benefit of real-time feedback via the app	Potential gaps include the need for individual randomization of participants and controlling treatment received by the control group.

Ibrahim et al., (2023)	RCT	Tsakuwa Primary Health Care Center, Kano State, Northwestern Nigeria	Adults with chronic low back pain, both male and female, aged 18-70.	Lecturer/Class Visual aids such as slides or prepared diagrams were be used where necessary to aid descriptions. Intervention delivered through	120 participants, randomized into MCE + PE, MCE, or PE groups. MCE plus PE=40 MCE =40 PE groups=40	Primary outcome, NPRS, ODI, Secondary outcome Quality of Life PCS, MCS, GRCS, FABQ-FABQ-W, PCS, BBQ	This study was conducted in a rural Nigerian setting, so its applicability to populations in other countries with different socioeconomic structures and healthcare delivery systems is limited, differences in demographic factors with other countries can be a consideration for future research in different countries
Izadirad et al., (2018)	Semi-experimental study	Aq-Qala, Golestan Province, Iran	Farmers Age 30-60 years General rural farmer Male & Female farmers.	Lecturer Physical education instructor/trainer about corrective exercise training/ Intervention group participated in an 8-session sports training program.	N=100 BG=50 CG=50	The intervention group showed a significant reduction in back pain by 24% after the exercise program	The study highlights the effectiveness of exercise training in reducing low back pain among farmers, suggesting the need for broader application and evaluation of similar programs in different settings.
Ibrahim et al., (2018)	pilot study randomized clinical trial	Tsakuwa village of Dawakin-Kudu Local Government Area, Kano state,	Male & female between 18-65yold,	Physiotherapist instructed for MCE 20-30 min, stretching 20 min per session, aerobic (walk) 30 min PE 60 minutes.	N=30 PE=10 MCE=10 MCE+PE=10	MCE+PE was more effective than PE for pain group, and MCE for disability group.	Need larger samples and different trial considering the demographics in different countries such as Asia.

		northwestern Nigeria					
Ayanniyi & Ige, (2015)	Randomized Controlled Trial.	Rural farming communities located in the Ibarapa East Local Government Area of Oyo State, Nigeria.	Male peasant farmers with chronic mechanical low back pain. /Peasant farmers in rural communities Age 25-60 years General agriculture Male peasant farmers	BCE was delivered face-to-face in the local language (Yoruba), with practical demonstrations using human models and posters.	A total of 247 participants were initially enrolled, with 126 assigned to the back care education group and 121 to the control group; the final analysis comprised 200 participants, evenly split with 100 in each group	Reduce in pain intensity and functional disability in the BCE group compared with the control group.	Potential gaps include the need for individual randomization of participants and controlling treatment received by the control group.
Nochit et al., (2014)	A quasi-experimental, two group pre-test & post-test group design	Province central Thailand and involved in rice cultivation.	Rice farmers Age Mean Experiment (mean age = 47.13; SD = 7.14 and control 46.75; SD = 6.77) Male & Female farmers	The intervention included an educational program and a back stabilization exercise regimen. The experimental group participated in the program grounded in Protection Motivation Theory, while the control group received standard information	N=80 BG=40 CG=40	The results show that this program can improve behaviors for preventing low back pain and increase back muscle endurance among Thai farmers	Potential gaps include the need for individual randomization of participants and controlling treatment receive.
Parekh & Phatak (2014)	Experimental design (study comparative)	District Vadodara, Gujarat, India	Farmers Age 30-50 years General Agricultural farmers	Lecturer before active learning about Ergonomic Intervention And Physiotherapy plus ergonomic	N=30 BG=15 CG=15	This study concludes that combining physiotherapy with ergonomic	Potential gaps include the need for individual randomization of

			Male Farmers			interventions leads to greater improvements in pain relief and functional performance for farmers suffering from chronic low back pain.	participants and controlling treatment receive.
Vyas, (2012)	Survey and educational intervention study.	Agricultural fields in India.	Male and female agricultural workers. Aged 35-40 years	Educational intervention using audio-visual aids and printed literature in Hindi.	N= 120 Male=60 Female= 60	The study aimed to assess musculoskeletal problems and body discomfort and the effectiveness of an educational intervention.	Further research could focus on long-term effects of such interventions and inclusion of more diverse agricultural settings.

N: Sample; BG: Treatment Group; CG: Control Group; MCE: Motor Control Exercise; PE: Patient Education

Table 2. Characteristics and main results of the educational activities from the reports included in this study

Authors	Contents of activities	Frequency/ Number of activities/Meetings	Duration of each meeting	Educator	Observed Outcomes (Outcome measures)	Remarks (Drop-outs/ Adverse events/etc)
Dunleavy et al., (2021)	Rapid prototype list of tasks and strategies to develop self-management and ergonomic strategies. 1. Review of existing video 2. Observation and video of task 3. Interview key stakeholders 4. Selection of outcome measure The most common work activities regarded as difficult due to back pain were: lifting bags onto/off the boat, moving baskets or boxes, standing while working	An accelerated participatory ergonomic method to create tailored self-management strategies over 8 weeks.	Adjust the time of day and working hours per week	Research Assistant qualified, not mention	PSFS Functional PSFS Pain ODI VAS PSS PSEQ-2 CSQ	19 Subjects Totals. 9 dropped out, about 32% from 28 people with 7 teams, 3 people were excluded for not meeting the scores in phase 1, 3 people resigned due to unrelated medical issues, and 3 people quit their jobs leaving
Baek et al., (2020)	Individualized exercise programs for shoulder, knee, and low back, with exercises varying in type, frequency, and intensity. 3-level Exercise for low back ½ Bird-dog easy Abdominal exercise easy Side-bridging exercise easy 3 Supine bridging 4 Plank	Mode I 3-month self-exercise using a smartphone app or physical education data (booklets). Mode II 9-months app-delivered + feedback/non-feedback	Total 6 exercises per day); frequency: 3 times per week; duration: 20 min/day; and intensity.	Not mentioned, as it's a self-exercise program guided by an app or booklet.	Completion rate of the exercise program, musculoskeletal pain and disability, and health behavior changes. Reduce pain, improve disability, and Depression. Low Back Outcome 1. SPADI 2. WOMAC 3. TUG 4. NRS 5. Muscle & Fat Mass 6. ODI	Includes assessments of musculoskeletal pain, disability, and health behaviors at multiple time points; also, mention of the potential of remote health management.

					7. PHQ	
Ibrahim et al., (2023)	1. Interactive Session/discussion, question 2. Basic anatomy, pain causation 3. Basic pain education 4. Returning to work and maintaining activity levels 5. Self-care skills 6. Postural modification 7. Lifestyle modification 8. Review information and application	PE once a week for 8 weeks (8 sessions) Stretching and MCE were twice a week for 8 weeks (16 sessions) Aerobic Exercise 5 times per week (8 weeks)	PE 60 and 80 minutes per session Stretching for 20 minutes MCE 30 minutes per session Aerobic exercise for 30 minutes	Physical education supervised	Primary outcome, NPRS, ODI, Secondary outcome Quality of Life PCS, MCS, GRCS, FABQ-FABQ-W, PCS, BBQ	MCE plus PE=37 2 no longer interested, 1 time commitment. MCE =38 2 samples drop out due to time commitment. PE groups=38 1 no longer interested, 1 unknown.
Izadirad et al., (2018)	Corrective exercise training Strengthening the abdominal muscles and back extensors. The intervention included an exercise training program focusing on the waist region.	2 months with 8-week corrective exercise training program. Not specified, but the program consisted of 8 sessions.	Warming up and light stretching from 5 to 10 minutes, tensile training 20 to 25 minutes, and returning to the initial 5 to 10 minutes In total, 45 minutes. Not specified.	Physical education instructor.	Prevalence of low back pain measured using the Nordic questionnaire.	Significant difference in the reduction of back pain in the intervention group compared to the control group.
(Ibrahim et al., 2018)	1. Interactive session/discussions/question 2. Meaning of LBP 3. Common facts about LBP 4. Common beliefs about LBP 5. Basic anatomy 6. Pain causation 7. Basics of pain 8. Get back to activities and stay active. 9. Pain coping and pacing	PE once a week for 6 weeks (6 sessions) MCE was twice a week for 6 weeks (12 sessions) Aerobic Exercise and stretching were instructed to perform	MCE 20-30 min, stretching 20 min per session, aerobic (walk) 30 min PE 60 minutes	Physiotherapist experienced (Licensed)	NPRS, ODI	MCE n=9, 1 loss to follow up with unreachable PE n=10, MCE+PE n=9, 1 reason: health problem.

	10. Self-management 11. Postural hygiene 12. Increasing activity level 13. Lifestyle modification 14. Indicators of low back pain and recommended actions 15. Summary of discussions and practical applications.	home program, 5 times per weeks.				
Ayanniyi & Ige (2015)	Focused on anatomy of the back, biomechanical principles, proper lifting techniques, good postures for farming activities, and specific prophylactic instructions.	Weekly for the first three weeks, then once every two weeks for the next four weeks.	45 minutes to 1 hour.	Two principal investigators delivered the instruction.	Pain intensity and functional disability, assessed using the Chronic Pain Questionnaire.	Twelve participants withdrew from the back care education group, while no attrition occurred in the control group. The study was prematurely terminated due to participants' engagement in farming activities.
Nochit et al., (2014)	Working Behavior Modification Program. 1. Education and discussion about severity of LBP 2. Teaching and skill training of proper working postures 3. Stabilization Back Exercise 4. Self-practice and group exercise once a week. 5. Training of advanced SBE. 6. Follow up through home visits 2 times a week	The Working Behaviors Modification Program: 9 weeks to evaluation	Working Behaviors Modification 30-90 minutes	Research Assistant qualified, not mention	1. LBP-PBQ 2. PDSRT	To address the possible loss of participants, this study participants were added (20% of minimal sample size) 80 participants 40 per group
Parekh & Phatak (2014)	1. Take periodic short rest intervals, such as a 5-minute break after every hour of activity. 2. Workers/Laborers should transport seedlings or crops on their backs instead of	Ergonomic intervention for 4 weeks. Ergonomic Plus Physiotherapy 2 sessions/ week, up to 4 weeks.	Duration of each meeting Not mention	Research Assistant qualified, not mention	1. VAS 3. ODI	30 participants with 15 for ergonomic intervention and 15 for ergonomic plus physiotherapy

	their heads, considering the use of suitable backpacks. 3. Alternate between tasks with low repetition and those involving repetitive movements. 4. Sitting while working helps reduce strain on the lower back and legs. 5. Perform squats with heels flat on the ground. 6. Proper lifting technique involves holding the load at a level that falls between the hands and shoulders. 7. For efficient handling, bags, vegetable boxes, and frequently accessed chemicals can be moved using roller conveyors. 8. Bend the knees at a 90-degree angle. 9. To reduce discomfort, avoid sitting continuously in the same posture for over 30 minutes					
Vyas (2012)	Educational program and knowledge Safety and Hazards in Agriculture Work; land preparation, sowing, irrigation, plant protection, weeding, harvesting, Awareness of musculoskeletal disorders (MSDs), hazards, and safety during agricultural work.	Awareness of musculoskeletal disorders (MSDs), hazards, and safety during agricultural work.	Not specified.	Not specified.	Not specified. Analysis Musculoskeletal disorder and body discomfort 1. BPDS 2. VAD	Emphasized on the need for awareness and education about MSDs in agricultural work.

SPADI: Shoulder Pain and Disability Index; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index: TUG: Time UP and Go; NRS: Numerate Rating Score; ODI: Oswestry Disability Index; PHQ: Patent Health Questionnaire; BPDS: Body Part Discomfort Score; VAD: Visual Analogue Discomfort; NPSR: Numerical Pain Rating Scale; LBP-PBQ: Low Back Pain Prevention Behaviors; PDSRT: Prone Double Straight-leg Raise Test; PSFS: Patient-Specific Functional Scale; VAS: Visual Analogue Scale; PASS: Pain Anxiety Symptom Scale; PSEQ-2: Short-form pain self-efficacy questionnaire; CSQ: Coping strategies questionnaire PCS-12; Physical component summary-12, MCS-12; Mental health component summary-12, GRCS; Global rating of change scale, FABQ-PA; Fear-avoidance beliefs questionnaire – (physical activity), FABQ-W; Fear-avoidance beliefs questionnaire – (work), PCS; Pain catastrophizing scale, BBQ; Back beliefs questionnaire

Table 3. Contents of back care education

Authors	Contents of Back Care Education										
	A & P	Definition Causes Symtomps	Lifting Technique	Postural awareness	Ergonomics of farming	Self-Care Management	Pain & Disability	Exercise			Special Instructions (See Table below)
								Postural correction	Core Stability	Stretches	
Dunleavy et al., (2021)	none	NONE	lifting bags onto/ off the boat moving basket or boxes	Standing while working	none	none	none	none	none	none	Orally & Video
Baek et al., (2020)	none	none	none	none	none	none	none	none	Bird-dog easy Abdominal exercise easy Side-bridging exercise easy Supine bridging Plank	none	Video & written
Ibrahim et al., (2023)	Basic anatomy	none	none	Postural awareness control	NONE	Self-management	Basics of pain & causation	none	Drawing-in maneuver	Double knee to chest stretch Piriformis stretch Hamstring,erector spinae stretch Hip adductor stretch Triceps surae stretch, Prone on elbow Trunk Rotation Trunk Extension	Orally & written
Izadirad et al., (2018)	none	none	none	none	none	none	none	Corrective Exercise	Strengthening abdominal & back Extensor muscle	none	Orally

Ibrahim et al., (2018)	Basic anatomy	none	none	Postural hygiene	NONE	Self-management	Basics of pain & causation	none	Motor Control exercise with Abdominal drawing-in maneuver	Double knee to chest stretch Piriformis stretch Hamstring,erector spinae stretch Hip adductor stretch Triceps surae stretch, Prone on elbow Trunk Rotation Trunk Extension	Orally & written
Ayanniyi & Ige (2015)	Back anatomy and biomechanical principles of the spine, harmful postures and activities, and prevention methods. "	none	Proper and safe lifting techniques for carrying loads.	Proper postures that promote back health during various farming tasks and everyday activities like bathing, sitting, and getting in and out of bed.	none	none	none	none	none	none	Orally & Written
Nochit et al., (2014)	none	none	none	Proper working posture	none	none	none	none	Stability Back Exercise	none	Orally & Demonstration
Parekh & Phatak, (2014)	none	none	none	none	Ergonomic interventions	none	none	none	none	none	Orally

Vyas (2012)	Safety and Hazards in Agriculture Work including land preparation, sowing, weeding irrigation, plant protection, harvesting	none	none	none	none	none	none	none	none	none	Audio Visual & Written

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