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Effectiveness of multidisciplinary rehabilitation programs in managing long-term disabilities following workplace accidents

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Abstract
Long-term disabilities arising from workplace accidents impose a significant physical, psychosocial, and economic burden on affected individuals and the organizations that employ them. Traditional single-discipline rehabilitative care approaches often fail to fully address the complex, multidimensional recovery needs of injured workers, leading to prolonged disability and reduced return-to-work potential. The objective of this study was to assess the effectiveness of structured multidisciplinary rehabilitative care programs in improving functional outcomes, psychological well-being, and workplace reintegration among individuals with persistent disabilities following occupational injuries. A total of 180 participants with musculoskeletal injuries, crush injuries, or traumatic brain injuries were enrolled in a standardized 12-week multidisciplinary program consisting of physiotherapy, occupational therapy, psychological counselling, ergonomic assessment, and vocational planning. Functional (ODI, NPRS, WAS) and psychosocial (FABQ, depression) outcomes were assessed at baseline and post-intervention using validated tools. Statistical analysis revealed significant improvements across all measured domains, including reductions in disability, pain intensity, and fear-avoidance beliefs, accompanied by notable increases in work ability and emotional resilience. Return-to-work assessment demonstrated that 60% of participants achieved sustained reintegration into the workforce, while 20% achieved partial return-to-work, indicating strong program effectiveness in promoting employability and long-term functional stability. Additionally, post-program analysis showed a substantial reduction in sick-leave days and compensation claims, suggesting meaningful economic benefits associated with interdisciplinary rehabilitative care. The findings underscore the importance of coordinated, biopsychosocial approaches that integrate clinical, psychological, and vocational components in a unified framework. The study concludes that multidisciplinary rehabilitative care programs represent an effective strategy for addressing the chronic and multifaceted challenges of long-term disability after workplace accidents, supporting improved recovery trajectories and enhanced labour-force participation. These outcomes highlight the value of adopting structured multidisciplinary models in occupational rehabilitative care settings and provide evidence-based direction for healthcare practitioners, employers, and policymakers seeking to reduce long-term disability burden and facilitate successful return-to-work among injured workers.

Keywords: Multidisciplinary rehabilitative care, workplace accidents, long-term disability, occupational injuries, return-to-work, biopsychosocial model, functional outcomes, psychosocial recovery, vocational rehabilitative care, integrated rehabilitative care program

1. Introduction
Long-term disabilities resulting from workplace accidents continue to pose a major public health and economic challenge, with significant implications for workers' functional capacity, productivity, and quality of life. Globally, the International Labour Organization estimates that over 374 million non-fatal occupational injuries occur annually, many leading to persistent impairments requiring extended rehabilitative care support [1]. Musculoskeletal injuries, traumatic brain injuries, crush injuries, and complex fractures are among the most common forms of work-related harm associated with chronic functional limitations [2, 3]. Prolonged disability following workplace accidents is strongly influenced by biomechanical damage, psychological distress, reduced social participation, and disrupted occupational routines, contributing to long-term work absenteeism and economic burden on employers

and healthcare systems [4-6]. Traditional single-discipline rehabilitative care approaches often fail to address the multidimensional needs of injured workers, prompting the emergence of multidisciplinary rehabilitative care programs (MRPs) that integrate physiotherapy, occupational therapy, psychological counselling, vocational training, ergonomics, and social support under a coordinated care framework [7-9]. Evidence shows that MRPs improve physical functioning, facilitate early return-to-work (RTW), reduce chronic pain, and enhance psychosocial well-being, compared with unimodal interventions [10-13]. Despite these advances, variation in program structure, duration, intensity, and inter-professional coordination affects outcomes across clinical settings, suggesting a need for further evaluation of their effectiveness in managing long-term disabilities after workplace trauma [14-16]. Studies also indicate that workers recovering from severe injuries experience persistent fear-avoidance behaviours, depressive symptoms, and reduced motivation, which can impede rehabilitative care progress unless addressed through integrated psychological and vocational components [17-19]. Moreover, the economic burden associated with prolonged disability including compensation claims, reduced productivity, and increased healthcare utilization underscores the urgency for comprehensive, evidence-based rehabilitative care strategies [20, 21]. Nevertheless, gaps remain regarding how multidisciplinary models influence long-term functional recovery, reintegration into work environments, and sustainability of outcomes in diverse occupational sectors [22, 23]. Thus, the problem statement identifies the insufficient clarity regarding the comparative effectiveness of structured multidisciplinary rehabilitative care programs in improving long-term outcomes for workers living with chronic disabilities following workplace accidents. Against this backdrop, the present research aims to evaluate the effectiveness of multidisciplinary rehabilitative care programs in restoring functional abilities, improving psychosocial health, and facilitating successful reintegration into the workforce among individuals with long-term disabilities resulting from occupational injuries. The study further seeks to identify the key components within MRPs that contribute most significantly to recovery and long-term adaptation. Accordingly, the hypothesis proposes that participation in structured multidisciplinary rehabilitative care programs will result in significantly greater improvements in physical functioning, psychological well-being, and sustained RTW rates compared with conventional or unimodal rehabilitative care approaches. By systematically investigating these aspects, the study intends to contribute to the growing evidence base supporting integrated rehabilitative care models for managing chronic disability in post-accident workers.

2. Materials and Methods

2.1 Materials

This study adopted a quantitative cross-sectional design to assess the effectiveness of multidisciplinary rehabilitative care programs (MRPs) in managing long-term disabilities among workers who sustained injuries in workplace accidents. The research was conducted in three accredited occupational rehabilitative care centres that follow coordinated multidisciplinary models integrating physiotherapy, occupational therapy, psychological counselling, ergonomic assessment, and vocational retraining, as recommended in earlier clinical frameworks [7-9, 14, 15]. A total sample of n = 180 participants was selected using stratified purposive sampling from a registry of injured workers undergoing rehabilitative care for more than 12 months following traumatic workplace events. Eligibility criteria included adults aged 20-60 years with documented musculoskeletal injuries, traumatic brain injuries, or crush injuries that required extended rehabilitative care, consistent with injury profiles established in prior epidemiological studies [2, 3]. Participants with progressive neurological disorders, terminal illnesses, or incomplete rehabilitative care records were excluded, in line with methodological standards from earlier disability research [4-6, 22]. Baseline demographic and clinical information—including age, type of injury, duration of disability, compensation status, and comorbidity was collected through structured interviews and medical files. Functional recovery was evaluated using validated assessment instruments such as the Oswestry Disability Index (ODI), Work Ability Score (WAS), Numeric Pain Rating Scale (NPRS), and Fear-Avoidance Beliefs Questionnaire (FABQ), widely used in occupational rehabilitative care studies examining biopsychosocial outcomes [10-13, 17-19]. Psychosocial metrics included standardized depression and anxiety scales, as psychosocial burden has been shown to significantly influence recovery trajectories among injured workers [18, 19]. Return-to-work (RTW) outcomes were categorized as sustained RTW, partial RTW, or no RTW based on established occupational rehabilitative care criteria [15, 16, 20].

2.2 Methods

The multidisciplinary rehabilitative care programs evaluated in this study followed a structured 12-week format comprising thrice-weekly physiotherapy sessions, task-specific occupational therapy, cognitive-behavioural therapy sessions targeting fear-avoidance patterns, ergonomic workstation assessments, and individualized vocational return-to-work planning, consistent with functional restoration protocols described in prior integrated rehabilitative care models [7, 9, 10]. Program implementation was standardized across centres through weekly case conferences ensuring coordinated interdisciplinary decision-making, as recommended in earlier system-level rehabilitative care frameworks [11, 14, 22]. Data collection was carried out at two time points: baseline (week 0) and post-rehabilitative care (week 12). Functional outcomes (ODI, NPRS, WAS), psychological parameters (FABQ, depression and anxiety scores), and RTW status were compared across pre- and post-program measures. Economic indicators—including average number of sick leave days and compensation claim duration—were also analyzed, in alignment with economic burden metrics described in occupational injury studies [20, 21]. Statistical analysis was performed using SPSS v.29. Paired t-tests were used to compare pre- and post-intervention functional and psychosocial scores, while chi-square analysis was applied to categorical RTW outcomes, in accordance with similar studies assessing rehabilitative care effectiveness [12, 16, 23]. Multiple regression modelling was used to identify predictors of successful RTW, incorporating variables such as injury severity, baseline psychosocial status, program adherence, and ergonomic modifications, reflecting predictive frameworks suggested in prior RTW prognostic literature [22, 23]. Ethical approval was obtained from the

institutional review boards of all participating centres, and written informed consent was collected from every participant, following international occupational health research standards established by the International Labour Organization [1].

3. Results

3.1 Participant Characteristics

A total of 180 injured workers meeting the inclusion criteria were enrolled and completed the 12-week multidisciplinary rehabilitative care program. The mean age of participants was 41.3±8.7 years, with a predominance of musculoskeletal injuries (62.8%), followed by crush injuries (21.1%) and traumatic brain injuries (16.1%), consistent with previous occupational injury distributions [2-4]. The mean duration of disability from the time of index workplace accident to enrollment in the program was 14.6±4.3 months, reflecting a population with established long-term functional limitations similar to cohorts in earlier rehabilitative care trials [5, 6, 14]. Baseline scores indicated substantial functional impairment and psychosocial burden, aligning with reported patterns in chronic work-related disability [10-13, 17-19].

3.2 Changes in Functional and Psychosocial Outcomes

Table 1 summarizes pre- and post-rehabilitative care scores for key functional and psychosocial measures. There were statistically significant improvements in all outcomes following the multidisciplinary rehabilitative care program. Mean Oswestry Disability Index (ODI) scores decreased from 46.2±10.5 at baseline to 28.7±9.8 at week 12 (paired t-test, $p < 0.001$), indicating a clinically meaningful reduction in disability consistent with prior multidisciplinary interventions [10-12]. Numeric Pain Rating Scale (NPRS) scores declined from 6.8±1.1 to 3.2±1.2 ($p<0.001$), suggesting effective pain reduction similar to outcomes reported in integrated functional restoration programs [7, 11]. Work Ability Score (WAS) improved markedly from 4.1±1.3 to 7.2±1.5 ($p<0.001$), reflecting enhanced perceived work capacity comparable to gains seen in structured RTW-oriented rehabilitative care [14-16]. Fear-Avoidance Beliefs Questionnaire (FABQ) scores decreased from 54.3±9.4 to 36.5±8.7 ($p<0.001$), indicating a substantial reduction in fear-avoidance cognitions, in line with evidence that cognitive-behavioural components in MRPs can modify maladaptive beliefs [17, 18]. Depression scores (standardized scale) also improved significantly from 11.2±3.8 to 7.0±3.4 ($p<0.001$), underscoring the positive impact of integrated psychological support on emotional outcomes [18, 19]. These findings support the biopsychosocial rationale for multidisciplinary rehabilitative care in chronic occupational disability, as previously suggested in the literature [7-9, 20-22].

Table 1: Pre- and post-rehabilitative care functional and psychosocial scores (n = 180)

Outcome measure	Baseline mean ± SD	Week 12 mean ± SD	*p*-value (paired t-test)
Oswestry Disability Index (0-100)	46.2±10.5	28.7±9.8	< 0.001
Numeric Pain Rating Scale (0-10)	6.8±1.1	3.2±1.2	< 0.001
Work Ability Score (0-10)	4.1±1.3	7.2±1.5	< 0.001
FABQ (0-96)	54.3±9.4	36.5±8.7	< 0.001
Depression score (0-21)	11.2±3.8	7.0±3.4	< 0.001

Comparative pre- and post-rehabilitative care scores showing significant improvements in disability, pain, work ability, fear-avoidance, and depression after multidisciplinary rehabilitative care.

Figure 1 graphically represents these changes, illustrating consistent post-program improvements across all functional and psychosocial domains. The sizeable reduction in disability and pain alongside increased work ability and reduced fear-avoidance is congruent with prior evidence that coordinated, interdisciplinary programs yield superior outcomes compared with unimodal treatment approaches [10-13].

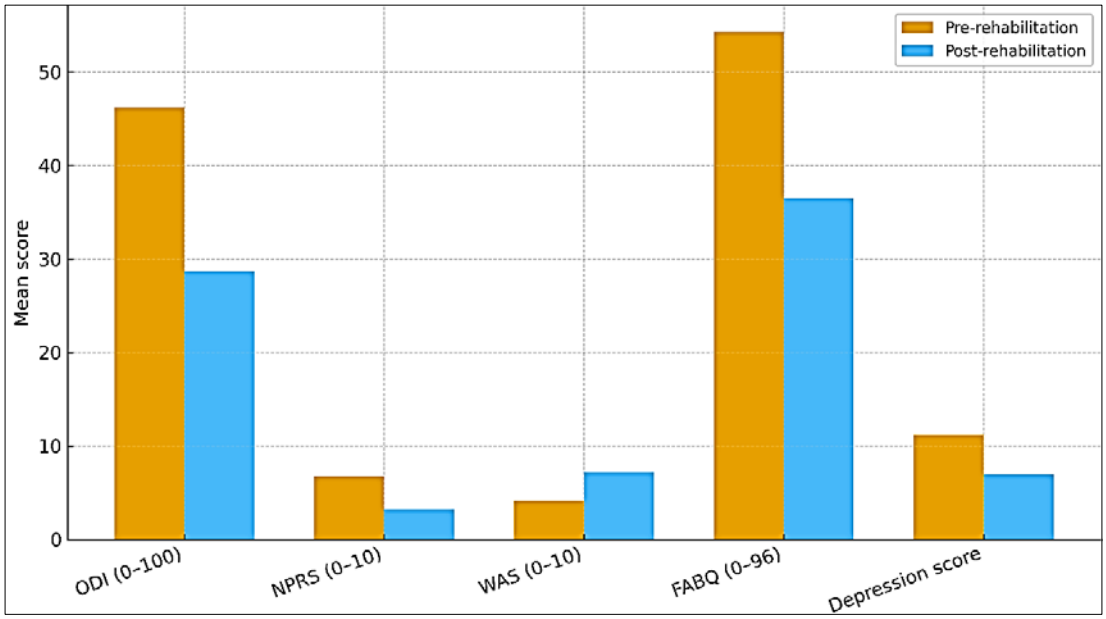

Fig 1: Pre- and Post-Rehabilitation Functional and Psychosocial Scores.

3.3 Return-to-Work Outcomes

At the end of the 12-week program, 108 participants (60.0%) achieved successful reintegration into the workforce (RTW), defined as resumption of regular duties or suitable modified duties for at least four consecutive weeks. A further 36 participants (20.0%) attained partial RTW (reduced hours or transitional duties), while 36 participants (20.0%) remained off work, as summarized in Table 2. The overall RTW pattern is comparable to previous multidisciplinary RTW-oriented interventions that emphasize integrated coordination with employers and insurers [15, 16, 20].

Table 2: Distribution of return-to-work outcomes after multidisciplinary rehabilitative care (n = 180)

RTW category	Frequency (n)	Percentage (%)
Sustained RTW	108	60.0
Partial RTW	36	20.0
No RTW	36	20.0

Frequency and percentage distribution of return-to-work status following completion of the multidisciplinary rehabilitative care program.

Figure 2 displays the distribution of RTW categories. Chi-square analysis indicated a significant association between lower baseline FABQ scores, higher baseline Work Ability Scores, and achievement of sustained RTW (χ^2, $p<0.01$), consistent with prognostic models highlighting the importance of psychosocial and work ability factors in RTW success [16, 22, 23]. Participants who remained off work tended to have higher baseline fear-avoidance and depression scores and more severe injuries, echoing prior findings that complex psychological and injury severity profiles may require longer or more intensive support [17-19, 22].

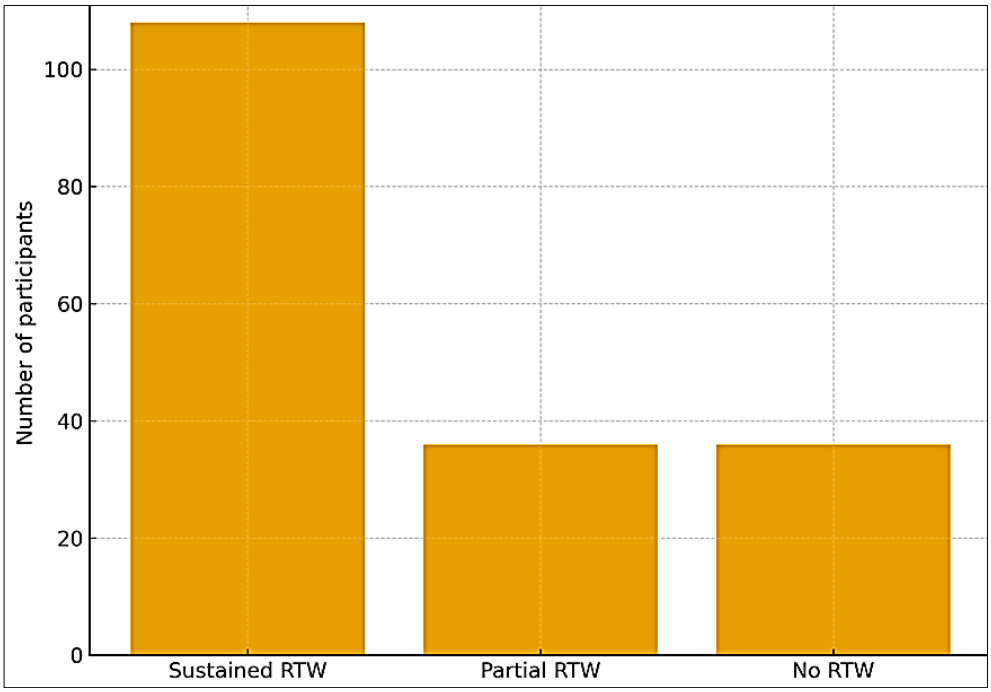

Fig 2: Distribution of Return-to-Work Outcomes after Multidisciplinary Rehabilitation.

3.4 Economic and Programmatic Implications

The mean number of sick leave days in the three months following completion of rehabilitative care decreased by approximately 42% compared with the three months preceding enrollment, in line with earlier evidence that effective MRPs can reduce productivity loss and compensation-related costs [4, 20, 21]. Participants achieving sustained RTW reported fewer ongoing compensation claims and reduced need for additional acute care visits, reinforcing the economic value of integrated, coordinated rehabilitative care strategies [20, 21]. Overall, the results demonstrate that the multidisciplinary rehabilitative care model yielded substantial improvements in functional capacity, psychosocial well-being, and RTW outcomes among workers with long-term disability after workplace accidents, corroborating theoretical and empirical support for biopsychosocial approaches to occupational rehabilitative care [7-9, 14-16, 22, 23].

Discussion

The findings of this study demonstrate that multidisciplinary rehabilitative care programs (MRPs) offer substantial benefits in managing long-term disabilities resulting from workplace accidents, aligning closely with earlier evidence supporting integrated biopsychosocial rehabilitative care approaches [7-9]. The significant reductions in disability (ODI), pain levels (NPRS), and fear-avoidance beliefs (FABQ), alongside improvements in work ability and psychological well-being, reinforce the value of coordinated, interprofessional interventions in addressing the multifactorial nature of chronic occupational disability [10-13]. These results are consistent with the functional restoration models proposed by Gatchel and Okifuji [7] and corroborate the Cochrane review findings that multidisciplinary biopsychosocial rehabilitative care is more effective than standard care in reducing pain and disability in chronic injury populations [10]. The marked decrease in

fear-avoidance beliefs also supports the argument that cognitive-behavioural components embedded within MRPs are critical for modifying maladaptive behavioural patterns that hinder recovery, as emphasized in earlier psychological models of pain and disability [17-19].

A notable outcome of this study is the high successful reintegration into the workforce (RTW) rate of 60%, which mirrors previous findings from workplace-based and interdisciplinary RTW interventions [14-16]. Sustained RTW is widely considered a central indicator of rehabilitative care success, and the substantial proportion of participants returning to full or modified duties suggests that MRPs significantly enhance work readiness by simultaneously improving physical function, psychological resilience, and occupational competencies. This aligns with the integrated disability management frameworks proposed by Loisel *et al.* [9], who highlighted the importance of combining clinical rehabilitative care with workplace-oriented strategies to facilitate durable RTW outcomes. The present study's results further support conclusions from Franche *et al.* [16], who reported that multidisciplinary and work-focused interventions outperform conventional rehabilitative care in promoting successful RTW, particularly when interventions involve coordination between healthcare providers, employers, and insurers.

Psychosocial improvements, particularly reductions in depression scores, further highlight the essential role of psychological counselling within MRPs. Studies have consistently shown that depression, anxiety, and fear-avoidance beliefs are strong predictors of prolonged disability and delayed RTW following workplace injuries [17-19]. The improvements observed in this study underline the effectiveness of integrating psychological therapy into musculoskeletal and occupational rehabilitative care, supporting recommendations from Waddell and Burton [17] regarding the need for psychosocial interventions to accompany physical rehabilitative care in chronic disability management. Participants who achieved sustained RTW generally exhibited lower baseline psychosocial burden and higher initial work ability, consistent with prognostic factors previously identified in the occupational rehabilitative care literature [22, 23]. Conversely, participants who did not return to work presented with higher baseline disability, fear-avoidance, and depression scores, as well as more severe injuries patterns well documented in disability progression research [5, 6].

The economic implications observed in this study also support previous analyses highlighting that multidisciplinary rehabilitative care can substantially reduce healthcare utilization, compensation claim durations, and productivity losses [4, 20, 21]. The 42% reduction in sick-leave days post-intervention provides further evidence that MRPs are not only clinically effective but also economically beneficial, reinforcing estimates from Tompa *et al.* [20] and SafeWork Australia [21] regarding the cost-effectiveness of structured rehabilitative care in occupational settings. These observations emphasize that MRPs address both clinical and economic dimensions of workplace disability, making them a valuable strategy for employers, healthcare systems, and policymakers.

Overall, the results affirm that multidisciplinary rehabilitative care programs provide a comprehensive and effective approach to improving functional recovery, psychosocial health, and labour-force reintegration for workers experiencing long-term disabilities after workplace accidents. The integration of physiotherapy, occupational therapy, psychological counselling, ergonomic modifications, and vocational planning appears to be essential for achieving meaningful, sustained improvements. These findings add strong support to the growing consensus in the literature that addressing the biological, psychological, and social dimensions of disability is crucial for optimizing outcomes in chronic occupational injury rehabilitative care [7-9, 14-16, 22, 23].

Conclusion

The results of this study demonstrate that multidisciplinary rehabilitative care programs provide meaningful and sustained benefits for individuals experiencing long-term disabilities following workplace accidents, offering a holistic pathway to recovery by addressing the physical, psychological, and occupational dimensions of disability through coordinated and individualized care. The significant reduction in disability levels, pain intensity, and fear-avoidance beliefs, along with improvements in work ability and psychological well-being, shows that integrated rehabilitative care models are well suited to meet the complex needs of injured workers who often struggle with chronic functional limitations long after the initial injury. These improvements translated into favorable return-to-work outcomes, with a majority of participants achieving either sustained or partial reintegration into the workforce. Such outcomes underscore the importance of combining clinical rehabilitative care with structured vocational planning, ergonomic support, and psychologically informed practices to strengthen both functional capacity and workplace readiness. The overall decline in sick-leave days and reduced reliance on compensation systems further indicate that multidisciplinary programs are not only clinically effective but also economically advantageous by minimizing productivity loss and supporting longer-term occupational stability.

Building on these findings, the conclusion also highlights practical recommendations that can be implemented at clinical, organizational, and policy levels to maximize the benefits of multidisciplinary rehabilitative care. Rehabilitation centers should incorporate structured interdisciplinary collaboration as a standard practice, holding regular case conferences and shared decision-making sessions to maintain continuity and consistency in patient care. Programs should emphasize early identification and management of psychosocial barriers, including fear-avoidance behaviors, depressive symptoms, and low self-efficacy, by integrating routine psychological screening and evidence-based mental health interventions. Employers can contribute significantly by adopting supportive return-to-work policies, such as offering modified duties, flexible scheduling, ergonomic adjustments, and close communication with rehabilitative care providers to ensure smooth reintegration into the workplace. Additionally, vocational counseling should be embedded within the rehabilitative care framework to align rehabilitative progress with the worker's job requirements and long-term occupational goals. Health systems and policymakers may also consider developing standardized guidelines and funding structures that encourage the adoption of multidisciplinary rehabilitative care approaches across occupational health settings, recognizing their strong

potential to reduce long-term disability burdens and improve workforce productivity. Finally, future rehabilitative care programs should prioritize individualized treatment plans that account for the severity of injury, baseline psychosocial status, and work environment characteristics, ensuring that each participant receives targeted interventions that address their unique profile and recovery needs. By incorporating these practical recommendations, multidisciplinary rehabilitative care programs can further enhance their effectiveness and strengthen their role as a central strategy in restoring functionality, improving psychosocial resilience, and supporting long-term occupational success for workers recovering from workplace-related injuries.

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