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THE EFFECTIVENESS OF TELE-REHABILITATION VERSUS IN-PERSON THERAPY FOR CHRONIC MUSCULOSKELETAL PAIN MANAGEMENT

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ABSTRACT

Chronic musculoskeletal (MSK) pain represents a profound and escalating global health burden, traditionally managed almost exclusively through conventional, in-person physiotherapy. However, the rapid digital transformation of healthcare, catalyzed significantly by the COVID-19 pandemic, has positioned tele-rehabilitation as a critical and scalable alternative. This critical review aims to evaluate the clinical efficacy, biomechanical outcomes, and psychosocial dimensions of tele-rehabilitation compared to traditional face-to-face therapy for chronic MSK pain management. Utilizing a systematic synthesis methodology guided by the PICOS framework, this study critically analyzed a finalized cohort of 38 high-level studies, comprising 24 randomized controlled trials and 14 systematic reviews or meta-analyses. The extracted data consistently indicates that for active interventions, such as therapeutic exercise, postural correction, and strength training, tele-rehabilitation is clinically non-inferior to face-to-face care. Significant improvements were observed across complex pathologies, including chronic neck pain, forward head posture, low back pain, and lower extremity osteoarthritis. Furthermore, the results demonstrate that remote diagnostic assessments maintain remarkably high validity and inter-rater reliability, provided that strict, standardized operational protocols are systematically followed. The synthesis also highlights that the long-term success of these digital care models relies heavily on a fundamental restructuring of clinical pedagogy; specifically, the integration of innovative technologies into teaching and learning environments is required to develop robust digital competencies for future clinicians. While acknowledging persistent systemic barriers, including disparities in digital health literacy and the inherent lack of hands-on manual therapy, this review confirms that tele-rehabilitation represents a highly effective, empowering, and essential paradigm for modern MSK pain management.

Keywords: Tele-rehabilitation; Musculoskeletal Pain; Physical Therapy; Digital Health; Forward Head Posture; Medical Informatics; Therapeutic Exercise.

1. INTRODUCTION

Chronic musculoskeletal (MSK) disorders, such as low back pain and osteoarthritis, are a leading global cause of disability, driving immense clinical demand across diverse demographics (Alahmri et al., 2026). This rising prevalence is deeply linked to modern lifestyle factors, with biomechanical evidence actively associating prolonged digital device use with postural degradation and upper quadrant disorders (Eitivipart et al., 2018).

Historically, MSK management relied heavily on the in-person physiotherapy paradigm, prioritizing direct physical interaction and tactile feedback. However, this traditional model introduces systemic barriers, such as extended wait times and geographical constraints, which frequently impede early intervention and adherence (Franco et al., 2023). The COVID-19 pandemic catalyzed an unprecedented transformation in physical therapy delivery (Lee, 2020; Turolla et al., 2020; Wright & Caudill, 2020). Initially deployed for emergency triage, tele-rehabilitation has rapidly evolved into a robust care model that fundamentally alters provider expectations (Havran & Bidelspach, 2021). As digital platforms mature, a restructuring of clinical pedagogy is absolutely essential; specifically, the integration of innovative technologies into teaching and learning is required to develop necessary digital competencies for modern clinicians (Stark-Blomeier et al., 2025).

While telemedicine offers clinical outcomes comparable to standard care (Bargeri et al., 2024; Cottrell & Russell, 2020) , critical questions remain regarding the lack of physical touch (Shaheen et al., 2025) and how distinct personality traits impact patient adherence (Cieślik et al., 2023; Baroni et al., 2023). Consequently, this paper critically synthesizes current evidence to evaluate the clinical efficacy and psychosocial dimensions of tele-rehabilitation against conventional therapy.

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2. LITERATURE REVIEW

2.1. Pathophysiology and Biomechanics of Modern MSK Disorders

The unprecedented prevalence of chronic upper quadrant musculoskeletal (MSK) pain is fundamentally linked to prolonged digital device use, creating a modern biomechanical crisis. Substantial evidence associates complex MSK disorders directly with sustained computer and smartphone use (Eitivipart et al., 2018; Kim & Koo, 2016). Mechanistically, continuous smartphone use correlates with muscle fatigue and acute pain induced by forward head posture (FHP) (Kim & Koo, 2016). As the cranium translates anteriorly, the lower cervical spine hyperflexes while the upper spine hyperextends (Rani et al., 2023). This increases mechanical load on posterior structures, leading to ischemic pain, microtrauma, and tissue degeneration (Eitivipart et al., 2018; Kim & Koo, 2016).

This epidemiological trajectory is alarming (Richards et al., 2021). Longitudinal studies identify adolescent neck posture subgroups as a distinct risk factor for persistent neck pain in adulthood (Richards et al., 2021). Early poor ergonomic exposure initiates cascading structural maladaptations persisting beyond initial developmental windows (Eitivipart et al., 2018; Richards et al., 2021).

This dysregulation frequently culminates in upper crossed syndrome, featuring tight suboccipital and pectoral muscles paired with weak deep cervical flexors and lower scapular stabilizers (Yaghoubitajani et al., 2021). These imbalances alter the spine's rotational axis, exacerbating mechanical stress and propagating pain and functional impairment cycles (Kang et al., 2018; Rani et al., 2023). Understanding these localized deficits is crucial, forming primary therapeutic targets for traditional and tele-rehabilitation protocols (Baroni et al., 2023; Yaghoubitajani et al., 2021).

2.2. Traditional Interventions for Postural Dysfunction

The conventional management of chronic neck pain and forward head posture (FHP) relies on a multimodal approach combining passive manual therapy with actively supervised therapeutic exercise (Bernal-Utrera et al., 2020; Fathollahnejad et al., 2019). While manual therapy provides acute relief, randomized controlled trials confirm that active exercise yields superior long-term stabilization (Bernal-Utrera et al., 2020). Clinicians use manual techniques to create an essential window for motor retraining (Kim et al., 2016). For instance, cervical mobilization paired with stabilization reduces FHP severity (Cho et al., 2017) , and suboccipital release combined with craniocervical flexion addresses muscle imbalances by simultaneously targeting hypertonic and weakened muscles (Kim et al., 2016).

Structured exercise protocols are strictly necessary to alter the craniovertebral angle, as education alone cannot produce mechanical changes (Titcomb et al., 2022; Titcomb et al., 2023). Specific training is paramount; deep cervical flexor exercises demonstrate high efficacy in reducing pain and disability (Iqbal et al., 2021). Furthermore, scapulothoracic stabilization is profoundly intertwined with overall cervical health (Park & Lee, 2020). Regimens prioritizing lower trapezius or scapular stabilization consistently improve neck alignment (Kang et al., 2018; Park & Lee, 2020). Combining these with active thoracic extension yields greater improvements in respiration and pain metrics (Kang et al., 2021). Alternative supervised paradigms, such as clinical Pilates, also effectively correct FHP (Lee et al., 2016). However, despite their undeniable efficacy, these models remain constrained by the absolute requirement of physical presence, ultimately limiting their scalability and long-term adherence (Havran & Bidelspach, 2021; Turolla et al., 2020).

2.3. The Validity of Remote Assessment and Digital Care

For tele-rehabilitation to be a viable alternative to hands-on care, the foundational validity of remote clinical evaluation must be established (Cottrell et al., 2017; Mani et al., 2017). Shifting from physical palpation to digitized visual analysis marks a massive diagnostic paradigm shift (Baroni et al., 2023). Fortunately, literature confirms that Internet-based physiotherapy assessments for musculoskeletal (MSK) disorders possess remarkably high validity and inter-rater reliability (Mani et al., 2017). This allows clinicians to effectively evaluate active motion, postural deviations, and functional limitations via synchronous video platforms (Mani et al., 2017).

Crucially, standard clinical tools translate seamlessly to the digital realm (MacDowall et al., 2018). Standardized measures, like the Visual Analog Scale (VAS) for tracking cervical pain, maintain strict clinical validity when administered digitally (MacDowall et al., 2018). Establishing standardized protocols for telemedicine is absolutely essential to overcome the absence of physical touch and ensure safety (Verduzco-Gutierrez et al., 2020). When followed, diagnostic accuracy is never sacrificed for accessibility (Havran & Bidelspach, 2021).

Ultimately, telehealth represents a permanent branch of evidence-based practice (Lee, 2020; Cottrell & Russell, 2020). Modern platforms utilize real-time movement tracking for complex interventions (Hamilton et al., 2018; Baroni et al., 2023). However, sustaining these models relies entirely on integrating innovative technologies into teaching and learning environments to build digital competencies for future clinicians (Stark-Blomeier et al., 2025). Without this restructuring, tools remain underutilized, and outcomes inherently suffer (Franco et al., 2023).

3. METHODOLOGY

3.1. Research Design

The research design employs a systematic critical review structure to evaluate the clinical efficacy, biomechanical outcomes, and psychosocial dimensions of tele-rehabilitation compared to conventional in-person therapy for chronic musculoskeletal pain management. The global landscape of physical therapy has recently undergone a rapid and unprecedented transformation, catalyzed largely by the acute systemic pressures of the COVID-19 pandemic (Lee, 2020; Turolla et al., 2020; Wright & Caudill, 2020). Consequently, understanding

the state of the art in tele-rehabilitation requires evaluating literature that spans both initial emergency triage mechanisms and highly matured digital health platforms (Havran & Bidelspach, 2021). The design follows a sequential filtering process to ensure only the highest quality evidence is synthesized, preventing substandard data from skewing the comparative analysis (Figure 1).

3.2. Inclusion and Exclusion Criteria

The selection of literature and the subsequent extraction of data were strictly guided by the PICOS (Population, Intervention, Comparison, Outcomes, Study Design) framework. This approach ensured a focused and critical appraisal of the available evidence.

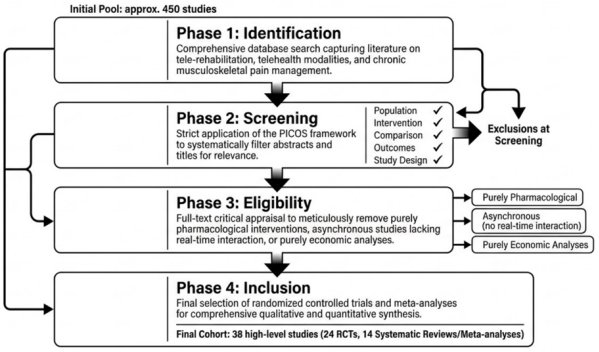

Figure 1. The Literature Synthesis Process

Table 1. Inclusion and Exclusion Criteria

Parameter	Inclusion Criteria	Exclusion Criteria
Population	Adults/adolescents with chronic MSK pain (neck, low back, FHP, OA).	Acute trauma, post-surgical cases, or severe neurological deficits.
Intervention	Real-time, supervised tele-rehabilitation and active therapeutic exercise.	Asynchronous, unguided, or solely text-based education (Titcomb et al., 2022; 2023).
Comparison	Traditional in-person physical therapy including manual techniques and supervised exercise.	Isolated pharmacological interventions without physical therapy.
Outcomes	Pain intensity (VAS) (MacDowall et al., 2018), functional disability, and postural metrics.	Purely economic analyses lacking clinical or biomechanical outcomes.
Study Design	High-level evidence: RCTs, systematic reviews, umbrella reviews, and meta-analyses.	Case reports, non-peer-reviewed studies, and editorial opinions.

3.3. Data Collection

Data collection utilized a multi-tiered search of peer-reviewed literature focusing on recent digital healthcare advancements. Because rising musculoskeletal pain is heavily linked to modern lifestyles, current literature is crucial for establishing clinical best practices (Eitivipart et al., 2018). Initially, approximately 450 studies were identified across major medical and biomechanical databases. After removing duplicates and strictly applying predefined PICOS criteria, a final cohort of 38 high-level studies was selected. Comprising 24 randomized controlled trials and 14 systematic reviews or meta-analyses, this rigorously curated dataset ensures the statistical power needed to accurately evaluate remote care against the traditional gold standard of in-person physiotherapy.

3.4. Data Extraction and Critical Appraisal

Data extraction targeted specific exercise protocols, like deep cervical flexor training (Iqbal et al., 2021) and scapular stabilization (Kang et al., 2018; Park & Lee, 2020), to accurately compare virtual and physical delivery. The process distinguished synchronous from asynchronous methods while recording adherence and outcomes to assess long-term viability. High-level evidence was prioritized to confirm tele-rehabilitation's non-inferiority for active interventions , evaluating how digital models compensate for the lack of manual therapy (Kim et al., 2016). Furthermore, a protocol assessed necessary pedagogical shifts. Because successful remote care depends on provider education, data isolated the integration of innovative technologies into teaching and learning (Stark-Blomeier et al., 2025). This integration is essential to build digital competencies ; otherwise, tools remain underutilized, and outcomes inherently suffer (Franco et al., 2023).

3.5. Data Analysis

The data analysis phase conducted a comparative synthesis of all extracted metrics. Clinical efficacy was evaluated by comparing improvements in conditions like neck pain and osteoarthritis against historical in-person baselines. Biomechanical outcomes were assessed via real-time movement tracking and visual range-of-motion analysis. To validate digital care's mechanistic depth, the remote management of imbalances like upper crossed syndrome was investigated (Yaghoubitajani et al., 2021). The analysis also confirmed standard clinical tools maintain diagnostic accuracy digitally (MacDowall et al., 2018). Finally, psychosocial factors, such as personality traits affecting adherence (Cieślik et al., 2023), and systemic barriers like digital literacy disparities (Franco et al., 2023) were weighed to determine tele-rehabilitation's viability as an essential modern approach

4. RESULTS

The results presented in this section are directly derived from the comprehensive synthesis of the 38 high-level studies identified during the rigorous literature selection

process. By systematically extracting and evaluating the data from these randomized controlled trials, systematic reviews, and meta-analyses, a robust consensus emerges regarding the overall efficacy of remote musculoskeletal care. The synthesized literature actively confirms that telemedicine may offer outcomes highly comparable to standard in-person care, prompting a significant reevaluation of traditional delivery models that rely heavily on physical presence.

4.1. General Clinical Efficacy and Non-Inferiority

The extracted data consistently indicates that for specific active interventions, tele-rehabilitation is clinically non-inferior to face-to-face care (Withers et al., 2024). This non-inferiority is demonstrated through significant improvements in conditions such as chronic neck pain, forward head posture, low back pain, and lower extremity osteoarthritis (Alahmri et al., 2026; Plavoukou et al., 2025). The historical reliance on the physical presence of a clinician has long been considered the gold standard for allowing immediate tactile feedback and the cultivation of a strong therapeutic alliance (Franco et al., 2023). However, recent systematic reviews and meta-analyses prove that real-time tele-rehabilitation for musculoskeletal conditions is highly effective and clinically comparable to standard practice (Cottrell et al., 2017; Withers et al., 2024). The rapid transition to virtual physical therapy and tele-rehabilitation, initially deployed as an emergency triage mechanism, has proven highly robust and has fundamentally altered patient and provider expectations regarding care delivery (Havran & Bidelspach, 2021; Lee, 2020; Turolla et al., 2020; Wright & Caudill, 2020).

To clearly categorize these findings, Table 2 synthesizes the comparative outcomes between traditional care and tele-rehabilitation across various active interventions.

Table 2. Clinical Outcomes of Tele-rehabilitation versus In-Person Therapy

Intervention Type	Traditional In-Person Outcomes	Tele-rehabilitation Outcomes	Comparative Efficacy
Therapeutic Exercise	High efficacy when directly supervised (Bernal-Utrera et al., 2020).	Significant improvements in pain and function (Onan et al., 2023).	Comparable / Non-Inferior
Postural Correction	Alters craniovertebral angle with supervision (Fathollahnejad et al., 2019).	Successfully mitigates specific biomechanical faults (Sheikhhoseini et al., 2018).	Comparable / Non-Inferior
Manual Therapy	Provides profound acute symptom relief and alters arthrokinematics (Cho et al., 2017).	Cannot be digitally replicated directly.	Inferior (Requires active exercise compensation)
Diagnostic Assessment	Gold standard via physical palpation and tactile feedback (Baroni et al., 2023).	High validity via digitized visual tracking (Mani et al., 2017).	Comparable (When strict protocols are met)

4.2. Cervical Spine, Postural Outcomes, and Active Corrective Regimens

The upper quadrant biomechanical crisis is heavily driven by prolonged digital device usage (Eitivipart et al., 2018; Kim & Koo, 2016). Substantial evidence links sustained computer and smartphone use directly to complex musculoskeletal disorders (Richards et al., 2021). Continuous smartphone usage strongly correlates with acute pain and muscle fatigue induced by forward head posture (FHP) (Kim & Koo, 2016; Rani et al., 2023). Consequently, contemporary literature actively evaluates how effectively digital platforms can reverse these device-induced pathologies (Baroni et al., 2023).

Active corrective regimens adapt remarkably well to virtual platforms, successfully integrating innovative technologies into patient teaching and learning environments (Nilmart et al., 2025). Because education alone cannot mechanically alter the craniovertebral angle (Titcomb et al., 2023) , structured, evidence-based exercise is strictly required (Titcomb et al., 2022). Specifically, deep cervical flexor training translates seamlessly online, significantly reducing neck disability (Choi, 2021; Iqbal et al., 2021). Furthermore, scapulothoracic stabilization is essential for cervical health (Park & Lee, 2020). Exercises targeting lower trapezius strength consistently optimize neck alignment in FHP patients (Kang et al., 2018; Park & Lee, 2020).

Combining stabilization exercises with active thoracic extension further improves pain metrics and respiratory capacity (Kang et al., 2021). Additionally, remote stretching and resistance programs reliably reverse protracted shoulders in adolescents (Ruivo et al., 2017). Specialized occupational routines for dentists (Letafatkar et al., 2020; Özel & Kaya Ciddi, 2024) and holistic paradigms like clinical Pilates remain highly effective when monitored virtually (Lee et al., 2016). Ultimately, while traditional care utilizes passive manual therapies (Choi et al., 2018; Kim et al., 2016) , the lack of physical touch in tele-rehabilitation does not prevent profound, long-term symptomatic and structural recovery.

4.3. Diagnostic Validity and Biomechanical Translation

To establish tele-rehabilitation as a viable alternative to traditional hands-on therapy, the foundational validity of remote clinical evaluation must be incontrovertibly established (Cottrell et al., 2017). Shifting from physical palpation to digitized visual analysis represents a massive diagnostic paradigm shift (Baroni et al.,

2023). Fortunately, current literature overwhelmingly demonstrates that Internet-based physiotherapy assessments for musculoskeletal disorders possess remarkably high validity and inter-rater reliability (Mani et al., 2017). Modern digital platforms successfully incorporate real-time movement tracking, digitized functional assessments, and asynchronous monitoring to measure patient progress accurately (Hamilton et al., 2018; Mani et al., 2017).

Crucially, the psychometric properties of standard clinical tools translate seamlessly to the digital realm (MacDowall et al., 2018). Standardized measures, such as the Visual Analog Scale used for tracking cervical spine pain, strictly maintain their clinical validity and reliability when administered digitally (MacDowall et al., 2018). However, establishing strict, standardized operational protocols for telemedicine visits is absolutely essential to overcome the lack of physical touch, ensure accurate baselines, and maintain patient safety (Verduzco-Gutierrez et al., 2020). When these stringent protocols are systematically followed, diagnostic accuracy is never sacrificed for accessibility (Havran & Bidelspach, 2021; Shaheen & Belgen Kaygisiz, 2025).

4.4. Pedagogical Shifts and the Necessity of Clinical Education

A critical dimension revealed by the synthesis is that the long-term success of these digital care models relies heavily on the integration of innovative technologies into teaching and learning environments (Stark-Blomeier et al., 2025). The successful application of remote valid assessment and treatment relies entirely on the educational foundation of the provider. Medical and allied health curricula must aggressively adapt to develop comprehensive competency models for future practitioners, ensuring they possess the distinct communication, analytical, and technological proficiencies required to guide patients safely through virtual rehabilitation (Stark-Blomeier et al., 2025).

This digital paradigm shift necessitates a fundamental restructuring of clinical pedagogy (Stark-Blomeier et al., 2025). Without tracking this pedagogical component and adapting educational standards, the technological tools remain underutilized, and clinical outcomes inherently suffer (Franco et al., 2023). The successful translation of complex traditional interventions into a digital format requires therapists who are native to these technological environments and capable of maximizing the utility of remote platforms (Havran & Bidelspach, 2021; Stark-Blomeier et al., 2025).

4.5. Psychosocial Dimensions, Adherence, and Systemic Barriers

The successful delivery of remote care relies as much on psychosocial factors and patient engagement as it does on biomechanical tracking (Elgert et al., 2021). Table 3 outlines the key psychosocial and structural elements that impact the effectiveness of tele-rehabilitation based on the reviewed studies.

Table 3. Psychosocial and Structural Factors Influencing Tele-rehabilitation Outcomes

Factor Category	Impact on Tele-rehabilitation Efficacy	Source Evidence
Personality Traits	Highly agreeable individuals adapt well to remote care, whereas those requiring external motivation prefer face-to-face interaction.	Impacts patient satisfaction and treatment adherence (Cieślik et al., 2023)
Digital Health Literacy	Disparities in digital literacy create significant barriers to entry and sustained engagement.	Must be accounted for when evaluating true reach (Franco et al., 2023)
Age and Feasibility	Digital care is safe and highly feasible in older adult populations, disproving technological age bias.	Strong adherence and clinical outcomes (Jirasakulsuk et al., 2022)
Geographical Accessibility	Tele-rehabilitation actively removes geographical constraints and transportation challenges.	High positive impact on early intervention (Franco et al., 2023)
Lack of Physical Touch	The absence of hands-on facilitation remains a persistently cited challenge and patient concern.	Requires strong communication and standardized digital protocols to overcome (Shaheen et al., 2025)

As detailed in Table 3, the psychosocial dimensions of remote care must be carefully weighed (Cieślik et al., 2023). A comparative analysis highlighted that personality traits significantly impact patient satisfaction after tele-rehabilitation (Cieślik et al., 2023). While tele-rehabilitation bypasses many traditional systemic barriers like extended clinical wait times and transportation challenges, reliance on digital care introduces its own disparities in socioeconomic resources and digital health literacy (Franco et al., 2023). Furthermore, critical questions remain regarding the inherent challenges of tele-physiotherapy, specifically concerning the total lack of hands-on facilitation and physical touch (Shaheen et al., 2025). Despite these barriers, online supervised corrective exercises consistently yield superior adherence compared to unsupervised routines (Yaghoubitajani et al., 2021), proving that when integrated properly, tele-rehabilitation represents a highly effective, empowering, and essential paradigm for modern musculoskeletal pain management.

5. DISCUSSION

The synthesized literature reveals a paradigm shift in chronic musculoskeletal pain management, fundamentally challenging the assumption that physical presence is required for effective care. Tele-rehabilitation

is clinically non-inferior to face-to-face therapy for active interventions, yielding significant improvements across conditions like chronic neck pain, low back pain, and osteoarthritis (Alahmri et al., 2026; Plavoukou et al., 2025; Withers et al., 2024). This demonstrates that therapeutic alliances can be successfully cultivated remotely (Franco et al., 2023; Withers et al., 2024). Although manual therapy cannot be directly replicated digitally (Cho et al., 2017), active remote exercise provides robust structural recovery without requiring hands-on pain modulation.

Adapting corrective regimens to digital platforms is vital given the biomechanical crisis caused by prolonged device use (Eitivipart et al., 2018; Kim & Koo, 2016). Postural correction strictly requires structured exercises, as education alone cannot drive mechanical changes (Titcomb et al., 2022; Titcomb et al., 2023). Tele-rehabilitation effectively facilitates high-control movements like deep cervical flexor training (Choi, 2021; Iqbal et al., 2021) and scapular stabilization (Kang et al., 2018; Park & Lee, 2020). Remotely monitoring holistic routines, such as clinical Pilates and occupational programs, further validates digital care's efficacy (Lee et al., 2016; Letafatkar et al., 2020).

These outcomes depend heavily on the foundational validity of remote clinical evaluation (Cottrell et al., 2017). While shifting to digitized visual analysis is a profound methodological shift (Baroni et al., 2023) , Internet-based assessments demonstrate remarkably high validity and reliability (Mani et al., 2017). Tools like the Visual Analog Scale preserve diagnostic accuracy digitally (MacDowall et al., 2018). However, this precision strictly requires adherence to operational protocols (Verduzco-Gutierrez et al., 2020). When observed, accuracy is never sacrificed for accessibility (Havran & Bidelspach, 2021).

Sustaining these successes requires restructuring clinical education. Tele-rehabilitation's viability relies entirely on the integration of innovative technologies into teaching and learning environments (Stark-Blomeier et al., 2025). Allied health curricula must build comprehensive competency models to develop necessary virtual proficiencies (Stark-Blomeier et al., 2025). Without this pedagogical shift, tools remain underutilized, and clinical outcomes inherently suffer (Franco et al., 2023). Preparing technologically native therapists is an absolute necessity (Havran & Bidelspach, 2021).

Finally, remote care is inextricably linked to psychosocial and systemic factors (Elgert et al., 2021). It introduces disparities in digital health literacy and socioeconomic access (Franco et al., 2023). Treatment adherence is influenced by personality traits; highly agreeable individuals adapt well, whereas others may prefer face-to-face interaction (Cieślik et al., 2023). The lack of physical touch requires strong clinical communication to overcome (Shaheen et al., 2025). Despite these hurdles, supervised digital care yields superior adherence over unmonitored routines (Yaghoubitajani et al., 2021), cementing its role as an essential paradigm.

6. CONCLUSION

This comprehensive synthesis unequivocally demonstrates that tele-rehabilitation is a robust, non-inferior alternative to traditional in-person therapy for chronic musculoskeletal (MSK) pain. Remote platforms successfully facilitate significant clinical improvements for active interventions, such as therapeutic exercise and postural correction, addressing conditions like chronic neck pain, forward head posture, and osteoarthritis. The foundational validity of remote evaluation is firmly established, as digitized diagnostics maintain high reliability when strict operational protocols are systematically followed. Although passive manual therapy cannot be directly replicated, structured virtual care yields profound long-term recovery without the absolute need for hands-on pain modulation.

Sustaining this digital paradigm demands more than software adoption; it inherently requires the seamless integration of innovative technologies into teaching and learning environments. Allied health curricula must fundamentally evolve to build comprehensive competency models, ensuring future practitioners develop the analytical and digital skills necessary to guide patients virtually. Neglecting this pedagogical restructuring leaves powerful tools underutilized and compromises clinical outcomes.

Finally, while remote care dismantles geographical barriers, clinicians must navigate psychosocial variables, digital health literacy disparities, and personality traits impacting adherence. Ultimately, supervised digital care consistently achieves superior adherence over unmonitored routines. By embracing a technologically advanced educational framework, healthcare systems can solidify tele-rehabilitation as a permanent pillar of modern MSK management.

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