Patient-perceived barriers and facilitators to full weight-bearing with a lower-extremity circular external fixator: a qualitative study

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Abstract

Background

Circular external fixators are commonly used in orthopaedics to immobilise fractured bones and correct deformities. Early weight-bearing with circular external fixators has been shown to enhance bone growth and improve patient outcomes. However, many patients do not fully weight-bear after surgery, indicating the presence of barriers to early weight-bearing that need to be addressed. The objective was to identify the barriers and facilitators to full weight-bearing with a circular external fixator.

Method

Patients with lower-limb circular external fixators in Pretoria, South Africa, were invited to participate in a qualitative exploratory study, using semi-structured interviews. The interviews were audio-recorded, transcribed verbatim, and analysed using thematic content analysis. Data saturation was reached after nine interviews.

Results

Four themes were obtained. These included pain/pain management, participants' state of mind, physical factors, and medical/non-medical support systems. The interviews revealed that pain, swelling, and the history of the injury influenced the participants' ability to bear weight, and their state of mind. Physical factors related to the human body and external fixator equipment also played a role, as did the availability of medical and non-medical support systems. Complications and fear of refracturing or falling were additional factors affecting mobilisation and weight-bearing.

Conclusion

The findings of this study emphasise the importance of addressing physical and psychological factors affecting rehabilitation. While identifying the barriers and facilitators is beneficial, the study's limitations may reduce the generalisability of the findings. Further research on the implementation of solutions to address these factors in physiotherapy practice are warranted in this context.

Level of evidence: 3

Keywords: external fixator, weight-bearing, bone growth, rehabilitation, physical therapy, Ilizarov

Introduction

This study aimed to address a critical gap in understanding the barriers and facilitators to full weight-bearing with lower-limb circular external fixators. Due to the dearth of available evidence on external fixator rehabilitation, this information may improve patient outcomes and treatment strategies. The research question was: What are the barriers and facilitators to full weight-bearing with a lower-limb circular external fixator?

Circular external fixators, pioneered by Ilizarov in the 1950s, consist of metal rings held in place with pins running through soft tissue and bone. These devices offer rigidity for healing without opening the fracture site.[1] Thus, through improved stability and even bone pressure, early weight-bearing is enabled.[2-4] Hexapod-style fixators represent the latest iteration of circular fixators. They are designed to optimise mechanical performance in promoting callus formation under both low and high axial loads, although higher loads are preferred. Unfortunately, the orientation of the loading plane and the placement of half pins significantly influence the bending stiffness of unilateral fixators. When unilateral frames are loaded out of plane, torsional and varus–valgus forces can cause noticeable movement at the fracture site, compromising the stability of bony fragments.[5] Under axial loading, a bending effect occurs at the fracture site. However, classic circular fixators are typically composed of either full circles or arches, each offering distinct advantages. Full circles provide greater stability against axial loads, whereas arches facilitate movement around joints. Additionally, smaller diameter rings generally enhance stability. Some studies suggest that hybrid and all-wire frames may offer comparable properties to classic circular fixators.[5] Circular fixators can also incorporate dynamisation, aligning with Wolff's Law of fracture healing. Dynamisation enables biomechanical adaptations to increase stress on the bone, maintaining fracture stability and promoting the bone's capacity to strengthen against applied forces.

External fixators have become essential in orthopaedic practice, treating comminuted fractures, non-union of bones, deformities, and leg length discrepancies. They also aid in ankle arthrodesis, infection control, osteomyelitis, and cosmetic limb lengthening, serving as an alternative to amputation.[1,6-10] They not only offer stability and early weight-bearing but shorter operating times and cost-effectiveness compared to alternative methods.[11,12]

Despite the benefits, complications from the external fixator may occur. These include pain, osteitis, soft tissue impalement, neurovascular injury, compartment syndrome, refracture around a pin site, contractures, mobility challenges and pin site infection. Physiotherapy, focusing on pain management, wound healing, joint mobility, muscle strength, and gait re-education, is pivotal.[3,6,11,13,14] Despite being allowed to fully weight bear with circular external fixation, many patients do not. Gait re-education supports weight-bearing and is vital for bone density preservation and reducing the risk of refracture.[15] Immediate intervention is necessary to address issues hindering early weight-bearing.[16]

Psychological factors are also significant, as wearing an external fixator can impact self-esteem and patient compliance with rehabilitation protocols.[10,17,18] This could result in longer bone healing times and an increased risk of complications,[13,19,20] underscoring the need for a holistic patient care approach.

Method

Design and procedure

This qualitative, exploratory study used semi-structured, in-depth, one-on-one interviews. Written consent, both to participate and for audio recordings, was obtained day 1 post-surgery once patients were orientated to time and place and not under the influence of anaesthesia. Participants completed a demographic questionnaire prior to the interview. A pilot study (one participant) was done to refine the interview process. After obtaining written consent, an interview was scheduled for four weeks after the surgery. Interviews took place at the researcher's private practice. Family members were used as translators in the case of non-English-speaking participants. Interviews, lasting 14 to 30 minutes, were transcribed verbatim, and thematically analysed. Anonymity was maintained through unique participant codes.

Participants

Participants in this study were patients who had undergone lower-limb circular external fixator procedures by one of three referring surgeons in Pretoria, South Africa, and who were referred for postoperative physiotherapy rehabilitation. The selection process began on the first day following their surgery, where eligible participants were identified based on inclusion and exclusion criteria. Participants were included if they were adults (18 years and older), and were cleared for full weight-bearing following the surgery with a unilateral, lower-limb circular external fixator for various purposes. Exclusion criteria included co-occurring conditions preventing full weight-bearing, being operated in another facility, for example in the government setting, concurrent intramedullary nail insertion in the ipsilateral femur, or polytrauma potentially affecting ambulation.

Data collection

Participants received an information document and consent form prior to hospital discharge. A semi-structured interview guide with possible probes was used (*Table I*). Demographics were gathered using a self-designed questionnaire (*Table II*). Field notes were recorded during and after the interviews, aiding in a better understanding of the participant and capturing non-verbal cues.

Data analysis and trustworthiness

The demographic questionnaires underwent descriptive analysis, while the feedback from the semi-structured interviews was analysed in terms of an inductive thematic analysis.[21] Triangulation involved audio recordings, verbatim transcriptions, and field journal notes, ensuring interpretation accuracy. The researcher reread the transcripts multiple times during the inductive analysis process. Themes were developed and later linked to literature until all the descriptive patterns had been developed.

For trustworthiness, steps were followed to ensure unbiased interviews.[22] Phrases showing bias or prejudicial opinions about the population were removed, emphasising open-mindedness. The researcher avoided pre-interview treatments and interactions to prevent influence. Participant consent forms clarified that participation would not affect treatment. Results were meticulously documented, with credibility upheld through participant checks and result verification. External audits and thorough documentation maintained reliability and confirmability. Assumptions and study context were transparent for transferable results. Data and results remained authentic without adaptation.

Table I: Interview guide

	Question	Prompt if needed
1.	Over the last four weeks, how have you been walking?	• Were you able to walk without your crutches at all? • Did you feel you were walking correctly, without a limp? • Why do you think you were walking with a limp?
2.	Have there been any changes in your physical or mental condition in these four weeks?	• Have you become more positive or negative about the external fixator? • What has happened with your pain levels? • Was there something that made standing on your leg easier? • Was there anything that held you back from standing on your leg? • Have you been able to do your daily tasks and work?
3.	Has there been anything with the external fixator specifically that has made it more difficult or easier for you to stand on it?	• How does the footplate affect your ability to properly walk on your leg? • Have you had any complications over these four weeks?

Table II: Demographic questionnaire

Unique identifier code	
Age	
Sex (sex was defined based on self-report)	
Weight	
Height	
Cause of defect	Born with or injury?
If from an injury	How did the injury occur? Date of injury?
Type of surgery	Elective/trauma Acute/chronic Adjustments being made: Yes/no Location of external fixator Dynamisers used: Yes/no Foot track used: Yes/no
Previous procedures	Number of procedures Date of procedures Type of procedure Complications
Employment status	Unemployed Working from home Back at work Awaiting return to work
Any other medical conditions we need to know of?	
Date of external fixator application	

Data management and bias mitigation

Questionnaires and interviews were electronically stored with robust security measures. Bias was minimised through bracketing, acknowledging, and setting aside interviewer assumptions. Results were offered for participant review at the coding phase. Triangulation across data, investigator and theory phases ensured objectivity. Ethical considerations, including voluntary participation and confidentiality, were strictly adhered to. Informed consent was obtained from the participants, and their privacy rights were observed throughout.

Results

In this study of patients with lower-limb circular external fixators, nine interviews were conducted to explore postoperative barriers and facilitators to full weight-bearing. During the study period, a total of 15 circular external fixator procedures were performed by the referring surgeons; however, six patients were excluded for polytrauma. Participants, predominantly with chronic injuries, received the circular external fixator due to complications or deformities. Most had undergone multiple previous surgical interventions. None received dynamic struts with their current fixator. All participants experienced complications with previous procedures, leading to the current use of the circular external fixator. For detailed participant characteristics, refer to *Table III*.

Table III: Characteristics of participants

Characteristic	**Participants (n = 9)**
Sex, male n (%)	5 (56)
Sex, female n (%)	4 (44)
Age in years: mean (SD)	52 (14)
Weight in kg: mean (SD)	82 (18)
Height in cm: mean (SD)	170 (17)
Time from original injury in years: mean (SD)	8 (15)
Foot track fitted: yes, n (%)	5 (56)
Foot track fitted: no, n (%)	4 (44)
Previous surgical procedure: yes, n (%)	8 (89)
Number of previous procedures, mean (SD)	6 (7)
Adjusting struts: yes, n (%)	6 (67)
Adjusting struts: no, n (%)	3 (33)
Cause of injury, n (%)	
Motor vehicle or motorbike accident	4 (44)
Slips and falls	3 (33)
Gunshot wound	1 (11)
Sports injury	1 (11)
Location of external fixator, n (%)	
Foot, ankle and tibia	5 (56)
Tibia	3 (33)
Knee, tibia and ankle	1 (11)
Types of previous procedures, n (%)	
Internal fixation	5 (56)
Circular external fixator	4 (44)
Multiplanar external fixator	3 (33)
Debridement	3 (33)
Plastic surgery	3 (33)
Ankle fusion	2 (22)
Osteotomy and bone graft	2 (22)
Plaster of Paris	1 (11)
Ankle replacement	1 (11)
Removal of prosthesis	1 (11)
Complication with previous procedures, n (%)	
Non-union of bone	5 (56)
Infection	4 (44)
Delayed wound healing	3 (33)
Deformity of leg	3 (33)
Cyst/abscess formation	2 (22)
Instability of ankle	2 (22)
Pseudoarthrosis	1 (11)
Failed plastic surgery	1 (11)
Loss of limb length	1 (11)
Pin-site infection	1 (11)
Employment status	
Unemployed	3 (33)
Back at work	3 (33)
Awaiting return to work	2 (22)
Working from home	1 (11)
Comorbidities	
Diabetes	2 (22)
Hypertension	1 (11)
Lupus	1 (11)
Spina bifida	1 (11)

Thematic analysis

Four themes emerged from the data collected from the interviews. They address the research question regarding the barriers and facilitators to weight-bearing with circular external fixators. Pain emerged prominently as a primary barrier, alongside various psychological factors that could either hinder or support weight-bearing. Similarly, specific physical factors related to the external fixator constructs played a crucial role. Additionally, external influences, including medical and non-medical support structures, significantly impacted participants, acting either as barriers or facilitators to weight-bearing efforts.

Theme 1: Weight-bearing is limited by pain

Pain was observed to be one of the main barriers to weight-bearing with a circular external fixator. This theme outlines the participants' experience of pain, as well as the measures to relieve pain, swelling and injury. The majority experienced pain negatively, particularly with weight-bearing while making adjustments to the external fixator. Pain affected sleep and daily functionality. Compensatory gait patterns also led to pain in unaffected joints. Swelling, pin-site pain, increased activity, and rainy weather also contributed to the pain felt. Most used assistive devices to alleviate their pain. One participant noted less pain with their current fixator, while three had desensitisation to pain due to previous experiences. Many struggled with pain medication efficacy, resorting to overdosing or experiencing side effects. Cycling, general exercises, elevation, and ice application provided relief, while precautionary measures, such as avoiding work, were taken to safeguard recovery.

Theme 2: Psychological factors influence weight-bearing

Participants' mindsets greatly influenced their ability to mobilise and bear weight. Pessimism was marked by depression, stress, anger, and a lack of confidence in the external fixator. The preoperative history of surgeries and complications played a significant role in their mental state. Fear of falling or re-injury was also an important factor. Conversely, some expressed optimism, finding hope and relief in their situation. Coping mechanisms included distraction, focusing on positive outcomes, accepting potential deformities, and finding humour in people's reactions to the fixator.

Theme 3: Physical factors affect weight-bearing

Physical factors, including walking endurance, wounds, muscle spasms, muscle atrophy and joint limitations due to stiffness, influenced weight-bearing. These factors also affected the participants' ability to sleep. Participants' preoperative strength, pain and function also played a role in postoperative outcomes. The external fixator equipment, such as pins, could cause pain and discomfort, as does pin-site bleeding and infection. The external fixator was cumbersome and difficult to manoeuvre, especially on uneven surfaces with the footplate. However, some participants felt the footplate improved their balance. Biomechanical alterations affected weight-bearing due to leg length discrepancies, weakness, and an inability to balance. The use of assistive devices also resulted in gait adjustments, affecting mobility both positively and negatively. Participants could mobilise further but placed less weight on their leg when using crutches or a walking frame. Some needed a wheelchair to continue with their activities of daily living. Other participants used a boot on their unaffected leg to correct the leg length discrepancy. Leg length discrepancies, weakness, and clothing restrictions also influenced participants' ability to mobilise. Complications with previous external fixators resulted in less weight-bearing with the current fixator.

Theme 4: Medical and non-medical support systems

Family support and community involvement played a significant role. Lack of family support led to an increased need for independence which resulted in the use of a wheelchair. The inability to drive, resulting in reliance on family members or public transport, affected participant mobility. Community safety concerns in those who lived in rural areas, also affected participants' mobility and ability to work, as did the unreliable nature of people. Participants often felt taken advantage of. Those who could work from home had no problem with working but used assistive devices to do so; others could not work as they could not drive. Trust, empathy, and the professionalism of the medical team were also crucial with honesty and trust in the surgeon being highlighted. The positivity and support from the multidisciplinary team made the participants feel positive. The immediacy of care, where necessary, also prevented complications. Furthermore, the hospital experience, as well as the nursing support, were deemed important as inadequate standards affected participants negatively. A delay in the administration of medication and a lack of care from the hospital

Table IV: Barriers and facilitators to full weight-bearing

	Barrier	Facilitator
Pain	√	√
Assistive device use	√	√
Pain medication	√	√
Work and home environment	√	√
Constructs of circular external fixator and footplate	√	√
Adequacy of patient education and understanding	√	√
Need to perform activities of daily living	√	√
History of previous complications and mismanagement	√	
History of injury	√	
Negative mindset	√	
Depression	√	
Impact on self esteem	√	
External fixator preoccupation	√	
Fear of falling or refracture	√	
Muscle weakness and stiffness	√	
Decreased joint range of motion	√	
Decreased balance	√	
Leg length discrepancy	√	
Poor endurance	√	
Pin-site infection	√	
Pin-site swelling	√	
Neural immobility	√	
Change in sensation of leg	√	
Presence of wounds	√	
Lack of family support	√	
Poor hospital standards	√	
Delay in medical administration while in hospital	√	
Rest, ice and elevation		√
Cycling and exercise		√
Gait adjustments		√
Decreasing limb length discrepancy with a boot		√
Being accustomed to walking with difficulty		√
Preoperative strength and balance		√
Change to a positive mindset		√
Hope for a positive outcome		√
Embracing mental strength		√
Distraction from external fixator treatment time		√
Confidence in being allowed to weight-bear		√
Expert care from multidisciplinary team		√
Trust in the surgeon		√
Fast reaction times to possible complications		√
Support from multidisciplinary team		√

staff resulted in increased pain and decreased weight-bearing. Adequate information and education on the circular external fixator mechanism were also valued, but some participants felt poorly instructed. Other participants understood what was required of them yet did not follow the doctor's instructions.

These results produced the barriers and facilitators to full weight-bearing with a circular external fixator, details of which can be found in *Table IV*.

Discussion

Clinical observations have shown that most patients with a circular external fixator do not weight-bear early enough. The study therefore aimed to explore the barriers and facilitators to full weight-bearing as early weight-bearing facilitates bone growth.[23,24]

Demographics

Patient demographics, including age, sex and comorbidities, significantly influenced weight-bearing ability and complication rates among those using circular external fixators for lower limb injuries. The literature suggests that younger patients tend to experience more complications, although the exact reasons remain unclear.[20] The mean age of participants in this study was 52 years, making definitive conclusions challenging with regard to age. Both males and females had an equal risk of developing complications, contrasting with typical findings where females are typically less prone.[25] Obesity, diabetes and hypertension also emerged as factors increasing complication risks, consistent with existing research.[25,26] All participants in this study had chronic injuries, with circular external fixators used after other treatment modalities had failed. Traumatic injuries, primarily from motor vehicle or motorcycle accidents, as well as gunshot wounds, were predominant among participants. Literature points to a rising incidence of severe tibial fractures in developing countries due to poor road conditions and violent incidents.[27-30] Pain significantly affected weight-bearing, particularly during external fixator adjustments. Postoperative adjustments were preferred over intraoperative adjustments to minimise intraoperative risks, according to literature.[31]

Fixator positioning impacted joint mobility; normal mobility during walking with a circular external fixator was feasible as long as the fixator did not cross over joints. Participants frequently faced challenges such as balance issues and leg length discrepancies due to the footplate intended to enhance stability and mobility.[32,33] Many participants had undergone multiple prior procedures, which increased the likelihood of complications and impacted self-esteem.[10,19] Financial pressures and the need to return to work were motivating factors noted in both the study and existing literature, influencing functional outcomes and weight-bearing ability.[29,34]

Barriers to full weight-bearing with circular external fixators

Some elements were a barrier and a facilitator to weight-bearing, depending on the participant, their experiences, or complications. The facilitators can, therefore, in some instances, be used as a guide to address the barriers. The barriers to full weight-bearing are described below.

Pain management

Pain stands out as the largest influencing factor to weight-bearing. Pain and pin-site infection are among the most common complications in a patient with a circular external fixator.[3,11] Pain can result from various factors, including strut adjustments, tissue tension, neural tension and swelling at the pin sites. Pain management through oral analgesics is important but may lead to substance abuse or adverse effects.[26,31] One of the reasons for loss of range of motion in the early postoperative phase is insufficient pain medication.[35,36] In some instances, there was a better level of tolerance of pain because of having been desensitised to pain in previous experiences with their injury.

Adequacy of education

Patient education on the external fixator mechanism of action and postoperative care is crucial.[37] Healthcare professionals, including physiotherapists, need to provide clear instructions and build good rapport with patients.[35,38] In the late 1990s, 80% of physiotherapists identified the need for better defined protocols and more information on the care of external fixator patients.[6] Although a study was done two years later, with a proposed treatment protocol, there are no recent studies in this regard, and there is still a need to upgrade protocols and update information on physiotherapy in external fixator care.[16] Physiotherapists need to have a detailed knowledge of the limitations of the external fixators, and the treatment protocols.[38] Patient compliance with doctor's instructions is essential to prevent complications. [39]

Functional outcomes

The main advantage of circular external fixators is that patients can use the limb functionally for the entire treatment time, allowing for an early return to function.[27,36,40,41] Some patients are overly cautious, leading to reduced functionality and weight-bearing. Assistive devices, like crutches or wheelchairs, can either facilitate or hinder weight-bearing, depending on patient usage. The work and home environment can also influence weight-bearing, with some feeling unsafe or limited in rural settings. Early weight-bearing is beneficial because it can increase the patient's functionality, and patients might then be able to return to work earlier.[23]

Circular external fixator components

The circular external fixator can be seen as cumbersome, heavy and difficult to manoeuvre by some patients; this makes day-to-day activities difficult, and hinders the patient's ability to walk.[28,42] The physical constraints and inconvenience of the circular external fixator have been frequently mentioned in literature.[3,6,11,17,43] The footplate may provide stability but can be challenging on uneven surfaces.[33] Complications with external fixator components, such as pin breakage or infection, can also deter weight-bearing. Soft tissue can be impaled by pins, leading to swelling, pain and reduced joint mobility.[6,29,39,44,45]

Effects of patient history

Previous complications and the patient's surgical history can negatively influence their mindset, as can the cause of the injury and previous negative outcomes. Negative past experiences with surgeons can lead to a lack of trust and apathy towards the current situation. Literature states that the number of previous operations plays a significant role in managing an external fixator but does not mention the effects of previous complications or mismanagement.[10,19]

Psychological impact

Psychological factors, such as depression and anxiety, can be significant barriers to weight-bearing. This is because certain psychological factors may affect compliance concerning mobilisation and weight-bearing.[13,19,20] Psychological issues arising from pain, as well as the psychosocial limitations from having to wear an external fixator for an extended period, resulted in patients not accepting the external fixator.[31,35,36,46] Fear of falling or refracturing the leg can hinder mobility and weight-bearing. Fear of moving could also result in a loss of range of motion.[35,36] Self-esteem issues and concerns about others' perceptions also affect weight-bearing.[10]

Physical barriers

Physical constraints of the circular external fixator, including its weight and footplate, affect gait pattern and quality of life.[3,6,11,17-19,43] Muscle weakness, joint stiffness, and decreased balance and proprioception due to immobilisation limit weight-bearing.[47] Crutch walking is a difficult skill that needs to be learned beforehand, and clothing needs to be adjusted. Pain, tension, discomfort from adjustments, pin pressure, and neural tension reduce the ability to bear weight.[46] Physiotherapy and functional dynamic splinting are important in reducing the chances of developing stiff joints and muscle weakness with an external fixator in situ. They may prevent or minimise joint range of movement (ROM) limitations altogether.[48]

Insufficient support structures

Family involvement is also important in the rehabilitation of external fixator patients; a lack of a support structure at home forces patients to rely on wheelchairs for mobility. As family members start feeling more like caregivers, there is a need to assess the impact of external fixator treatment on both the caregivers and patients.[25] Family ignorance is one of the main barriers to fracture management in developing countries.[29] Poor hospital experiences, inadequate healthcare facilities, and insufficient pain management contribute to barriers in weight-bearing.[29]

Facilitators to full weight-bearing with circular external fixators

While certain barriers mentioned previously had corresponding facilitators that could mitigate these issues, participants also highlighted additional factors that supported achieving full weight-bearing, as described below.

Methods to improve function and joint range of motion

Swelling and pain may result in stiffness and immobility.[6,29,33,39,44,45,49] Non-pharmacological pain relief methods, such as elevating the leg and applying ice, help reduce pain and swelling. Joint range of motion exercises and general exercises, such as cycling, can alleviate pain and improve weight-bearing. Furthermore, closed chain and weight-bearing exercises are beneficial in improving function.[46] Education on infection management, rest and elevation is also crucial for addressing swelling and stiffness.

Physical measures to improve gait

Adjustments to gait, such as wearing a boot on the unaffected leg to correct leg length discrepancies and taking longer strides, aid in better weight-bearing. Specialised footwear, including a hard shoe with an elastic band for the external fixator limb, helps maintain ankle range of motion and reduce contractures.[26,50] Gait re-education by physiotherapists and surgeons encourages normal gait patterns and weight-bearing.[6,13,15,16] Preoperative strength and ability to balance facilitate gait and ability to weight-bear postoperatively. Therefore, the patient's ability to mobilise preoperatively should be part of the plan for postoperative preparation.[37] Furthermore, preoperative physiotherapy treatment may also be beneficial if pre-existing issues where the joint ROM can be addressed.[48]

Psychological variations that facilitate weight-bearing

A positive mindset, hope for a positive surgical outcome, and mental distraction from pain contribute to improved weight-bearing. Functional outcome assessment based on the psychological acceptance of the procedure and the degree of the disability improved the physical aspects of the patient over time.[51] Embracing mental strength helps patients persevere through the challenges of circular external fixator treatment.[46]

Benefits of the multidisciplinary medical team

Expert care from a multidisciplinary team addresses patients' social, physical and psychological needs.[46] Positive experiences and support from healthcare professionals, particularly the surgeon and physiotherapists, foster trust and willingness to follow recommended weight-bearing protocols. Timely responses to patient concerns, especially infection-related, reduce complications and promote positivity. How the multidisciplinary team works together achieves a positive outcome for the patient.[39] A multidisciplinary team approach with specialised staff is very important in patient care and rehabilitation in respect of circular external fixators.[33,45]

Although the surgeries were conducted in the private sector, the sample population was from both rural and urban areas, with different levels of familial support. The support of the medical team, as well as patient and family education, were of utmost importance, and further research in the government sector may provide important information as there is a stark difference in care between the two sectors. Despite this, understanding all the above-mentioned factors is crucial for promoting early weight-bearing with circular external fixators, which can facilitate bone growth and patient recovery.

Limitations of the study include the data saturation point that was reached after interviewing nine participants. A larger sample size over a longer period might have yielded more results. All the participants' injuries were chronic by nature and associated with previous failed interventions, as, owing to polytrauma, acute patients were excluded as potential participants for this study. This study was also limited to a South African private sector context; therefore, more social and cultural diversity could have assisted in being truly reflective.

Conclusion

The findings of this study emphasise the importance of addressing physical and psychological factors affecting rehabilitation. Further research and the implementation of solutions to address these factors in physiotherapy practice are warranted in this context. These findings are consistent with the limited existing literature on the rehabilitation of external fixators and provide valuable insights into the barriers and facilitators to full weight-bearing.

Declaration of generative AI and AI-assisted technologies

During the preparation of this work, the authors used Chat GPT in order to improve language and readability in the condensation of information. After using this service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Ethics statement

The authors declare that this submission is in accordance with the principles laid down by the Responsible Research Publication Position Statements as developed at the 2nd World Conference on Research Integrity in Singapore, 2010.

Prior to commencement of the study, ethical approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (Medical), reference number M210723. All participants gave written informed consent before data collection began. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Declaration

The authors declare authorship of this article and that they have followed sound scientific research practice. This research is original and does not transgress plagiarism policies.

Author contributions

MDC: conceptualisation, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, visualisation, writing original draft, review and editing, final approval of the version to be submitted

SL: conceptualisation, supervision, review and editing, final approval of the version to be submitted

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