Preoperative Rehabilitation Enhances Mental and Physical Well-Being in Anterior Cruciate Ligament-Injured Individuals: A Mixed Methods Study

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Context: Rehabilitation after an anterior cruciate ligament injury is recommended to be started soon after the injury. When surgery is required, research supports the delivery of physiotherapy before anterior cruciate ligament reconstruction (prehabilitation) to optimize recovery and positive outcomes. Individuals attending prehabilitation have never been questioned regarding their adherence to prehabilitation, perception of utility in meeting needs, upcoming events, or anticipated recovery goals. ***Design:*** Mixed methods cross-sectional study: ***Methods:*** 25 individuals before anterior cruciate ligament reconstruction (43% of eligible individuals from 12 clinics during the delivery period) were surveyed on their mindset and recovery expectancies. Semistructured interviews conducted in 9 of 25 participants assessed their lived experience of prehabilitation. ***Results:*** Participants reported that preventing a reinjury (96% of responses) and feeling confident during daily activities about their knee (92%) were the higher rating expectations at this stage of their treatment course. Three themes were developed from the interviews and analyses. (1) Participants reported that prehabilitation was a period full of challenges with memories of the injury and uncertainties. (2) They viewed prehabilitation as a step to move forward by finding support and self-motivating. (3) They believed that prehabilitation would have positive impacts on the treatment outcomes. Participants were confident that prehabilitation would accelerate the recovery of muscle volume (88%) and strength (84%). ***Conclusion:*** Participants had positive experiences of prehabilitation, aligning with the findings on functional outcomes in the existing literature on prehabilitation.

Keywords: preoperative exercise, physiotherapy, knee injuries, patient-centered care, patient satisfaction

Key Points

- Prehabilitation alleviates anterior cruciate ligament-injured participants' uncertainties.
- Prehabilitation is valued for treatment adherence and self-motivation.
- Prehabilitation enhances postsurgical recovery and outcomes.

Anterior cruciate ligament (ACL) surgical reconstruction (ACLR) followed by rehabilitation remains the most common treatment pathway after an ACL injury, especially for individuals experiencing feelings of knee instability, desiring to return to activities requiring high demands (eg, pivoting sports[1]), and for those who continue to have unsatisfactory outcomes despite an initial conservative supervised-physiotherapy.[2,3] The delivery of physiotherapy before ACLR has been demonstrated to enhance postoperative knee strength, motor function, and long-term quality of life.[4–6] This stage of treatment is known as prehabilitation (Prehab). The goals of Prehab are as follows: (1) to improve mental and functional capacities of patients before surgery, (2) to reduce the risk of deconditioning and health deterioration, and (3) to enhance postoperative recovery.[7]

Rehabilitating from an ACL injury requires that individuals commit to an extensive treatment course, dedicating time, effort, and consistency.[8,9] Expectations, uncertainties, or motivation has been reported to modulate the success of ACL rehabilitation.[3,10–12] Preoperative expectations of recovery and fears of reinjuring or incomplete recovery have been examined within the timeframe for Prehab (eg, Webster and Feller[12] and Filbay and Kvist[13]). However, it is noteworthy that Prehab itself is not considered as a specific focus in these studies. To the best of our knowledge, individuals attending rehabilitation before ACLR have never been questioned on their adherence to Prehab, perception of utility in meeting needs, upcoming events, or anticipated recovery goals. Gaining insight into this experience is necessary, as understanding the patient's expectations and current feelings facilitates successful rehabilitation outcomes.

Feedback from individuals with an ACL injury is usually gathered through either a survey or interviews (eg, Walker et al[10] and Filbay et al[14]). We plan to use a mixed-method design to capitalize on the strengths of survey and interview methods. Standardized measures via a survey would aim to understand relationships with outcomes, while qualitative data would provide in-depth understanding of patients' experiences and how Prehab might participate in promoting their recovery.[15] The purpose of this study was to investigate the beliefs and perceptions of people with ACL injury attending Prehab before ACLR. We also aimed to

understand how they perceive the effects of Prehab on their health status and their recovery. Insights from this research could offer areas for the improvement of management strategies.

Methods

Study Design

This mixed-method study combined a quantitative and qualitative convergent approach. In this popular approach, data are collected concurrently, analyzed, and reported separately, and then combined together in the discussion.[16] This design enabled us to collect information on individuals' beliefs and presumed effects of Prehab using a survey, while semidirective individual interviews explored perceptions and experiences associated with Prehab. The University Human Research Ethics Committee approval was obtained before initiating this study (CERNI, n° 0512022-1). This research was reported in accordance with the Checklist for Reporting Results of Internet E-Surveys and consolidated criteria for reporting qualitative research checklist from the EQUATOR network.[17]

Participants

Individuals treated with Prehab after an ACL injury were recruited in 12 physiotherapy clinics specialized in sports rehabilitation, engaged locally into a consortium to improve the delivery of physiotherapy for orthopedic and sport injuries. Participants were enrolled after scanning a hyperlink (QR code) from a flyer displayed on the clinic room wall that redirected them to the welcome page of the online survey. They could participate if they satisfied the inclusion criteria: being over the age of 18 years, having a first episode of ACL injury, and undergoing Prehab before ACLR. Before participating in this research, participants were asked and provided their informed consent (in accordance with the Declaration of Helsinki) on the first webpage of the survey.

Procedures

Quantitative data were collected through an online, secured survey platform only accessible by the researchers after identification (LimeSurvey, version 3.23.4 + 200922). The survey contained 17 close-ended, single- or multiple-choice questions designed to better understand: patients' history and treatment course, expectations for recovery, mindset, and perceptions of presumed effects of Prehab (see Suppl File 1). Selected items were generated relying on the literature exploring physical and psychological health consequences related to ACL injury, ACLR, adherence, and participation in rehabilitation.[9,12,14] The survey employed display logic that enabled the presentation of only those questions that were pertinent to the respondents based on their previous answers. The survey was pilot-tested on a small representative number of individuals (n = 3) from the target popu-lation to check for clarity of items, misleading, or missing options from question choices. No specific issues or comments were identified from pilot validity-testing, indicating the questions and items were clear and comprehensive, and aligned with patient considerations. No monetary incentives were offered for complet-ing the survey, which took approximately 9 and 15 minutes. Responses were collected between January 3 and May 31, 2022. Participants could review and edit their answers. Those interested in an interview provided an email address at the end of the survey, to be fixed within 14 consecutive days. They were informed that this interview aimed to elaborate on their experiences of Prehab and would not influence the delivery of their treatment. When individuals showed interest, they received an email from one of the study investigators to arrange a suitable interview date. Semistructured interviews were conducted via videoconference (Microsoft Teams, Microsoft Office 365) using an interview guide, by the same researcher with a physiotherapy background, previously trained in qualitative methods. The interviews lasted between 21 and 35 minutes and were fully recorded. The interview guide is available in Suppl File 2.

Statistical Analyses

Following the closure of the survey, the data underwent screening and responses were excluded if they were determined to be inconsistent with a valid response (eg, submitted in <3 min) or not unique (identified as duplicates based on IP addresses). Data were exported into a spreadsheet for analysis (SPSS, IBM, version 26.0). Descriptive statistics were used for continuous variables (mean and standard deviation) and binomial variables (frequencies and percentages). For multiple-choice questions, an a priori internal consistency analysis was performed. Cronbach alpha coefficient was found between .80 and .86, indicating adequate consistency of question and items. For questions utilizing a 6-point Likert scale, frequency distributions were used for the distribution of responses for each scale option, enabling the identification of the most and least frequently chosen responses among participants. An inductive thematic analysis derived from grounded theory[18] was conducted on qualitative data to understand how individuals awaiting ACLR made sense of their lived experience during Prehab (NVivo, QSR International Pty Ltd, version 14.0). We used 3 strategies throughout data collection and analysis for ensuring trustworthiness of qualitative data, as recommended by Creswell and Plano Clark.[16] First, a summary of the findings was discussed at the end of the interview with each participant to ask whether these elements were accurately reflecting their experiences (member checking). Second, the transcription of each interview was performed separately by 2 researchers who were qualified and licensed physiotherapists, experienced in treating individuals with ACL injury. Initial codes were generated for interesting features of the data across the dataset, in relation with the object of the research. A third researcher from the team was involved in collaborative revision to eliminate redundancy and achieve consensus. The final codes were organized into themes and subthemes for similar ideas on respondents' mindset and Prehab experiences[19] (triangulation). Finally, an external revision was made by a peer researcher from the faculty, familiar with qualitative research but not affiliated with the project.

Data were collected and analyzed in French. For publication purposes, they were translated into English with the assistance of an English-native physiotherapist. To ensure accuracy and consistency with the original version, the English translation was back-translated to French.

Results

Results of the Survey

Twenty-four responses were excluded: 8 participants did not satisfy inclusion criteria so their response was not obtained, 1 response was duplicate, and 15 responses did not fill the date of the surgery (making impossible to verify whether the response was

provided before or after surgery). Among the 25 remaining responses, 24 (96%) completed the survey, corresponding to 43% of the total eligible individuals being in Prehab settings in the clinics during the period of survey distribution (targeted population). Participants were mostly of female (n = 14, 56%) gender, aged: 28.4 (10.9) years. They answered to the survey at a mean of 76.1 (38.9) days after their ACL injury and 30.0 (21.4) days before their ACLR. Participants reported a first episode of ACL injury, during a sport activity for 92% of cases. The injury occurred during a change of direction (cross-step cutting) in 44% of cases or landing from a jump in 32% of cases (Table 1).

At the time of the surveyed, the highest expectations from respondents were to prevent a new/persistent knee injury (96% of responses rated 4 or 5 on Likert scale) and no longer have to worry about the knee during daily life (92%; Figure 1). Participants felt highly motivated (92%) and mostly capable of facing their daily demands (76%). Almost a third of them (32%) declared to replay past events from the injury, and approximately half of responses (44%) had worries about the ability to return to preinjury situations (Figure 2).

Long-term expectations of treatment and specific contribution of Prehab to clinical course were discussed with the surgeon for 83% of respondents and for 100% with the physiotherapist. The remaining 17% of participants all stated that they would have desired to discuss these points with their surgeon. Participants felt highly involved in the process of establishing their treatment goals (88%) and customizing the content of Prehab (84%) with the physiotherapist, with adjustments considering their physical/psychological condition on a given day (76%).

As depicted in Figure 3, the effects of Prehab were perceived to be positive for muscle volume, strength, knee stability, and range of motion (at least >60% of responses). Participants judged the highest effects of Prehab on their health status prior to the surgery, at the end of Prehab, and during the first to sixth month after ACLR. They reported that Prehab would enhance muscle volume and strength recovery (88% and 84%, respectively). A minority of individuals estimated that Prehab would change their drug consumption (8%).

Results of the Interviews

The semistructured interviews were carried out with 9 participants within 3 to 15 days after the survey completion. All interviews were conducted before data analysis. Saturation could be achieved when no new codes emerged from the seventh interview. A total of 3 themes and 10 subthemes were identified from the data: (1) From injury to recovery: a period full of mental and mood issues, (2) Prehab: an opportunity to move forward, and (3) Preoperative rehabilitation: perceived positive effects. For clarity, illustrative supporting quotes are summarized in Table 2. Additional quotes can be found in Suppl File 3.

Theme 1: From injury to recovery: a period full of mental and mood issues

Participants frequently reported that the period between injury and surgery was associated with challenges related to their mental, well-being, and emotional states.

Subtheme 1.1: Memories of the injury

Repeated recollections or thoughts of the injury were outlined by participants to resurface over time. These memories manifest as vivid images, emotions, or sensory experiences associated with representations of individuals (such as watching sports on television) and capturing their personal encounters at the moment of the injury.

Subtheme 1.2: An injury that is present throughout daily life

The injury was reported to have significant impacts on their daily activities, or interactions on a regular basis, depending on the individual demands. This constant presence shapes experiences', and demands' ongoing attention and adaptation.

Subtheme 1.3: Concerns due to treatment uncertainties

During this period, unresolved questions about future treatment (in particular ACLR) did create a general atmosphere of unease or insecurity for many individuals.

Subtheme 1.4: Threats linked to the future

Participants indicated facing challenges in envisioning their recovery and anticipating the final outcomes.

Table 1 Characteristics of Survey Respondents

Characteristic	Participants (n = 25)
Sex, n (%)	
Female	14 (56)
Male	11 (44)
Age, y, mean (SD)	28.4 (10.9)
Date from ACL injury at the time of the study, d, mean (SD)	76.1 (38.9)
Date before surgery at the time of the study, d, mean (SD)	30.0 (21.4)
Circumstances of ACL injury, n (%)	
Sport activity	23 (92)
Walking around obstacles	2 (8)
Characteristics of ACL injury, n (%)[a]	
Deceleration phase of movement	3 (12)
Landing from a jump	8 (38)
Change of direction/cross-step cutting	11 (44)
Contact (either direct or indirect, to the knee)	5 (20)
Loss of balance/Fall	3 (12)

Abbreviation: ACL, anterior cruciate ligament.
[a]Participants could choose >1 answer.

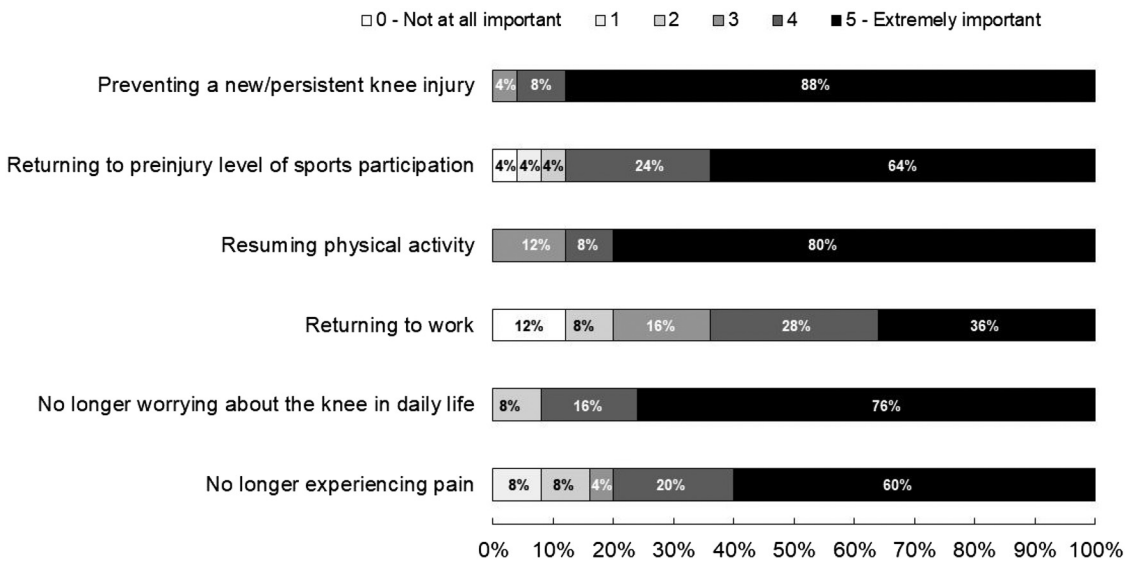

Figure 1 — Patient ratings of their final expectations at the end of treatment, while attending rehabilitation before anterior cruciate ligament reconstruction (n = 25). Frequencies of ratings on a 6-point Likert scale.

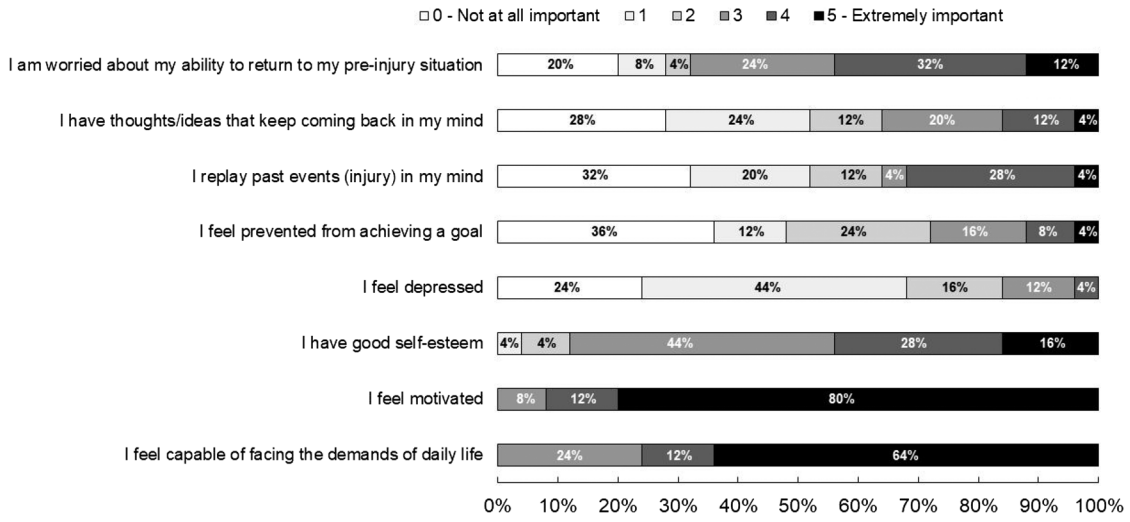

Figure 2 — Patient ratings of their current mindset, while attending rehabilitation before anterior cruciate ligament reconstruction (n = 25). Frequencies of ratings on a 6-point Likert scale

Theme 2: Preoperative rehabilitation: a step to move forward

Engaging in Prehab was consistently found helpful by individuals for improving their quality of life.

Subtheme 2.1: Being listened to, reassured, and gaining self-confidence

Many individuals expressed that their physiotherapist actively listened and provided support regarding their uncertainties and needs. This recognition implied being identified and understood as an individual, with tailored support instead of feeling like "just someone else."

Subtheme 2.2: Self-awareness of competence

Participants also reported that Prehab increased the consciousness of persisting self-abilities during their daily life activities, limiting a sense of defeatism.

Subtheme 2.3: A source of self-motivation

Prehab was highlighted by individuals as an opportunity to generate motivation for adhering and actively engaging in the treatment plan and the ACL injury journey.

Theme 3: Preoperative rehabilitation: positive impacts on treatment outcomes

Individuals consistently reported that engaging Prehab would be advantageous in promoting outcomes at the end of the treatment.

Subtheme 3.1: A faster recovery

Participants believed that Prehab helps in facilitating a faster recovery process after the injury (eg, "to walk again") and after ACLR.

Subtheme 3.2: A better recovery

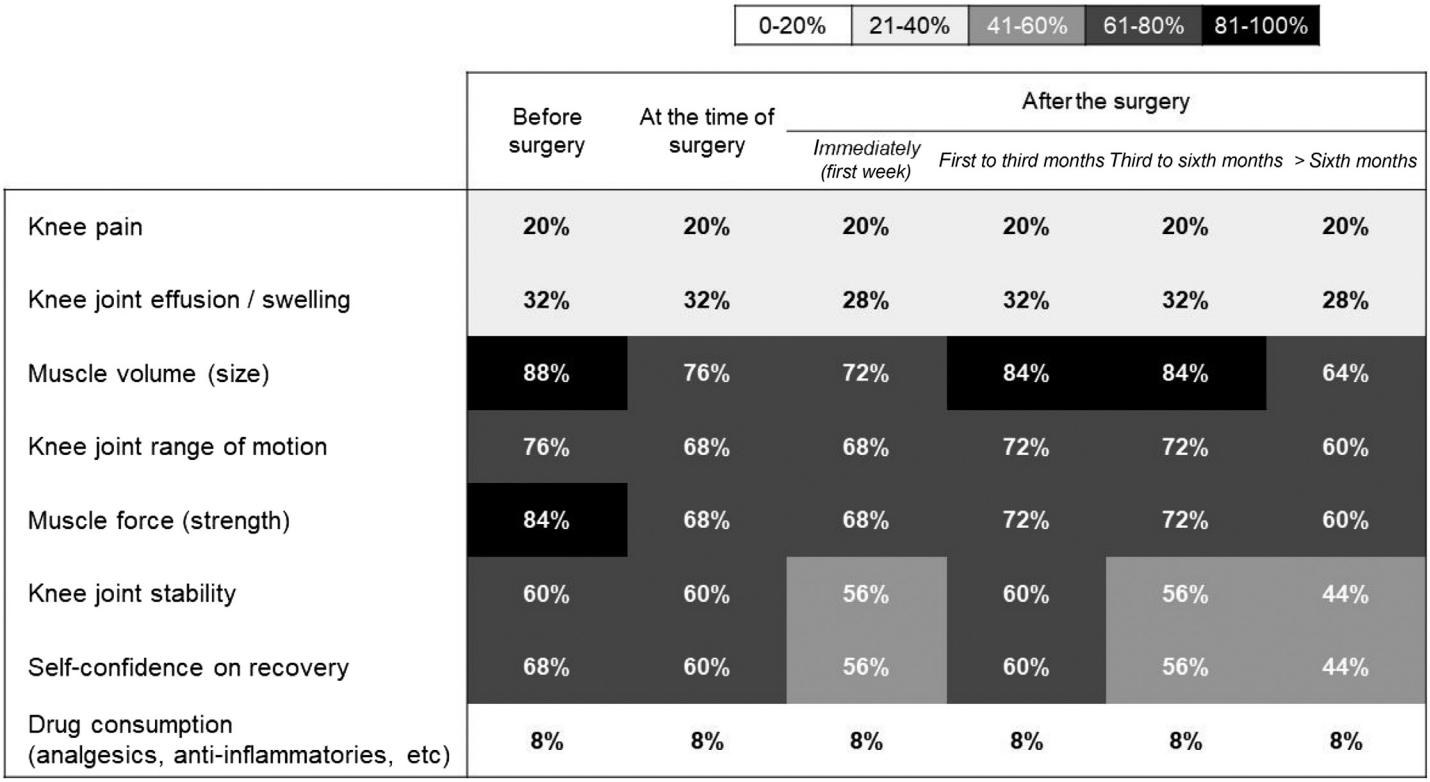

Figure 3 — Patient anticipated positive effects of preoperative rehabilitation before anterior cruciate ligament reconstruction (n = 25).

Individuals perceived that Prehab would enhance healing and recovery, leading to a more favorable trajectory after ACLR.

Subtheme 3.3: Joint and muscle landmarks

Individuals could perceive improvements due to Prehab based on very specific indicators related to their knee health: muscle volume, strength, and joint mobility. The focus on these markers could be attributed to their interactions and goal settings with their health practitioners.

Discussion

The purpose of this study was to investigate the perception of Prehab by ACL-injured patients, before their ACLR. The main findings derived from the combination of survey and interviews showed that patients associate Prehab in relation to distinct phases of their health journey. Specifically, these phases include reflecting on 3 time points: the past (ACL injury and its consequences), the present (since the beginning of Prehab), and the future (ACLR, and post-ACLR recovery).

First, concerning their past, participants reported during the interviews negative emotions and sensations associated with memories of the injury, along with uncertainties related to their treatment course and the decision whether to undergo an ACLR or not. While it is possible that flashbacks of the injury may be indicative of psychological trauma,[20] only a portion of the patient sample reported frequent replaying of past events, according to the survey responses (32%, cumulated frequency of Likert ratings of 4 or 5 among the sample). This indicates that the frequency of flashbacks might be less frequent (52%, cumulated frequency of Likert ratings of 0 or 1 among the sample; Figure 2).

Second, with regard to the present, as revealed by the interviews, participants perceived Prehab as a support to alleviate uncertainties and to increase their self-motivation in their treatment pathway (Table 2, theme 2). Comparable findings were found in the results of the survey with high ratings of self-esteem and motivation (Figure 2). Moreover, participants exhibited a great self-confidence and satisfaction in performing they daily activities at the time of Prehab, even if the interviews reported that they might face challenges depending on activities' demands.

Third, with regard to the future, the survey identified "avoiding a new injury" and "resuming a physical activity" as important outcomes (Figure 1). They also expressed uncertainties about the extent of final recovery, such as achieving a full recovery of anterior activities (Table 2). The results are in accordance with those of Filbay and Kvist,[13] where ACL-injured patients prone to undergo ACLR may realistically anticipate a partial recovery of their abilities so as to accurately understand the greater risk of reinjuring when returning to pivoting/contact sports activities.

According to the results obtained through both methods, participants believed that Prehab might positively influence the treatment outcomes (Table 2). They strongly perceived improvements in muscle mass and strength (Figure 3). On the one hand, they were confident that Prehab would enhance their post-ACLR rehabilitation, facilitating a faster and more complete recovery.

Globally, Prehab was reported as an opportunity to express and share experiences, address doubts, and confront fears. The attentive listening and reassurance provided by the physiotherapist may have contributed to the emotional well-being of

Table 2 Identified Themes and Subthemes

Theme 1: From injury to the recovery: a period full of mental and mood issues
Subtheme 1.1: Memories of the injury *I recall the injury quite often actually. Now I tend to project my injury on others, like when I see someone changing direction, yeah I start to get tense (P06)* *I've never hurt so much in my life. I remember every step of my jump (P01)*
Subtheme 1.2: An injury that is present throughout daily life *Every day, it's like there's something wrong with you (P09)* *I'm very careful when I have to press down on my knee to bend down and pick something up, like my shoes or when I'm shopping (P08)*
Subtheme 1.3: Concerns due to treatment uncertainties *It was like, one moment I'm having the operation, and the next minute, I'm not. Hard to know where I stand! (P02)* *3 months after the injury, well … everything was postponed, because … I was not ready for it, I was scared to go to the surgery without anything [preparation], just like that … (P01)*
Subtheme 1.4: Threats linked to the future *I … yeah …. I … I'm scared … I know that apparently it can come back … (P04)* *I don't think it will ever be the same again […] I won't be able to ski like I used to. (P07)*
Theme 2: Preoperative rehabilitation: a step to move forward
Subtheme 2.1: Being listened to, reassured, and gaining self-confidence *Talking about it all the same … it answers some questions, so I think, I think there's a big mental aspect to it. It helped me to … to reassure myself (P05)* *I'm starting to reassure myself a little because in the end when I see that … just with the rehabilitation I did until now, I've already managed to recover quite a bit. I think to myself … If you hadn't done that … you wouldn't be here. (P08)*
Subtheme 2.2: Self-awareness of competence *I feel able to do more and more things in my [daily] life, like taking the tram to work when I used to have to sit in the tram due to fatigue (P01)* *Going back to a semi-athletic activity via the physio was still a stress reliever. (P02)*
Subtheme 2.3: A source of self-motivation *I feel listened to, there is the human side that motivates too, because you feel understood and supported. I feel more concerned and invested, so it makes me want to get involved a bit more, like continuing at home in parallel … (P03)* *Now I have line of sight. Basically, I know the steps I have to go through etc. Knowing where you are going helps you stay motivated to progress. It can help you to set a timeline and not to get false hopes. (P09)*
Theme 3: Preoperative rehabilitation: positive impacts on treatment outcomes
Subtheme 3.1: A faster recovery *I know that the rehabilitation before surgery will pay off, my rehabilitation will be faster afterward,, in fact it's not … it's not wasted time at all, that's it. (P05)* *The fact that I've recovered that much before [surgery], can only be positive …. I'll struggle less after the surgery and may be [able to] run quicker again (P04)*
Subtheme 3.2: A better recovery *I think it will be much easier, than if I really hadn't done anything in pre-op …. I would start from nothing. It would be a struggle otherwise … (P03)* *I've made a lot of progress and that's continuing, […] which will make the job easier in the future (P07)*
Subtheme 3.3: Joint and muscle markers *I understood well that if I went to surgery without having a full range of motion and muscle strength, it would be catastrophic afterwards, so … thankfully, I was able to recover thanks to the physio (P05)* *We are building muscle, yes, I see it, that's good (P06)*

participants, participating in preparing them for surgery, and alleviating their fears and providing dramatic relief.[21] Moreover, individuals felt satisfied to be actively involved in their treatment plan. These results might value Prehab as an opportunity to create therapeutic relationship and a patient-centered approach.[10] This would also promote a higher level of adherence to rehabilitation and increase self-motivation.[10] For instance, some participants of our sample expressed satisfaction at completing home-based exercises, which is known to be a favorable behavior for positive outcomes at the end of treatment.[10,22] Our findings suggest that Prehab may participate in the regulation of psychological aspects associated with the ACL injury recovery, such as self-efficacy, self-esteem, self-determination, or emotional distress.[23,24] Longitudinal studies with comparator groups without Prehab would determine if initial mindsets from the injury could gradually be substituted by improvements in self-efficacy, personal control, and coping strategies.[25]

Limitations

The objective of this study was to focus on an area that has been underresearched compared with post-ACLR rehabilitation and despite recommendations to use Prehab in the ACL-care pathway.[26] For that purpose, we used a mixed-method approach, where survey and interview guides were built to capture patient experiences before ACLR. Because the current surveys/questionnaires designed for ACL populations mainly focus on post-ACLR recovery, they fail to cover all the necessary elements for this study. We developed a questionnaire specifically targeting pre-ACLR concerns. Prior to distribution, we assessed its face validity and internal consistency. However, it is worth noting that the use of Likert scales does not rank the choices in multiple-choice questions. Further investigations are needed to assess the accuracy of the instrument on the specified factors reflected by this version of the survey (eg, psychological trauma and kinesiophobia). Responses

were not collected at the same date relative to the injury, surgery, or the initiation of Prehab for each participant. However, the frequency of the answers suggested similarities between participants. In addition, it is possible that patients were exposed to slight variations in the delivery of Prehab such as the number/frequency of Prehab sessions, although all of them employed manual therapy, exercise, and prophylactic contents during the sessions. Moreover, the extent to which some typical expectations conveyed by the therapists (eg, "your knee needs to reach that point before surgery") due a possible bioreductionist model of care[27] would need further investigation. Physiotherapists and surgeons used to collaborate with similar treatment pathways, reflecting the health care model promoted in France. It may reduce the risk of heterogeneity in our results but also limit the generalizability of the findings to other countries. Future studies should assess the changes of parameters over time, including at the end of treatment after ACLR and rehabilitation. The specific influence of time and exercises promoted in Prehab should also be further investigated and clarified.

Conclusions

This study provides new insights into the perceptions of Prehab by individuals awaiting ACLR. At this stage of their treatment course, individuals express a positive perception of Prehab. According to them, they find support that helps alleviate uncertainties, increase self-motivation, and adhere to their treatment plan. They also perceive Prehab as valuable for improving their current daily activities and enhancing their recovery. Longitudinal studies might precise the Prehab's value on recovery over time.

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Suppl File 1 – Survey

Translated from FRE to ENG (and back-translated) for check.

Start of Block 1: Eligibility & Inclusion

What is involved in this project? This research aims to investigate patients' perceptions of participating in prehabilitation before ACL surgery. We invite you to complete a survey about your experiences during ACL prehabilitation.

The survey will take you approximatively 10-minutes to complete.

Who can participate (inclusion criteria)? Individuals, over the age of 18, who have had an ACL injury, waiting for ACL reconstruction surgery (not operated yet), and participating in prehabilitation (physiotherapy) before surgery.

What are the potential benefits/risks of this research project? Participation in this study is entirely voluntary, with no individual benefits/risks. You may withdraw at any time without any consequences.

What's in it for you? The opportunity for your voice to be heard and contribute to increase the successful implementation of rehabilitation programs to improve outcomes and health of individuals post-ACL injury.

How will my data results be used? All the data collected will be treated with confidentiality and not made accessible to any person outside : Nina Desfontaines (Physiotherapist student, nina.desfontaines@ifm3r.eu), Antoine Frouin (Physiotherapist, PhD student, antoine.frouin@etu.univ-nantes.fr) and Guillaume Le Sant (Physiotherapist, PhD, Principal investigator, guillaume.le-sant@univ-nantes.fr). Data will be stored in a secure location at Nantes University (France) for 5 years. This research has been validated by the Human Resarch Ethics Committee (CERNI, n°05012022-1). Any publication from this research will be reported as averaged results for the participant group, so that we cannot identify you as an individual.

Q1 Participant Information

- By clicking the 'YES' button below, you acknowledge :
- consenting to participate in the investigation into ACL prehabilitation, conducted at Nantes University
- for the data to be used in publications arising from this research
- satisfy inclusion criteria : > 18yo, having a first episode of ACL injury, waiting for surgery (not operated yet), undergoing prehabilitation (physiotherapy) before surgery

[____] YES

[____] NO

Skip to Q2 if Q1=No

Q2 Based on the answers you have provided you are not eligible to participate in the survey. Thank you for your time and consideration.

End of Block 1: Eligibility & Inclusion

Start of Block 2: General information

Q3 How old are you?
[_____] (number, in years)

Q4 What is your gender ?
[____] MALE
[____] FEMALE
[____] I DEFINE MYSELF AS [……] (precise)

Q5 Set the date of your ACL injury?
[YYYY/MM/DD]

Q6 Precise the circumstances of your ACL injury
[____] SPORT ACTIVITY
[____] ACCIDENT, ON PUBLIC RAILWAY
[____] OTHER [……] (precise)

Q7 Precise the characteristics of your ACL injury
[____] LANDING FROM A JUMP
[____] DIRECTION CHANGE
[____] DECELERATING
[____] EXTERNAL CONTACT TO THE KNEE / OTHER PART OF BODY
[____] BODY FALL / LOOSE OF BALANCE
[____] OTHER [……] (precise)

Q8 Set the date of your ACL surgery?
[YYYY/MM/DD]

End of Block 2: Eligibility & Inclusion

Start of Block 3: Rehabilitation and objectives

Please take into account the long-term results of your rehabilitation, including post-surgery.
This part of the survey is not limited to the period before surgery alone.

Q9 Please rate the following factors regarding your final recovery desires (at the end of post-surgery rehabilitation) ?
Likert scale 0-5 ; 0= not at all important ; 5= extremely important

- No longer experiencing pain
- No longer worrying about the knee in daily life
- Returning to work
- Resuming physical activity
- Returning to pre-injury level of sports participation
- Preventing a new/persistent knee injury

Q10 Did you discuss of your recovery desires with

- Your surgeon
  [____] YES
  [____] NO
- Your physiotherapist
  [____] YES
  [____] NO

Skip to Q11 if Q10=NO

Q11 Would you have wished for it?
[____] YES
[____] NO

Skip To: Q12 if Q10=YES

Q12 Rank your state of mind on the following elements based on your feelings over the past 7 days.
Likert scale 0-5 ; 0= not at all important ; 5= extremely important

- I feel capable of facing the demands of daily life
- I feel motivated
- I have good self-esteem
- I feel depressed
- I feel prevented from achieving a goal
- I replay past events (injury) in my mind
- I have thoughts/ideas that keep coming back in my mind
- I am worried about my ability to return to my pre-injury situation

End of Block 3: Rehabilitation and objectives

Start of Block 4: Rehabilitation before surgery (prehabilitation)

This part of the survey is now specifically related to your rehabilitation before the surgery only (prehabilitation).
It does not concern the rehabilitation after the surgery.

Q13 Did you discuss specifically of prehabilitation with

- Your surgeon
  [____] YES
  [____] NO
- Your physiotherapist
  [____] YES
  [____] NO

Q14 Do you feel involved in prehabilition (with the physiotherapist) regarding...

- The definition of your treatment objectives
  [____] YES
  [____] NO
- The content of the prehabilitation sessions (exercises...)
  [____] YES
  [____] NO

- The adaptation of the prehabilitation sessions to your condition of the day (physical/psychological state)
  [____] YES
  [____] NO
- Other [……] (precise)

Q15 Do you think prehabilitation is going to be effective on the following parameters? (Check all that apply)

- Knee joint effusion / swelling
- Knee pain
- Knee joint range of motion
- Muscle volume (i.e. size)
- Muscle force (i.e. strength)
- Knee joint stability
- Self-confidence on recovery
- Drug consumption (analgesics, anti-inflammatories, etc)

Skip To: Q16 if Q15=checks ; Skip To: Q17 if Q15= no check

Q16 When should prehabilitation produce optimal benefits ? (Check all that apply)

- Before the surgery
- At the time of the surgery
- After the surgery, immediately (1st week)
- After the surgery (1st to 3rd months)
- After the surgery (3rd to 6th months)
- After the surgery (> 6th months)

Q17 Do you think prehabilitation is going to be effective on the following events? (Check all that apply)

- Returning to work (date)
- Returning to running activity (date)
- Returning to full physical activities (date)
- Recovery of pre-ACL-injury capacities
- Risk for a second/new ACL-injury

Q18 Please provide your contact details below (phone or email) so that we get back to you for an interview with an investigator of this project (video conference, approximately 30 minutes)
[_____email_____]
[_____phone_____]

End of Block 4

End of Survey

Suppl File 2 – Semi-structured interview guide

Translated from FRE to ENG (and back-translated) for check.

ACL injury, and treatment options

- Can you tell me how you injured your ACL?
- What happened next? How was your experience with healthcare providers?
- Can you tell me about your experiences with health care professionals? How did you approach your personal objectives with treatment?
- Decision for having surgery? Were you offered different/other treatment options? Was surgery, an option that you expected?
- Who started to discuss about rehabilitation before surgery?

Rehabilitation before surgery

- How was rehabilitation before surgery presented to you?
- Based on your experience, what are your feelings about rehabilitation before surgery?
- How would you define your therapeutic relationship with the surgeon? the physiotherapist?
- How does rehabilitation before surgery influence your situation? (Mental, motricity, daily activities)
- In which extent do you feel rehabilitating before surgery will participate to modify your treatment course? recovery?

Anything else you want to add, that was not covered before ending the interview?

Suppl File 3 – Additional quotes from identified themes and sub-themes

Theme 1: From injury to the recovery: a period full of mental and mood issues

Subtheme 1.1: Memories of the injury

- *I see everything again, finally it's stupid, but every time I finally think about it, I see how I when I finally fall, I find it too stupid the way it happened…. on the other hand, for once I really have all the memories of all the pain and… the feeling, like the pain or like the… the feeling of the knee twisting, really something cracking, what. I really have everything that is really printed in my mind for once.(P02)*
- *when I watch a football match, I pay more attention now, to… when there are… there are contacts, yeah. I'm looking to see if he could have hurt his knee, for example the ligament... (P05)*

Subtheme 1.2: An injury that is present throughout daily life

- *I feel like nothing was right. And my knee, I found it super disabling to go to the faculty… […] Every day, when you go outside, you feel like something's off, you know? (P02)*
- *It depends on the day, but in fact, it's just really exhausting and demoralizing! (P03)*

Subtheme 1.3: Concerns due to treatment uncertainties

- For a month, I didn't really know what was going to happen, what a stress! (P06)
- *When they came to get me with the ambulance, an [emergency medical technician] firefighter told me that 'there will be no other option than surgery', at the ED [emergency department], it was 'no emergency but see a surgeon' and the surgeon told me 'we'll wait a few weeks before deciding' . I didn't really understand if surgery was needed or not […], what was going to happen next and why nobody was saying the same thing in the end (P09)*

Subtheme 1.4: Threats linked to the future

- *I think I'm a bit…afraid of not being able to… I mean, I don't really know what happens afterwards for… if my physical abilities are still there (P06)*
- *Two friends of mine in my team who've returned to football after their [knee] sprain, but honestly, when I see how hard they're struggling, […] I wonder if I shouldn't say to myself that I won't return to the game, to prepare myself for it (P05)*

Theme 2: Preoperative rehabilitation: a step to move forward

Subtheme 2.1: Being listened to, reassured, and gaining self-confidence

- *It's cool because I feel a little... listened to. And, I don't feel like I just come to the physio with this "goal" and then that's where it ends. It's really about listening. We're more used to…well, I think… it's up the practitioners, whether it's the surgeon or the physio, to have their say... tough luck. To feel that it's the patient who is directly involved in the treatment, well that's good.. (P02)*
- *the psychological aspect... telling myself that I am ready [for the surgery] (P04)*

Subtheme 2.2: Self-awareness of competence

- *I went back to work […] it was basically very… manual, physical. I saw everything that it didn't get worse, so it also helped me regain confidence. (P05)*
- *At least we see... we can better see our progression. I think that if we go into it without knowing where we want to go, well at least… I would give it more importance, I think… to see the steps, the improvement of my condition, and during every day moves. (P03)*

Subtheme 2.3: A source of self-motivation

- *the encouragement from [physiotherapist's name] and the challenges we set each other with patients make exercise more fun (P07)*
- *I want to do it [the exercice] better in the next session, and I often succeed! (P08)*

Theme 3: Preoperative rehabilitation: positive impacts on treatment outcomes

Subtheme 3.1: A faster recovery

- *I can redo a lot of things, and I don't think I could have done them as quickly without anything. (P09)*
- *afterwards, in fact it's not... it's not wasted time at all, that's it. (P01)*

Subtheme 3.2: A better recovery

- *I think it will be much easier, than if I really hadn't done anything in pre-op... I would start from nothing. It would be a struggle otherwise…(P02)*
- *When it comes to getting back [into sport], I think… the best thing is to talk about it and work on it […]. I could do it better, I could come back and play better. (P08)*

Subtheme 3.3: Joint and muscle landmarks

- *It's true that I feel better... I can see that my muscles are getting stronger as my sessions progressed (P04)*
- *The surgeon had given me a target of... you know when I contract my quadriceps, to be able to lift my heel off the table basically, and because before... I couldn't do it at all … it was depressing… my heel stayed there, I got no reaction. So that was the goal he gave me, as a goal for the surgery. Now I can do it (P07)*