

# **Adherence to Anterior Cruciate Ligament Rehabilitation: A Qualitative Analysis**

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**Objective:** To investigate the subjective experience of anterior cruciate ligament (ACL) rehabilitation and identify variables that influence adherence as perceived by ACL-reconstructed patients. **Design:** A qualitative study using in-depth interviews to gather data and thematic coding to analyze findings. **Setting:** Participants were interviewed at home or in their workplace. **Participants:** Eleven patients were interviewed at an average of 4.8 months ( $SD = 0.8$ ) after ACL reconstruction. **Results:** Using thematic coding of the interview data, 3 categories of variables influencing adherence emerged: environmental factors, physical factors, and psychological factors. Variables specifically affecting adherence to home exercise were perceived lack of time and a lack of self-motivation. Fear of reinjury emerged as a significant consideration for those who were nonadherent. Factors such as therapist support, the rehabilitation clinic, and the progression of exercises were identified as being important for attendance at physiotherapy appointments and adherence during appointments. **Key Words:** ACL, compliance, interviews

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Rehabilitation after anterior cruciate ligament (ACL) reconstruction requires a substantial commitment over an extended period of time, and a perception exists that adherence to ACL rehabilitation is essential for an optimal outcome.<sup>1</sup> In recent years, research attention has focused on factors affecting adherence to sports-injury rehabilitation, including ACL rehabilitation.<sup>2,3</sup> The limitation of much of this research is that the variables that determine the multifactorial construct of adherence have been identified using quantitative measurement scales, resulting in a somewhat fragmented representation of rehabilitation adherence. Across the medical, psychological, and physical domains of rehabilitation over 200 variables relating to adherence have been examined.<sup>4</sup> Quantitative investigations of rehabilitation adherence are generally restricted to the examination of a limited number of these variables and are further hampered by the need to identify and employ reliable and valid measurement tools.

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A recent investigation attempted to address the scarcity of qualitative research in the area of adherence to orthopedic rehabilitation by interviewing and examining the rehabilitation experiences of 20 patients with knee osteoarthritis.<sup>5</sup> Data were thematically coded and a model developed to help identify reasons for adherence or nonadherence with physiotherapy rehabilitation for patients with knee osteoarthritis. The authors suggested that a similar method be undertaken during research into other areas of rehabilitation adherence.

The analysis of the experience of ACL rehabilitation and the various influences on its completion lends itself to a qualitative approach. Such an approach permits a comprehensive account of the rehabilitation experience and the many variables affecting adherence. In response to discrepancies in the literature regarding adherence determinants and the dearth of qualitative analysis of such a complex issue, a qualitative investigation was undertaken. The aim of this qualitative study was to identify variables that influence adherence to rehabilitation after ACL reconstruction.

## Method

Eleven ACL-reconstructed patients were interviewed at an average of 4.8 months ( $SD = 0.8$ ) into the rehabilitation process. Participants were selected from a larger research project analyzing the adherence-outcome relationship in ACL rehabilitation. In the larger study, adherence was measured using scores of attendance at physiotherapy appointments, therapist ratings of patient adherence during appointments, and self-reported adherence to home-exercise programs (including self-directed gymnasium workouts).

To allow a comparison between factors that influence rehabilitation in adherers and nonadherers, a stratified purposive sampling technique was employed. Such a technique attempts to capture major variations by selecting a sample of above-average, average, and below-average cases.<sup>6</sup> Because participants attended most physiotherapy appointments and were judged by their therapists to be adherent during physiotherapy, the sample was stratified based on adherence to home-exercise completion. Home adherence rates were determined using self-report diaries over the first 12 weeks of rehabilitation. Diaries were returned weekly to the principal researcher and contained information regarding the number of exercises completed each day. Of the 11 participants, 5 were adherent (>80% completion of home exercises), 1 was moderately adherent (60% to 70% completion of home exercises), and 5 were nonadherent (<60% home-exercise completion) in the larger study. The classification of adherence percentages was based on previous literature.<sup>7-9</sup>

In addition to selecting a variable sample with respect to home-exercise adherence, we sought variation among participants with relation to gender, age, occupation, and sporting level. Participant characteristics are presented in Table 1. All participants had sustained a rupture of the ACL and

**Table 1** Participant Statistics at the Time of Interview

Pseudonym	Age	Occupation	Injury source	Sporting level	Adherence level	Stage at interview
Jeff	52	marital-arts instructor	tae kwon do	competitive	adherent	4 months
Nick	25	student	soccer	competitive	adherent	4 months
Jane	38	administrative officer	nonsport	recreational	adherent	5.5 months
Belinda	21	student	netball	recreational	nonadherent	6 months
Melissa	28	desktop publisher	basketball	recreational	adherent	5 months
Colin	29	finance analyst	basketball	recreational	nonadherent	5.5 months
James	24	student	soccer	competitive	nonadherent	5 months
Mary	31	nurse educator	netball	nonathlete	nonadherent	5.5 months
Leah	32	teacher	netball	competitive	nonadherent	4 months
Jessica	22	receptionist	football	competitive	adherent	4 months
Annie	22	dispatch officer	netball	competitive	moderate	4.5 months

had been treated with an ACL reconstruction by 1 of 3 participating orthopedic surgeons. Seven participants were treated with hamstring grafts, and 4 with patellar-tendon grafts, and rehabilitation was undertaken at 5 different physiotherapy clinics. Participants were required to be between 16 and 55 years of age and were excluded if they displayed coinciding collateral ligamentous laxity greater than grade II, required repair of the posterior cruciate ligament, displayed chondral lesions with exposed subchondral bone or radiographic or arthroscopic evidence of osteoarthritis, had been ACL deficient for more than 12 months, or had had a prior ACL reconstruction.

After ethics-committee approval, 12 participants were contacted by telephone to determine their willingness to partake in the study and arrange a convenient interview time and location. Only 1 selected participant declined to be interviewed, citing study commitments as the reason, leaving 11 participants. The interviews lasted 45–90 minutes and took place between April and December 2000. The primary investigator conducted all interviews, and the participants chose the times and settings of the interviews. Nine of the interviews were conducted at participants' homes, and 2 were conducted at participants' workplaces. The primary investigator was known to all participants as a result of recruitment for the larger study and earlier testing in the rehabilitation process, but none of the investigators were involved in participant rehabilitation. Interviews were tape-recorded with permission from the interviewees. The tape recordings provided exact accounts of what was said in the interviews and enabled accurate transcription of the conversations.

In-depth interviews were chosen to allow exploration of the experience of ACL injury, ACL rehabilitation, and the various influences on the completion of rehabilitation. A preliminary schedule of questions was developed and was intended to guide the interview and ensure that important areas pertaining to the study aims were covered. The schedule contained broad areas to be discussed and was revised as new topics were raised during interviews. The broad areas included the injury and process to surgery, the rehabilitation experience, factors that made rehabilitation easy or difficult to complete, relationships with therapists and medical practitioners, and the impact of being in the larger study on rehabilitation.

Each interview was transcribed from tape recordings by the principal researcher. Copies of the transcripts were sent to all participants to check the accuracy of the transcription, with an invitation to make changes or additions. Member checking is a method used to enhance credibility by ensuring that data are accurate.<sup>10</sup> Only minor modifications were offered (ie, spelling mistakes), and 1 participant expanded on details of the diagnosis of his ACL rupture. Transcripts were then edited to remove information that could reveal the identity of the interviewees. All participant names were changed to pseudonyms, and physiotherapy clinics, therapists, and surgeons were also coded.

## Data Analysis

After the completion of all interviews, the schedule of questions was revisited by the principal researcher (TP) and one co-researcher (HMcB), and notes were made regarding possible emerging themes from the areas covered in the schedule. The transcripts were independently read and reread by the researchers and any thoughts about their content and general themes noted. Using QSR NUD\*IST 4 (Nonnumerical Unstructured Data Indexing Searching and Theorizing) software (Qualitative Solutions & Research Pty Ltd, Australia), the principal researcher examined each interview individually, line by line, and freely developed categories to classify and sort ideas and comments. QSR NUD\*IST 4 allows efficient storage of transcript data, coding of data in a flexible index system, and text and pattern searches and supports the organization and analysis of data.<sup>11</sup> All passages were coded using a descriptive word to identify the category. Of particular interest were the comments relating to the 3 aspects of adherence (attendance, adherence during appointments, and home-exercise adherence). While the principal researcher was coding the data, one co-researcher (HMcB) independently categorized the data using a manual method of coding. This coder was blinded to the adherence status of the interviewees.

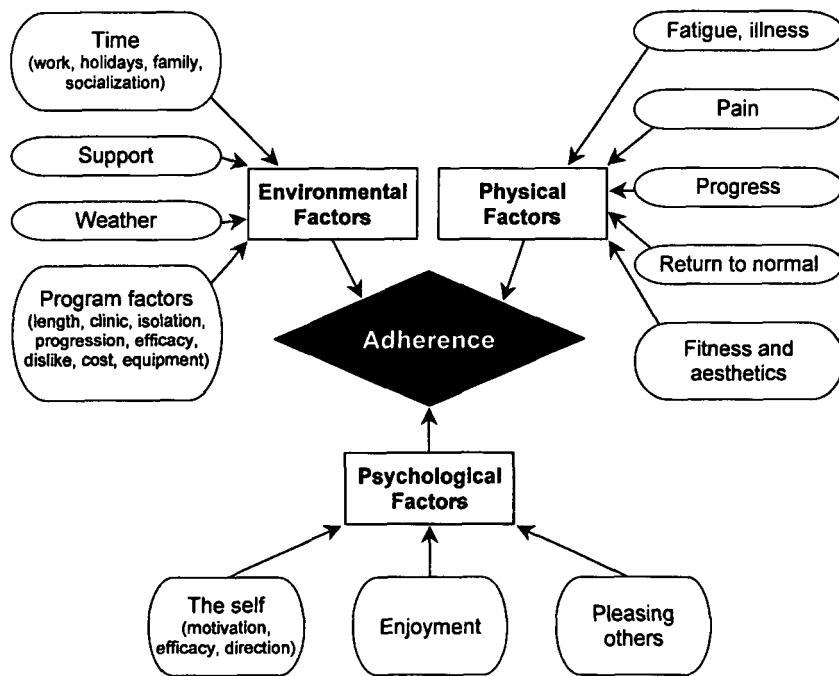
Once both researchers had completed initial coding, the codes were compared, and any discrepancies in the coding were discussed with a third independent researcher (NT). This technique of peer examination enhances the robustness of the findings.<sup>10</sup> The themes identified by both researchers were very similar, and clarification was only necessary for naming categories where descriptors were different. Codes were collapsed by grouping together related or similar codes under new headings, and coding was redefined and united until 3 main themes emerged.

## Results

The 3 categories of variables identified by participants as influencing rehabilitation adherence were environmental, physical, and psychological factors. Figure 1 shows a flowchart derived from thematic coding of the variables and their thematic groupings.

### Environmental Factors

The major environmental factor influencing the completion of home exercise was reported to be lack of time. An abundance of work, holiday, family, and social commitments depleted the amount of time available for rehabilitation. With "just too much (going on) in life" (Belinda), some found that "trying to do rehab around that did get quite difficult" (Mary). This was mainly true for the nonadherent participants in the study, but it was also noted that lack of time was often used as an excuse for nonadherence



**Figure 1** Flowchart illustrating determinants of adherence to anterior cruciate ligament rehabilitation.

despite adequate time being available. Adherent participants tended to identify time availability as a factor in adhering to rehabilitation but also emphasized the need for greater organization when time was limited.

Being a mother . . . you have to prioritize and you get to be good at doing that you know, so you sort of like think "I've got to do this, I've got to do that," and in your mind you're already thinking "I've planned this and planned that," and we can do it you know. . . . You just prioritize what you need to do and get the job done. (Jane)

Other environmental factors such as the support provided by the treating physiotherapist, the comfort and convenience of the rehabilitation clinic, and the constant progression of program exercises were important influences on attendance at rehabilitation facilities for all participants. These factors did not, however, influence adherence to home-exercise programs.

The most significant part of the rehabilitation process for most participants was their interaction with their physiotherapists. Physiotherapists were described as friendly, knowledgeable, and supportive, and most respondents indicated that their positive relationship with the therapist helped with attending the clinic and completing rehabilitation at appointments.

The informational and emotional support provided by physiotherapists throughout rehabilitation was important to all participants. Particularly in the initial stages of rehabilitation, information regarding the injury and rehabilitation process was thought to be vital for adherence. When information was lacking, nonadherence resulted.

I started physio 3 weeks after my operation. . . . The people at the hospital didn't really inform me of what I had to do. I mean maybe it was naive to think I'd get a phone call to say "You have to start physio," but I suppose that's what I was thinking at the time. I wish I'd have known and I would have started it earlier. I mean, I knew I had that sheet from the hospital, but yeah. . . . I saw the physios actually twice in the hospital, on 2 separate occasions, and I wish they'd have stressed more that the first couple of weeks was the most important, just to keep it moving moving moving, because I don't think I moved it enough. And I think that . . . took me longer to get started. So, the first couple of weeks of physio was sort of like behind. (Belinda)

Another identified method of obtaining progress information was comparing progress with that of other injured people, with expected milestones, or with the opposite leg. This form of benchmarking played a significant role throughout the rehabilitation process for nearly all participants.

And it was also encouraging for me because when I'd ask some people where they were at, and it got to a point probably after 3 weeks I found I was even better than most people who were so much further than me. Like there was 1 girl who was 8 weeks and I was at 3 weeks, and I honestly believed I was better than her, even. . . . That was really encouraging for me, sort of like my competitive streak came out. . . . I had to be better than everybody. So, that made me work harder, too. (Jessica)

Environmental program factors mentioned by nonadherent participants as affecting home-exercise adherence included the extended length of the rehabilitation process, the isolation of the program, the repetition of exercises, the lack of perceived effectiveness of the exercises, the cost of rehabilitation (attending a private gym), and the lack of availability of equipment. Particularly significant was the availability of equipment. The perception that "there was just some things that I couldn't do (at home)" (Annie) was a result of lack of equipment such as weights, "just because I simply have to have them" (Leah) to perform the exercise. Individual exercises, or in some instances whole sessions, were relinquished, with nonadherent participants opting to "wait and do them in physio" (Annie) because of a lack of equipment: "I did no exercises at home. I strictly went to the physio to do them and then forgot about it for the rest of the times, which I don't know how good that is. . . . He had all the equipment" (James).

Lack of equipment was not identified as a problem for the adherers; in fact, 1 participant went to great lengths to ensure that lack of equipment would not hamper the rehabilitation process.

I was pretty lucky because I've got one of the balls at home . . . the exercise balls . . . and the gym I go to is pretty well equipped so I've got pretty much everything there. . . . So I worked out what I had at the gym and what I could use for the rehab. And I constructed a few little things, I made a wobble board for myself and made a little strap for the leg to do some of the exercises at the gym, I played around and made a few things. (Jeff)

## Physical Factors

A significant difference between adherers and nonadherers emerged when examining the influence of physical factors and coding ideas about return to sport and regaining normal function. Adherent respondents regarded return to sport as a motivating and exciting prospect that helped drive their rehabilitation. "Oh yeah, the desire to get back to sport, because I realized that was my passion, has just driven me all the way" (Jessica). "That's sort of a motivation to keep going to the gym every day because you know if you do all the hard work that you'll be playing again" (Mark).

Conversely, 4 of the 5 nonadherent respondents spoke about their fear associated with return to sport and talked about delaying the return to sport despite advice from surgeons and physiotherapists promoting an early return. "I'll see how I feel and how it goes. I'm not in a rush to get back because I know it's not worth it. I can still feel the pain" (Leah).

Physical factors such as pain, fatigue, and illness were identified as having only a transient influence on adherence at various stages throughout rehabilitation, typically for the nonadherent respondents. "If I was sick I didn't do them" (Belinda).

Maintaining fitness and body weight was recognized by a few respondents as being a motivating factor for exercising and completing rehabilitation, and the perception of progress had a mixed affect on adherence. The belief that the knee rehabilitation was ahead of schedule or on track was enough for some nonadherent participants to relax rehabilitation constraints somewhat: "Because L [physio] said I was ahead of things I felt like maybe I didn't have to work as hard" (Annie). For the adherent participants, however, being on track was further motivation to work hard and progress through rehabilitation milestones.

## Psychological Factors

The most significant psychological characteristic was that of self-motivation. The word *motivation* was used consistently by all respondents throughout the interviews, and motivation was perceived to be extremely important

for completion of home exercises. "Motivation. I guess if they could sell motivation in a bottle it would be a gold mine" (Colin). Motivation of the self appeared to be particularly difficult for the nonadherent interviewees, most noting the need for an external influence to manufacture motivation. Exercising with a friend, a team, in physiotherapy, and under instruction from another person were all methods of promoting motivation and completing rehabilitation. Adherent respondents talked of being motivated throughout the rehabilitation process whether external influences were present or not.

The adherent respondents displayed greater self-direction of rehabilitation. They controlled the amount, intensity, and progress of rehabilitation, relying less on physiotherapists' input. Self-efficacy (the belief in one's ability to perform a particular behavior),<sup>12</sup> however, was not an obvious influence on rehabilitation adherence.

Enjoyment of rehabilitation contributed to most of the adherent participants completing rehabilitation outside of the clinic. Enjoyment of rehabilitation for nonadherent participants was mentioned only with reference to completing the program in the clinic. In fact, lack of enjoyment was identified by nonadherent respondents as a factor contributing to failure of home-exercise completion. Home exercises were described as "boring more than anything" (Annie), "not quite as fun" (Colin) as team activities, "mundane stuff, . . . not really that stimulating" (Leah), and "silly, stupid, . . . wasting my time" (Belinda). The lack of enjoyment evident from these comments had implications for completion of home exercises, particularly over an extended period of time.

The desire to please either the treating physiotherapist or the surgeon influenced adherence to some degree in half the respondents, although there was no difference in this respect between adherent and nonadherent participants.

## Discussion

The 3 themes that emerged from the data are consistent with previous literature that separates determinants of rehabilitation adherence into situational factors (incorporating environmental and physical factors) and personal factors (incorporating psychological factors).<sup>2,3</sup> Considering the fact that over 200 variables have been identified in the literature as influencing rehabilitation adherence,<sup>4</sup> it is not surprising that many of the variables identified in the present study are consistent with previous research.

Of the environmental factors, time availability was the most significant influence on home-exercise completion. Perceived lack of time has been identified consistently in the exercise literature as the most common reason for dis-continuing an exercise program.<sup>13-16</sup> Research on adherence to physiotherapy has also found that noncompliant patients identified lack of time and busy daily routines as a major barrier to completing rehabil-

itation.<sup>17</sup> In the present study, nonadherent participants identified lack of time because of work, holiday, family, and social commitments as a major reason for nonadherence to home exercise. The perception of limited time availability could in fact be a consequence of poor organization of available time.<sup>15</sup> This hypothesis is supported by the work of Dishman, Sallis, and Orenstein,<sup>18</sup> who found that regular exercisers in their study were as likely as the sedentary to view time as a barrier to exercise.

Although not significant for home-exercise adherence, the treating physiotherapist's provision of support was important to all participants and positively influenced attendance at appointments. Other qualitative research into the provision of support to injured athletes has identified the physiotherapist as an important source of informational support throughout the rehabilitation process.<sup>19,20</sup>

Informational support in the form of benchmarking, identified by nearly all participants as having an influence on motivation and adherence, is consistent with the qualitative research of Johnston and Carroll.<sup>19</sup> Benchmarking was of use mainly during appointments when other patients were present or milestones were identified. Although most participants admitted to employing the technique of benchmarking to improve motivation, there was no difference in this regard between adherers and nonadherers of home exercise.

The length, isolation, repetition, efficacy, and cost of the rehabilitation program were issues for some of the nonadherent participants and did affect home-exercise completion. These program factors and others have been identified in reviews of the rehabilitation-adherence literature.<sup>23</sup> The availability of equipment for rehabilitation emerged as one of the most significant program factors and has important implications for exercise prescription for ACL rehabilitation. Home-equipment availability has been positively correlated with self-reported physical activity in 1 study investigating the effect of perceived physical environments on physical activity.<sup>21</sup>

Overall, environmental factors had a significant impact on adherence to physiotherapy appointments, adherence during physiotherapy, and adherence outside of physiotherapy. Lack of time and the availability of equipment were the most important variables influencing adherence to home exercise, whereas therapist support was important for attendance at physiotherapy sessions.

The analysis of the contribution of physical factors to adherence identified arguably the most interesting finding from the interview data. Nonadherent participants spoke about the desire to delay a return to normal function and articulated that the fear associated with return to sport was considerable. This is an interesting phenomenon in light of the fact that the decision to have surgery in the first place was based on the desire to return to sport or activity. Such a finding provokes a discussion of what came first. Is it that the fear of reinjury was already present and nonadherence is a method of delaying return to sport and function, thus waylaying

the negative fear emotion? Or conversely, does nonadherence effectively reduce confidence in the knee and initiate the fear of reinjury? This is a fascinating finding that deserves further investigation. The fear of return to sport could be considered a psychological factor but was coded under physical factors because the fear was a response to the physical function of return to activity. Other physical factors appeared to have a limited influence on adherence.

Self-motivation was the most important psychological factor affecting adherence, particularly home-exercise adherence. Adherent participants were motivated to complete rehabilitation irrespective of external factors, whereas nonadherent participants relied heavily on external motivation. External motivating factors might not be consistent, particularly over an extended period of time, and at times when external factors are few (eg, when physiotherapy is discontinued) the reliance on self-motivation is increased. At these times (for those with low self-motivation) rehabilitation adherence appeared to suffer.<sup>22</sup> This is consistent with the qualitative research into reasons for adherence to physiotherapy rehabilitation for knee osteoarthritis.<sup>5</sup> Patients with knee osteoarthritis undertaking a rehabilitation program found it difficult to continue rehabilitation after being discharged from physiotherapy. The quantitative literature has also consistently linked self-motivation with improved adherence to rehabilitation.<sup>23</sup>

Variables closely linked with self-motivation and identified as determinants of adherence in this research were self-direction and enjoyment.<sup>22,23</sup> Self-efficacy, however, a trait that is gaining attention in adherence research,<sup>23</sup> was not an obvious factor contributing to adherence. None of the responses relating to adherence behavior could be coded under the self-efficacy heading. This might be because self-efficacy is a prospective belief related to a specific behavior. Because the interviews covered a retrospective analysis of the rehabilitation experience, self-efficacy beliefs regarding commitment to rehabilitation might not have been recalled.

The desire to please was mentioned by a number of adherent and nonadherent participants as being important for all aspects of adherence. Considering the poor home-exercise completion levels of nonadherers, however, this desire might not have been strong enough to significantly affect home-exercise completion. The experience of patients feeling an obligation toward their physiotherapist was also recognized by Campbell et al<sup>5</sup> as an important reason for high levels of adherence in the initial stages of knee osteoarthritis rehabilitation.

Despite qualitative methods becoming increasingly popular in areas of health and medical research,<sup>24,25</sup> they are often criticized for lacking reliability and validity. The terms *reliability* and *validity* are commonly referred to as *rigor* in qualitative research.<sup>26</sup> This investigation used several methods to enhance rigor. First, the purposive sampling technique used minimizes the potential bias arising from convenience sampling and improves the chance of collecting rich data relevant to the behavior being studied

when compared with random sampling.<sup>26</sup> Second, providing interviewees with transcribed interviews to check ensures that the information has been accurately translated.<sup>10</sup> Third, the independent peer examination and coding of transcripts enhance the reliability of the analysis.<sup>26</sup> Finally, the use of verbatim transcripts and direct quotations when presenting data serves to improve the internal validity of the findings.<sup>27</sup>

## Conclusion

The results provide a detailed description of the ACL-rehabilitation experience and the variables influencing adherence to rehabilitation. The qualitative approach allowed a greater discovery and analysis of variables than would be possible with a quantitative approach. Perception of time availability, equipment availability, fear of reinjury, and self-motivation emerged as the most noteworthy differences separating adherers and nonadherers with regard to home-exercise completion. Program factors and physiotherapist support were identified as determinants of attendance at and adherence during appointments for all participants but did not differentiate between adherers and nonadherers.

The findings of this study highlight the need for further research into the emotions associated with return to sport after ACL reconstruction. Such research might help explain the difference identified between the reinjury concerns of adherers and nonadherers.

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