

2018

Factors Influencing Confidence After Multiple ACL Injuries: A Qualitative Case Study

Jacob Casebolt

Let us know how access to this document benefits you.

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

 Part of the [Sports Sciences Commons](#)

Recommended Citation

Casebolt, Jacob, "Factors Influencing Confidence After Multiple ACL Injuries: A Qualitative Case Study" (2018). *Graduate Student Theses, Dissertations, & Professional Papers*. 11190.
<https://scholarworks.umt.edu/etd/11190>

This Professional Paper is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.

FACTORS INFLUENCING CONFIDENCE AFTER MULTIPLE ACL INJURIES: A
QUALITATIVE CASE STUDY

By

JACOB SCOTT CASEBOLT

Bachelor of Science, University of Montana, Missoula, Montana, 2018

Professional Paper

presented in partial fulfillment of the requirements
for the degree of

Masters of Athletic Training

The University of Montana
Missoula, MT

May 2018

Approved by:

Scott Whittenburg, Dean of The Graduate School
Graduate School

Melanie McGrath, Chair
Health and Human Performance

Valerie Moody
Health and Human Performance

Larry Stayner
Northern Rockies Orthopedic

FACTORS INFLUENCING CONFIDENCE AFTER MULTIPLE ACL INJURIES: A QUALITATIVE CASE STUDY

Chairperson: Melanie McGrath

Background: Anterior Cruciate Ligament (ACL) injuries are common with over 200,000 injuries occurring yearly in the United States. Despite excellent objective measures, only 63% of patients return to their pre-injury level of activity. The low number suggest psychologically mediated disability in ACL reconstruction (ACLR) patients.

Purpose: The purpose of this qualitative case study is to describe the confidence of one athlete who underwent multiple ACLR and continued to move into higher levels of competition.

Methods: A qualitative case study was conducted with a single women's soccer player with three ACLR. After a review of the participant's medical history, the primary investigator conducted a semi-formal interview, which was transcribed and coded. Peer debriefing was conducted with a faculty supervisor. Text segments were categorized into themes from the interview and a member check was completed by the participant to verify the accuracy of the analysis.

Results: Four main themes were Identified from the interview. These themes were *motivation; support; knowledge; and appraisal*. *Motivation* from the patient was crucial in returning to play after each ACLR. She remained mentally tough to undergo three recurrent ACL surgeries and progress to a higher level of sport. *Support* helped the participant through difficult times when her confidence lacked due to challenges in rehabilitation. *Knowledge* gained through education and experience was important during recovery. Proper education of the patient allowed the participant to understand the process and feel more comfortable with rehabilitation. Her experience allowed her to know how to cope with stressors. The participant's *appraisal* led to a reprioritization of sport and a reframing of challenging rehabilitation.

Conclusions: The themes discovered in this study are similar to other studies on individuals undergoing ACLR. These themes give insight for clinicians to help with their patients by showing how understanding a patient's sense of motivation is critical to their confidence. Also, developing a strong patient-therapist relationship is key to supporting patient well-being. Patient education is helpful for the patient to understand what to expect in rehabilitation and how to properly perform exercises. Finally, the patient's appraisal of the injury will dictate most of their attitude about rehabilitation throughout the process.

Table of Contents

Introduction	1
Review of literature.....	2
Risk Factors for ACL Injury.....	2
Surgical Procedures and Outcomes.....	3
Return to play outcomes.....	6
Psychological Aspects of ACL Injury.....	7
Summary.....	11
Statement of the Problem.....	12
Significance of Study.....	12
Qualitative Research Question.....	13
Methods	
Research Paradigm and Designs.....	14
Participant for Qualitative Case Study.....	14
Qualitative Instruments.....	14
Data Collection Procedure.....	15
Interview Questions.....	16
Qualitative Analysis.....	17
Qualitative Procedure.....	18
Verification Procedures.....	18
Ethical Nature of Data Collection.....	18
Limitation.....	19
Results	21
Medical History.....	22
Motivation.....	24
Support.....	27
Knowledge.....	28
Appraisal.....	30
Final Reflections.....	31
Discussion	33
Motivation.....	33
Support.....	35

Knowledge.....	38
Appraisal.....	39
Factors Absent in the Case.....	41
Implication for Clinical Practice.....	43
Conclusion.....	45
References.....	47

Tables and Figures

Figure 1: Flowchart of study methods.....19

Figure 2: Conceptual framework of factors influencing confidence.....21

Table 1: Motivation.....26

Table 2: Support.....28

Table 3: Knowledge.....30

Table 4: Appraisal.....31

Table 5: Final
Reflection.....32

Introduction

The Anterior Cruciate Ligament (ACL) is one of the 4 major ligaments in the knee and prevents anterior tibial translation (ATT). The treatment of this ligament receives a great deal of attention in scientific literature, specifically complete ruptures due to evolving reconstructive surgical techniques to restore correct knee function, as well as improving short and long-term patient outcomes. The high frequency of tears and sprains to the ACL demand that treatments progress. One study reports that injury rates to the ACL are 70 per 100,000 people¹; considering a population of 318 million in the United States that brings the numbers to around 222,000 ACL injuries per year. 75% of patients elect reconstructive surgery, most of which are under 18 years of age.¹ For patients who return to high intensity sports the risk of re-injury is over four times greater than those who do not return to sports.²

Even though a decrease in the number of ACL injuries has occurred, due to the increase in knowledge about preventing and treating ACL injuries, the overall prognosis for patients does not seem to be improving. This issue is further compounded when psychological considerations are brought into the picture. Despite excellent objective outcomes for these patients, around 63% of patients return to their pre-injury level of sport.³ In the absence of physical knee impairment, a lack of confidence may account for poor performance upon return to play⁵ demonstrating the impact of psychologically mediated disability. One factor negatively affecting confidence is fear. Almost every individual returning to activity after ACLR experiences fear at some point of the rehabilitation process, regardless of return to play status.^{3,4} The presence of fear may negatively impact patient confidence, which might have a significant influence on their

return to play. Lowered confidence will cause patients to limit themselves, both in rehabilitation and sports activity.⁴ Thus patients with lower confidence they may lack an innate desire to return to activity. Understanding the physical and psychological influences on injury recovery and patient confidence at return to play, and utilizing this knowledge to improve rehabilitation practices, may improve outcomes after ACL injury.

Review of Literature

Risk Factors for ACL Injury

High school level female soccer players are among the highest risk for sustaining an ACL injury.⁶ Soccer is the second highest risk sport, ranked behind American football and ahead of basketball.⁷ Aside from the inherent high risk in the sport, the danger of ACL injury begins to sharply rise around the ages of 12-13 and hits a peak between the ages of 14-18 years old.¹ Females, in general, are 2 -8 times more likely to tear their ACL than men in similar sports⁶ a phenomenon that is not completely understood yet.

Many theories attempt to explain the difference in knee stability between the sexes but there isn't a single theory to wholly explain this phenomenon. Hormonal changes throughout the menstrual cycle are thought to be involved in the elevated risk of ACL injury in female athletes, however, there is no consistent data in the literature to support hormone's role in ACL injuries.⁸ The most likely explanation for the difference between sexes are biomechanical variations. These biomechanical considerations include higher body mass index (BMI), increased foot pronation, generalized joint and muscle laxity, increased Q-angle, poor neuromuscular control during puberty.⁸ ACL injuries are

multifactorial. While no single theory can explain the difference, the combination of multiple factors likely contributes to the high risk in females.

The evidence on risk factors is primarily for first time tears and does not include the risk factor of continuing sport post-reconstruction. Athletes with a prior history of ACL rupture have 15 times greater risk of ACL injury than non-ruptured athletes.⁹ About 30% of young and active patients who do undergo reconstruction rupture their ACL a second time in the first few years.² Sports that require jumping and pivoting are particularly high risk since these athletes are at four times greater re-injury rate than those who avoid sports with similar motions.² Due to this increased risk to active patients, great care must be given to prevent re-rupture and ensure the long-term health of the patient and their knee.

The factors that contribute to ACL rupture is multi-factorial. Fortunately, the risk is better understood than in the past and the frequency of ACL ruptures is declining.² But, once an ACL has been torn an individual's risk increases and subsequent pain continues. Therefore, surgical interventions have been continually changing to improve this situation.

Surgical Procedures and Outcomes

The most variability in surgical outcomes may come from graft type. Many types of grafts exist, with many more being created and tested, including the use of synthetically made grafts.¹⁰ Of all the choices, three stand out as the most commonly used and studied. These grafts are hamstring tendon autograft, cadaveric ACL allograft, and a bone-patellar tendon-bone autograft. The most predominant graft choice is the hamstring

tendon autograft, due to its versatility and flexibility.^{8,9} Therefore, the favored population for this graft are younger, active patients to support their growth and need for flexibility.¹⁰ Since most hamstring donor sites do not reach full maturity until 1-year post-surgery⁹, there is excessive time spent in rehabilitation trying to compensate for this muscular imbalance. Even with the effort put forward to rehabilitate this muscle, athletes may be at a slightly greater risk of further ACL injuries due to impaired hamstring integrity, decreased strength and impaired neuromuscular control.⁸ The prolonged healing and maturation of the hamstring tendons either delays an athlete's return to play or subjects them to a higher risk of re-rupture.¹⁰

Despite the potential concerns outlined above the hamstring autograft option shows favorable outcomes. One study, examining the general population of those who undergo ACLR, showed hamstring autograft have decreased re-rupture rates compared to cadaver allograft by 2.3%.⁷ Yet, Kraeutler¹¹ et al. argues that, in the general population, the hamstring's benefit over the allografts are minimal and not significant. This graft was developed to minimize donor site morbidity and preserve the patient's body so that the only rehabilitation needed was regaining neuromuscular control and strength post operation. There is an issue of the patient's body rejecting the allograft and therefore creating a need for further surgeries. Thus, a method for cleaning the graft was developed and now allografts fit into two categories, irradiated and non-irradiated. Non-irradiated grafts have been associated with reduced failure rates, better outcome scores, and reduced laxity compared to irradiated.¹² Recently, there has been an increase in using live donor hamstring allografts from older, living relatives to reduce the chance of disease

transmission or rejection. However, this method is new and outcomes are yet to be fully researched but early reports appear promising.⁸

The bone-patellar tendon-bone (BPTB) graft has strong evidence for low failure rates and return to play success.^{11,13} This graft, harvested from the patient's patellar tendon incorporates a bone plug from the tibia and the patella to allow for quicker fixation with the implant. Unfortunately, there is a high prevalence of donor site morbidity, specifically osteoarthritis. In a 15 year follow up study of patients after ACLR, 52% of patients had developed patella-femoral osteoarthritis compared to 35% in patients with other grafts.¹³ The removal of the patellar tendon creates weakness and pain along the anterior knee, increasing the risk of further patellar injuries.^{8,9} On the other hand, this surgery has been associated with lower laxity, higher durability and the graft size can be cut to appropriately fit the ACL footprint.¹¹ Most importantly this graft has been associated with a 1.4% and 3.6% lower re-rupture rate when compared to hamstrings and allografts, respectively.¹⁰ Long term clinical scores and rates of failure are not significantly greater than the other choices for grafts, but the biomechanical studies behind it are more promising.¹⁰

One of the most concerning outcomes following ACL injury is the early development of osteoarthritis. Follow-up studies of ACL reconstructed patients have found that up to 27% of patients develop moderate arthritis and that 23% develop severe arthritis.¹⁰ That is a staggering 50% of all patients who develop moderate to severe arthritis. When considering a peak incidence of ACL ruptures occurring between 15-20 years-old, female patients may have significantly symptomatic and chronic osteoarthritis by age 30 that will likely continue to worsen. Yet, the risk of osteoarthritis after surgery

is still lower than compared to non-operative treatment.¹⁰ Most of the reported data on ACL re-injury and osteoarthritis was summarized across all surgical reconstructions, but the rates and statistics change depending upon graft type and surgical method.

There is no technique that can fit every individual perfectly. Each graft has its pros and cons and careful discussion must occur to best match an individual with the best graft type. Some factors to consider are patient age, activity level, previous grafts, and BMI.^{3, 8, 9} The art of matching graft to individual is improving, yet the numbers of those who are returning to play has not improved as drastically as the knowledge of surgical techniques. Therefore, one must consider the psychological response to ACL injury to better understand this phenomenon.

Return to play outcomes

Despite the increase in knowledge about surgical reconstruction and rehabilitation, outcomes when patients return to activity are concerning. Many patients are unable, or unwilling, to resume the same level of physical activity after surgery. Clinical recommendations suggest that most patients should be able to return to sport at nine months post-surgery.¹⁴ The criteria typically used to assess readiness to return to activity includes absence of symptomatic knee joint instability; quadriceps and hamstring strength within 90% of uninjured limb, the presence of no more than mild joint effusion; positive patient rated outcomes and the ability to return to sports.⁵ However, 53.1% of high school age patients do not meet International Knee Documentation Committee (IKDC) subjective knee evaluation criteria, and 72.2% do not meet

quadriceps and hamstring strength criteria.¹⁵ These data suggest that many patients may not be prepared for return to sport at the conclusion of rehabilitation.

Although many patients do not meet recommended criteria for return to activity, the majority of patients who were physically active prior to the ACL injury attempt to do so.¹⁶ Two studies report that 81-93% of those who undergo ACLR attempt some form of sports participation.^{3,4,17} However, only 63-65% return to preinjury levels of competition and only 55% return to a competitive level of sports.^{3,4} Although the lack of physical readiness may play a role in this statistic, psychological factors may have a greater influence on return to activity. Kinesiophobia, the fear of movement, is thoroughly linked with lower activity levels.¹⁸ When asked about their unwillingness to return to activity, patients most commonly cite fear of re-injury as their primary reason for not returning to participation.¹⁹ This demonstrates the impact of a patient's confidence on their ability to return to play.

Psychological Aspects of ACL Injury

A significant portion of patients who do not return to pre-injury levels of participation may lack confidence in their knee. Lack of confidence is a normal response for patients during the initial phases of rehabilitation, and those who return to activity generally become more confident and comfortable on their knee throughout rehabilitation.⁴ Those who are not able to regain that confidence in their knee largely do not return to sport.³ Interestingly, it is noted that deficits in function in the short term are linked to physical impairment (such as muscular weakness), yet long term impairments in function are more linked to psychological factors.⁵ Even in the short term, patient's

confidence levels throughout rehabilitation have been correlated with the objectively measured criteria including kinesiophobia, muscle weakness, and IKDC scores.⁵ Conversely, it is shown that higher levels of confidence during rehabilitation facilitates positive outcomes.²⁰

Initial methods of increasing confidence in a patient's knee relies on early improvement in quadriceps strength, due to the increased feeling of stability.⁶ Progress on regaining strength may be delayed from pain. Pain experienced by the patient has a negative effect on confidence and rehabilitation effectiveness since pain feeds into the fear-avoidance model and decreases compliance to rehabilitation, thus decreasing confidence.⁶ Extended work on developing strength may cause rehabilitation to last longer than a patient expected, which leads to feelings of frustration, loss of self-esteem, and confidence.²⁰ Patient focused education has also been shown to increase confidence counteracting the effect of rehabilitation time.¹⁹ This education includes instructing on timeline for rehabilitation (including ROM and strength timeline) and return to play, what the typical goals of rehabilitation are, and return to activity outcomes of ACLR.¹⁹ Patient may feel more comfortable entering rehabilitation when they understand the process. Since a lack of confidence decreases the chances of a patient returning to activity, one of the primary rehabilitation goals should focus on rebuilding patient confidence.

After a severe injury such as ACL rupture, athletes experience mood disturbances similar to the five stages of grief.¹⁷ In even more severe cases, younger athletes may develop post-traumatic stress disorder as a result of injury.²¹ The traumatizing experience may later develop into poor coping mechanisms for stress as this is a significant change in quality of life for many athletes. The emotional consequences on their confidence can

be devastating, especially for athletes with a high athletic identity. These individual's self-worth is often tied into their athletic performance. Throughout rehabilitation they cannot perform, and when they initially return to play performance is decreased.^{4,21} This decrease in athletic performance may lead to feeling dissatisfied in their rehabilitation and further harm confidence, which may prolong recovery.²² The severity of the incident also traumatizes the athlete and creates kinesiophobia.²³ Kinesiophobia is not strictly limited to movements that recreate the mechanism of injury, but with any movement that places the patient in a vulnerable position. Kinesiophobia is correlated with a decline in clinical outcomes such as International Knee Documentation Committee (IKDC) scores or poor return to play outcomes.³

High self-efficacy and internal locus of control may lead to better outcomes and knee function.¹⁴ Self-efficacy is an individual's judgement about performing a task. Evidence supports higher self-efficacy relates to more positive outcomes after rehabilitation.⁴ Secondly, those with more self-efficacy have more confidence in their rehabilitation, which further promotes compliance.²⁰ Self-efficacy has been found to determine an individual's locus of control.^{21,24} Those with a high internal locus of control believe that life events are a direct outcome of their actions while high external locus of control view life events as fate.²⁰ Internal locus of control and high self-efficacy allow patients to remain confident in their ability to positively affect their rehabilitation outcomes.^{4, 17} When belief in one's actions affect quality of life, they are more willing to engage in rehabilitation.

An initial step to psychological recovery after ACL injury that a patient must confront is their cognitive appraisal of the situation.¹⁷ During the injury, the patient may

feel fear or confusion of the upcoming rehabilitation process. Many have negative thoughts about ACL injuries, which threatens their athletic identity. The patient's emotions are fragile at this time and patient education is essential to develop confidence in the patient.¹⁹ Arden¹⁷ et al. argues that the patient's appraisal of the injury has the greatest influence for returning to sport. Individuals that are able to make a positive, prospective analysis of their rehabilitation are more likely to play their sport again at the previous level of competition. Those who enter the rehabilitation with doubt, or inability to overcome doubt, struggle to make a successful return.¹⁷ This appraisal is a multi-factorial influence that is influenced by family support and advice from health care professionals.¹⁷

Perhaps the most influential psychological factor during return to play is fear that is present as the patient begins that process.^{3,4,17} This does not just include fear of re-injury but also kinesiphobia, fear of pain, financial burden and even reduction in performance. Fear in some form was present in every person studied after ACL injury, regardless of their ability to return to their activity.³ Since fear of re-injury negatively affects a patient's confidence, the longer and more fear that is present, the worse their confidence.²⁵ Fear is generally higher in people who do not return to play.²⁶ However, those who return to play prioritize their respective sport high enough that they were able to find ways to overcome that fear.^{3,4}

Reprioritizing the value of sports in one's life is the second most common psychological factor influencing ACLR rehabilitation.^{3,4} The priority that sports take in an individual's life, to a degree, may dictate the determination in rehabilitation. The majority of people who return to sport find their identity in the sport, knowing that if they

quit playing, a significant part of themselves would be lost. Others use the injury as an opportunity to retire from their sport to pursue other interest such as academics, career, or a family.⁴

Those who make a successful return to play after ACLR show high intrinsic motivation.⁴ Intrinsic motivation is an internal drive towards success. This motivation is more efficient in promoting behavioral compliance and long-term commitment than other forms of motivation.²⁷ Intrinsic motivation is separate from outcomes, as this trait is not dependent on external factors, although it is supported by over-all mental wellbeing.²⁷ Therefore, when health care professionals are attending to the patient's mental health needs, an athlete is more likely to develop autonomous motivation. This development creates commitment to the rehabilitation program, which improves return to play outcomes.

While psychological variables have a huge impact on athletic performance and recovery, most of the return to play decision is based upon physical and objective measurements.¹⁴ As more research is done on this topic, hopefully more health care professionals begin to see the importance of mental health and psychological evaluation as part of their return to play decision.

Summary

The frequency of ACL ruptures makes this a common injury seen in many rehabilitation clinics. With thousands of individuals suffering from this injury every year, most health care practitioners work with these patients on a regular basis. Although many aspects of ACL injury rehabilitation have been studied thoroughly, the science of ACLR

is still a work in progress with every facet being researched. Since interest in psychological factors is increasingly studied, it's implications must be carefully considered.

Statement of the Problem

Research conducted on outcomes after ACL surgery and rehabilitation have primarily focused on objective measures of physical readiness for sport, including stability, failure rates strength and range of motion.^{14,17} There is limited subjective data on how psychosocial factors may impact recovery after ACL injury. There exist several qualitative studies addressing ACLR rehabilitation for patients who undergo one surgery, yet there is a lack of subjective data on the lived experiences of patients with multiple ACL injuries who continue to compete at a high level. Therefore, the purpose of this paper was to conduct a qualitative case study on a specific athlete who has undergone three different ACLRs. The goal of this case study was to describe the experience of one athlete who underwent multiple ACLRs and continued to move into higher levels of competition. Questions specifically focused on what influenced her confidence upon return to play after each surgery. Detailing the experience of a single athlete allowed us to investigate potential factors that may positively relate to enhanced confidence and mental preparation upon return to play.

Significance of the Study

Athletes who undergo multiple ACLRs rarely exceed their pre-rupture competition levels.² This is the one of the first studies to examine the experience of a

patient who underwent three different surgical ACLR and returned to play at a competitive level. Investigation into lived experiences of a patient who experienced three recurrent ACL surgeries may give insight into the factors that aid a patient's confidence when returning to activity. Therefore, through this project, clinicians may gain essential, subjective information to aid their patients with psychological confidence in their ACLR.

Qualitative Research Question

What factors influence patient confidence when returning to activity after multiple ACL reconstructions?

Methods

Research Paradigm and Design

This project was designed as a qualitative case study to capture the uniqueness of this situation. The paradigm used was a bounded system, intrinsic case study, as the events described are unique occurrences.²⁸ An embedded analysis allows the authors to focus their research primarily on the psychological factors that affect the participant's confidence. Therefore, the questions posed in this project were exploratory in nature.²⁹ A constructivist approach was taken to the data analysis since both the primary investigator and participant worked to create an understanding of this case.³⁰

Participant for Qualitative Case Study

The participant was a 20-year-old female soccer player who has sustained three separate ACLRs over the course of five years. These ACLRs have all occurred in the same knee.

Qualitative Instruments

A semi-structured interview was conducted, which allowed the interviewer freedom to ask further questions if points of interest arose during the interview.³¹ The interview allowed the primary investigator to focus questions on specific topics within the context of the previous discussions.³¹ Prior to this interview unstructured and informal discussions had occurred between primary investigator and participant. These discussions occurred due to social and professional interactions between participant and primary investigator. The primary investigator also used the participant for a class project before construction of this project. These prior interactions increased the primary investigator's

interest in the psychological factors that influenced her confidence, which led to the development of this project.

A list of questions was developed *a priori* to the semi structured interview. Questions were developed to understand the participant's confidence level and mental approach to rehabilitation through each surgery. The goal was to understand how her confidence changed through each surgical process. The participant was asked to rate her confidence on a scale of 1-10 to assess and frame her confidence level after each reconstruction. Confidence was further investigated qualitatively by asking open-ended questions about factors that may have influenced her confidence.

Data Collection Procedure

Initially, the participant's medical records were reviewed, and the primary investigator asked the participant to clarify information from her medical history and gained additional information. Conversations between the primary investigator and participant also occurred as part of a previous class project about her experiences after all three surgeries. Secondly, a review of the literature was done, to understand common factors of ACLR that affect an individual's confidence upon return to play. From this review, questions for the interview were designed to understand that patient's confidence through each reconstruction and what her overall response was to her injuries. Questions were developed December 2017 and January 2018. Both the primary investigator and faculty advisor refined the questions to reflect the purpose of the interview. Once the interview questions were finalized, the primary investigator conducted a 30-minute interview with the participant on February 15th, 2018. The interview was conducted in a

mutually agreed-upon public location. The interview was recorded on the interviewer's phone with the Voice Recorder, Voice Studio, Inc. app. The recording was taken from the phone and put on a computer for transcription. Transcription was done via a word document, Word, Microsoft, Inc.

Interview Questions/Sub-questions

Surgery 1: Hamstring Tendon Autograft

- a. One a scale of one to ten (ten being the most confident) how confident were you in your knee upon RTP? Why?
- b. Between the rehab, the graft, and the RTP protocol, which had the greatest influence on your confidence when you returned?
- c. What was your approach to the rehabilitation process?
- d. What were the other factors, outside of rehab, that helped or hindered your confidence?

II) Surgery 2: Cadaver Allograft

- a. One a scale of one to ten, how confident were you in your knee upon RTP? Why?
- b. Between the rehab, the graft, and the RTP protocol, which had the greatest influence on your confidence when you returned?
- c. What was your approach to the rehabilitation process?
- d. What were the other factors, outside of rehab, that helped or hindered your confidence

III) Surgery 3: Bone-Patellar Tendon-Bone Autograft

- a. On a scale of one to ten, how confident were you in your knee upon RTP? Why?
- b. Between the rehab, the graft, and the RTP protocol, which had the greatest influence on your confidence when you returned?
- c. What was your approach to the rehabilitation process?
- d. What were the other factors, outside of rehab, that helped or hindered your confidence?

IV) Overall:

- a. How did you change as an athlete after each surgery?
- b. Now that you are retired, would you do anything differently if given the opportunity?
 - i. Has this decision to retire instead of continuing to play changed how you viewed previous injuries?
- c. What advice would you give to a young girl in a similar position as you?

Qualitative Analysis

Prior to the interview, a review of the participant's medical history was performed through discussion with the participant and her current medical providers. After the interview the primary investigator transcribed the interview. Both transcription and voice recording were shared with the faculty mentor. Independently, the primary investigator and faculty mentor went through a process of segmenting the data into meaningful analytical units.³² Segments were created by highlighting descriptive phrases and key words that were used repeatedly as the participant answered questions, as well as for

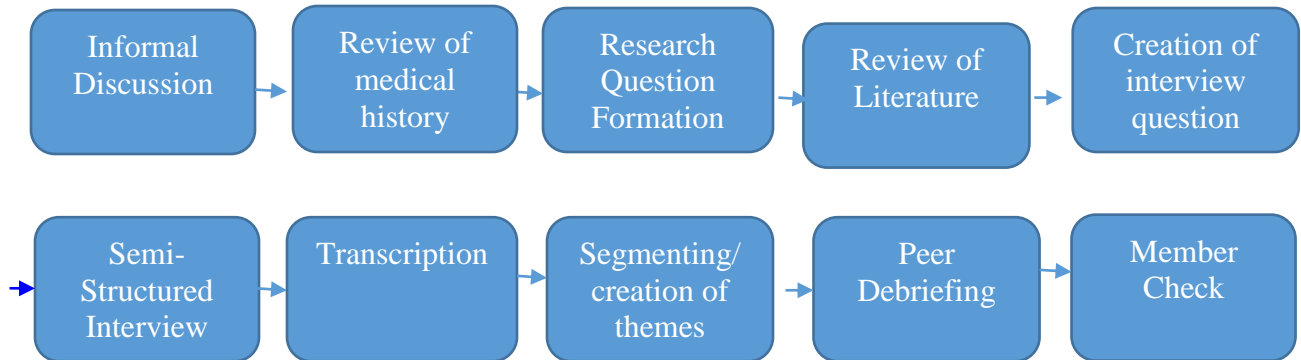
important phrases that were relevant to the prior review of literature. The highlighted phrases were reviewed and grouped into segments based on their meaning. These segments were summarized and analyzed to create themes which provided a thorough description of the interview. After the primary investigator and faculty mentor individually identified key phrases, segments, and themes, they met to compare and discuss the results. During this debriefing, discrepancies and commonalities between the results were discussed, and a final set of themes were determined. These were then verified with the participant. Finally, the primary investigator triangulated the results of the interview with the participant's medical history and review of literature, to arrive at a final result and description of the case.

Qualitative Procedures

Verification procedures

The primary investigator and faculty mentor met for peer debriefing to compare segments and themes they individually constructed.³² Any discrepancies or differences were discussed and resolved. The participant was not initially sent the interview transcript; however, a member check was completed once themes were finalized.³² She received results to verify the findings. She was asked to read the document and provide written and verbal feedback on the content. The participant had the opportunity to provide additional information, or to correct the investigator's interpretation of her answers. No changes were made by the participant. Figure 1 represents the process of developing the results.

Figure 1: Flowchart of Study Methods



Ethical Nature of Data Collection

The Institutional Review Board (IRB) determined that this study did not require formal approval, as it was deemed a true case study. The participant signed a release form that gave permission to use her surgical history and answers to the questions for this case study.

Limitations

Threats to Legitimation

A threat to legitimation in this study is the participant's understanding of the project. Understanding that she is involved in a case study and having the interview recorded may have changed her responses; a phenomenon called the novelty effect.³³ The questions developed were non-biased questions, attempting to minimize this threat.

Both the primary investigator and faculty mentor have researcher bias with ACLRs due to their education.³² The faculty mentor has had prior experience with ACL surgery herself, bringing in additional bias. The primary and faculty mentor were consciously aware of their bias from their education and experience. Efforts to minimize

the effect of this bias on the results were performed through the member checks, triangulation, and peer debriefing.

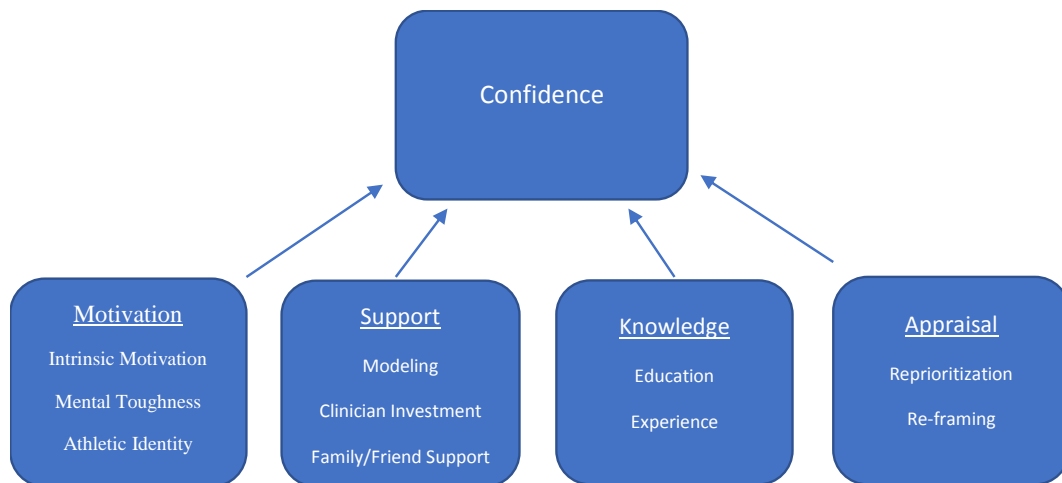
Additional threats include the prior interactions of the participant and the interviewer, which include treatments inside the athletic training facility, occasional social interactions, and previous interviews for a class project. All may influence some of the responses or the interpretation of those responses. This threat was minimized by utilizing data only collected for this specific project and by peer debriefing with the faculty mentor who has very limited interaction with the participant.

Finally, this interview represents a moment in time, a limitation called temporal generalization.³³ The participant's thoughts and feelings may have changed over time and may continue to change. Questions were asked in a way that she had to refer back to the time of her return to play, in attempt to capture the emotions and understanding of that time.

Results

After review of the transcript and participant medical history there was a consensus of four main themes and 10 subthemes. These themes include: *Motivation*; *Support*; *Knowledge*, and *Appraisal*. *Motivation* encompasses any factor that increased her desire to succeed, overcome obstacles, and return to athletics. Sub-themes identified for *motivation* included intrinsic motivation, mental toughness, and athletic identity. *Support* encompasses emotional and social support received from those around her. Sub-themes for *support* include modeling, clinician investment, and family/friend support. *Knowledge* includes education from surgeons and therapists that aided in decision making as well as how her personal experience changed the way she viewed rehabilitation. Two sub-themes for *knowledge* are education and experience. *Appraisal* incorporates mental response to the injuries as well as her mindset towards rehabilitation. This theme includes two sub-themes: reprioritization and re-framing. Figure 2 illustrates the themes and sub-themes that affecting confidence in this case.

Figure 2: Conceptual framework of factors influencing confidence



Medical History

The participant in this study was a 20-year-old collegiate female soccer player at the time of the interview. The first surgery was on August 1st, 2012 while the patient was 14 years old at the time. The injury occurred playing a club basketball league. The participant performed a plant and twist while dribbling the ball and felt her knee give out, and she fell down on the court. She stood up and walked off the court complaining of little pain and mild swelling. She received no medical attention after the injury, so she iced her knee and went home after the game. When she woke up the next morning she was in incredible pain which led to a visit to her primary care physician. The physician ordered magnetic resonance imaging (MRI), which revealed a complete ACL tear. For this first surgery she was referred to an orthopedic surgeon who chose a hamstring tendon autograft and the surgery occurred seven days after the injury. Rehabilitation under direction of a physical therapist began later that week. After six and a half months of rehabilitation she performed above 90% on her return to play tests and was cleared to play again by her orthopedic surgeon in February 2013.

The second injury occurred in the middle of February 2013, 7 days after her clearance to return to sport. This injury also occurred during a basketball game, this time she landed from a rebound and turned. Although she was wearing a brace at the time, she felt her knee give out and collapsed. She limped off the court and did not continue participation in that game. No medical providers were present at the game, so she went home to put ice on her knee. She described minimal pain, but profuse swelling and spasms around the knee. After another visit to her primary care physician, an MRI showed a partial rupture of her ACL, meniscus tear and a sprained MCL. The participant

sought advice from another orthopedic surgeon and her physical therapist about what was the best treatment option. After discussion, an ACL allograft as well as meniscal stitching, took place in March 2013, but this time it was from a different surgeon. The meniscus continued to be symptomatic during the healing process, which led to a meniscectomy in December 2013. The total time from surgery to return to play was approximately 13 months. The athlete was then cleared to play by the orthopedic surgeon who performed the surgery in April 2014 and returned to full participation in soccer for the next two years. For the first few months the athlete felt very confident about the reconstruction but recounts her knee “giving out” occasionally. As time passed this shifting sensation in her knee became more frequent until in August of 2016 when she complained of a very unstable knee.

The third injury occurred while the athlete was playing collegiate soccer in August of 2016, where she reported taking an extend lunge to stop a ball, felt it “pull” and immediately sought attention from the team’s athletic trainer. Her pain at the time was tolerable and she decided to play in a game a week later, where her performance was significantly hindered. The morning after that game she awoke to a significant amount of pain and swelling. She was seen by the University’s team physician and received another MRI. This time her ACL had not ruptured but was stretched beyond its useful capacity. The participant was seen by a new orthopedic surgeon and underwent pre-surgical treatments to reduce swelling and gain range of motion. The surgery occurred a couple weeks later in the end of August, and she underwent a BPTB reconstruction. She began rehabilitation with the team’s athletic trainer as well as a new physical therapist a few days after surgery. The participant was cleared to play 11 months by the team physician after

rigorous biomechanical testing in a lab. After the participant competed for the 2017-18 soccer season a post-season evaluation led to an MRI showing a partial tear in her ACL. After consultation with the orthopedic surgeon and athletic trainer she decided to medically retire.

Motivation

A high level of motivation for successful rehabilitation and return to play was the most present, and overarching theme identified in the interview. Even when asked about physical aspects of her rehabilitation, she always referred to the importance of her mindset through rehabilitation. Her consistent *motivation* is defined by the sub-themes of intrinsic motivation, mental toughness, and athletic identity.

The participant's intrinsic motivation was a source of confidence for all surgeries, but the focus of that motivation was different for each (table 1). An important aspect of intrinsic motivation is that an individual seeks to overcome challenges and view the challenges as an opportunity for growth.³ The participant described this quality more than once throughout the interview (Table 1). Through her first injury her *motivation* was regaining the ability to play again. Her mindset was focused returning to sports as soon as possible (Table 1). Once the participant's ACL ruptured a second time overcoming the odds was her *motivation* (Table 1). The participant understood that since she had re-injured her ACL her chances of returning to sport were significantly lower. Since she returned from one surgery, she found *motivation* to overcome the odds to successfully return from the second injury. As she began rehabilitation from her third surgery, she described more doubt about her ability to return to play. Yet, for this highly *motivated*

individual, the doubts just gave her more fuel to overcome the odds she faced (Table 1). Through each rehabilitation the participant pursued opportunities to improve herself and do things correctly, to become a better athlete.

In addition to intrinsic motivation was the participant's mental toughness. Mental toughness is possessing a psychological fortitude that enables one to cope with psychological demands.³⁴ She emphasized her mental toughness multiple times (table 1). It was this resilience that set the foundation for her *motivation*. (Table 1). Throughout her second and third injury there was an emergence of doubts, not only from those around her, but from herself. Her mental toughness was her ability to maintain her sense of purpose and motivation, and to not be derailed by doubt or challenge (Table 1). When she was challenged by her rehabilitation she adapted to situation to maintain her internal drive to succeed and overcome challenges.

Finally, the last reason she may have been so *motivated* was her high sense of an athletic identity (Table 1). This participant was dedicated to soccer and viewed it as an important part of herself. This dedication increased her *motivation* to return to soccer. The sports that she played meant so much to her that she was willing to put the work in to keep playing. She described how, during her rehabilitation, she found ways to maintain her athletic identity by supporting her teammates and participating on the teams as much as she could. She described using this time to learn more, both about her sport but also about being a good teammate (Table 1). Despite her current inability to play, she sees sports as an important of her identity and continues to be involved as a coach.

Throughout the three different injuries, this participant faced multiple challenges, and utilized various sources of *motivation* to meet those challenges. This participant

pushed herself to get better despite her injuries and the challenging times she experienced during rehabilitation. Her intrinsic motivation to overcome her injuries and become a better athlete is what primarily motivated her. This was aided by her mental toughness against doubts and challenging situations. Finally, her athletic identity also kept her focused on becoming a better soccer player.

Table 1		
Motivation	Internal Motivation	I just had that internal motivation to come back and play another season and prove myself wrong again
		I feel like I am very internally motivated, which can give, you know, myself confidence to keep playing.
		Coming back... it made me stronger, in a way, ironically. Um, mentally, you know, when you're doing something you don't like to do it makes you a lot less... a lot more grateful because, you're like I am able to do it, I am actually able to do it
		Going into [rehabilitation] I was... full force ready to get back. I think that kind of led my confidence, was just my eagerness to overcome it
		Knowing that not many people [come back from two ACL surgeries] ... I also kind of tried to use that as a fuel. Not just to prove other people wrong, but to prove myself wrong
		I think my mindset was to, you know, overcome it. Umm, knowing that not many people do that.
	Mental Toughness	You know, mentally, I have always looked at myself as being very mentally tough person and going into it I was, you know (fist pounding), full force ready to get back.
		I'm strong, mentally, and I can very well overcome [a third surgery] so that definitely gave me a lot of confidence
	Athletic Identity	It kinda opened my eyes a lot to...looking less at yourself and being an athlete that can get the best out of your other players and teammates was me other thing because when you're on the sideline you just gotta invest in the other people since you can't invest in yourself at that point. So as an athlete I think it helped me become less selfish of an athlete.
I don't regret doing that last surgery... because I did get another year out of it, and I'm in this great position of being able to coach and being able to... be some one that can help this team.		

Support

Support was frequently identified as important for her confidence through rehabilitation, and came from multiple sources. During the recovery process from her first surgery, she mentioned the importance of those undergoing similar circumstances as her. The participant had older teammates that modeled the ACL rehabilitation process to her, as well as a brother who was recovering from a fractured ankle (Table 2). This modeling allowed her to see how traumatic injuries can be overcome, and this made her more confident. Sharing similar experiences during rehabilitation was, in her mind, was the most helpful form of support others could offer her.

The team of health care providers for this athlete provided emotional *support*, which became a great source of *support* after her second and third surgeries. Often, the participant spoke of “being taken care of” by her healthcare providers, which gave her confidence. After her second surgery and third surgery she noted how much help her surgeon, physical therapist, and athletic trainer were (Table 1). Through her third rehabilitation she was seeing her athletic trainer five times a week, and her physical therapist three times a week. She stated that the constant contact was more beneficial than the standard three times a week, not just for emotional *support*, but quality of rehabilitation. The fact that this athlete had several different health care providers that had her best interest in mind allowed this athlete to only worry about herself and less about how she is being taken care of.

The final sub-theme of support was the participant’s friends and family. She often referenced how those closest to her were present and encouraging her through her rehabilitation (Table 2). The participant found constant support from her family. Her

family was an integral part of her support system, which she greatly relied on. She also described receiving uplifting motivation from teammates, and felt they encouraged her when she had doubts. She praised her teammates for helping to improve her confidence (Table 2). The team aspect of sports helped her to thrive in a difficult situation. External support from others was essential to each of her successful rehabilitations.

Table 2		
Support	Modeling	I had a couple other teammates that have had ACL surgeries and they had come back and like, been totally fine.
		I have a brother who, like at the same time was like, he had broke his ankle twice. He was like going through like so much stuff at the same time, so I think it helped, like having someone kinda to go through it.
	Clinician Investment	I was confident in the way [physical therapist] managed my rehab and never really had an issue regarding whether or not I was getting the best care... I think that is what gave me confidence, is because I knew I was being taken care of.
		[My surgeon] gave me a lot of confidence, you know, saying that he is fully confident in being able to do the patellar surgery and have it be completely fine
		I heard great things about [the surgeon] and you know having confidence in the doctor, having confidence in [athletic trainer] in the rehab, like knowing I would be taken care of
	Family/friend support	I think that, a good support system definitely is a very important thing in the mental aspect of dealing with any injury
Having more of a team aspect in college helped my confidence to find that movitaiton to get back and play for the team. My teammates are my reammates. They could tell when I was starting to lose motivation and knew when to push me and pump me up.		

Knowledge

Knowledge about ACL recovery combined education from healthcare providers with her own lived experience, which seemed to impact her confidence after each surgery. The participants stated that she had lower confidence after her second injury, but her physical therapist provided her with education about successful return to sports following a revision surgery, and this increased her confidence. The more time she spent

with health care professionals the better she said her rehabilitation was (Table 3). During her rehabilitation from her third surgery, consistent contact with her athletic trainer and physical therapist helped her understand more about her knee and rehabilitation which helped her gain confidence (Table 3). Yet, while education was helpful, there were instances where the more the participant knew, the less confident she was (Table 3). While education on rehabilitation and outcomes rate increased her confidence, understanding of the increased risk made the participant less confident when returning to play. Education increased her confidence overall, although some of this knowledge provided her with perspective that may have also decreased her confidence.

Secondly, the participant's experiences significantly influenced her response to injury. Through the recovery of her first injury, the participant was unaware of all the risks and complications that occur during ACLR. She stated that "ignorance is bliss," and she was "kind of naïve," about rehabilitation after her first injury. When she returned to activity she said she "went back full force," and was unaware of the risk of re-injury. When she tore her ACL a second time she stated how her experience with prior rehabilitation and return to play made her more diligent about her approach rehabilitation and cautious about returning to play (Table 3). After the second injury, the participant played for a year and a half before her third injury. Throughout this time the participant grew significantly in awareness of how her knee reacts to stressors, including when she "pushed herself" too far (Table 3).

After each ACLR the participant gained more knowledge about returning to sports after ACLR through education and lived experience. She relied on the clinicians and past experiences to maintain confidence.

Table 3		
Knowledge	Education	My therapist helped a lot. Umm, helped educate me one a lot of case where people have come back from second times and have been totally fine kind of thing. Kind of opening my eyes to being like, you are not the only one in this situation.
		I was more educated on, you know, the scenario and how I was the second time, you know, more risk, more susceptible to getting re-injured. So I guess I was less confident
	Experience	I know what to do and what not to do. I learned a lot of things...I should or shouldn't have pushed the first time. I definitely was a lot more confident in my rehab the second time
		I think it would be impossible to not be a little more tentative going into a second one. Just because now you are like, oh, this isn't just 100% foolproof

Appraisal

This athlete was also able to make a positive appraisal of the situation. Appraisal means an individual's assessment of an event. The participant's appraisal of her injuries was prominent in her reprioritization of sports and reframing of challenges. The first two injuries she sustained were playing basketball. After her second injury she *appraised* her situation and determined that, since her injuries had all occurred during basketball, she could maximize her chances of remaining healthy by retiring from basketball. This *appraisal* of risk and reprioritization of soccer as the most important sport allowed her to remain confidence in her athletic ability (Table 4).

The participant reframed the challenge of recurrent ACL injuries to have a positive outlook on the situation. She continually sought for a good outcome of her situation by using injury and rehabilitation to develop patience and strength (Table 4). The participant talked about the positives she discovered while on the bench, on how to be a better teammate and how to understand the game better (Table 4). Through the challenges she faced with rehabilitation the participant never let a poor circumstance dictate how she would respond (Table 4).

Table 4		
Appraisal	Reprioritization	And I think after I tore it the second time I made the decision to focus solely on getting back to soccer. And kind of letting basketball go... So I think that helped... helped my confidence a bit just because knowing I was like, I never... I've never been hurt in soccer.
	Reframing	At the end of the day you're gonna come back stronger and there's gonna be so many things that you will gain from this that you never have learned about yourself having not been injured. There's a lot of lessons to be learned that's going to make you into a better person, at the end of the day, from overcoming adversity. Those are the things I am almost thankful for getting hurt for because it made me the person I am today. I definitely think that a big thing is seeing the picture and all the positives that are gonna come out of it... that it's not, you know, not going to change your life entirely. But it will change who you are in a positive way.

Final Reflection

Finally, since this participant is retired from soccer, it is important to discuss her reflection of her three surgeries. Most notable trend throughout her reflection is the participant's growth. Her ability to cope with and grow through the injuries was a change she viewed as positive (Table 5). She recognizes the factors of injury that allowed for her growth and is thankful for those opportunities, without regret of where she is now. Finally, her advice to a young, female athlete with a torn ACL is to be patient with the process and take the time in rehabilitation to get the most out of the process (Table 5). The participant can look back through her athletic career and be at peace with her decisions because of how she handled the injuries. That, in her mind, made her a better and stronger person.

Table 5

Reflection	<p>as cliché as it sounds, I honestly do not regret a thing... I make the joke I probably should have retired last year, you know, before the third surgery... But, at the same time, you know, mentally, I was like I know I can do this again. I got another season out of it, I had an amazing season like, I was able to play through,...that last surgery a lot people would have gone the other way. Um, and I don't regret it and luckily I didn't damage more thing.</p>
	<p>I can't think of anything right now that I would have wanted to change. Obviously I would have hoped for it to go a different way, physically, but, I mean those were things that weren't in my control I guess, because I knew, especially this last one because I did everything I could to play again. And I did. So, it was definitely fulfilling in that way. Where... I am going out on a good note, I guess.</p>
	<p>my advice to [a young girl in my position] would to be stay patient... looking back at, knowing how I reacted to it, was... angry and thinking it's not fair, you know why is ths happening to me kinda thing and kinda trying to tell her that yes the next 6,7,8 months of your life are gonna be really tough but, at the end of the day you're gonna come back stronger and there's gonna be so many things that you're gonna gain from this that you would never have, you would've never learned about yourself having not injured. Obviously that's hard to take if that girl just got injured, she's not gonna want to hear that but... try to focus on the big picture. Um, that there's a lot of lessons to be learned that;'s gonna make you into a better person at the end of the day from overcoming adversity and um, those are things that I almost thankful for getting hurt for, because it made me the person I am today.</p>

Discussion

This project was designed to understand the psychological factors that influence confidence and an athlete's return to a high level of sport after three ACL surgeries. Until recently, there has been little research into this area. The available research primarily looks at the factors that prevent a person from returning to activity the response to an injury. This qualitative case study describes the emotional and psychological experiences of the participant and underlying factors to those responses.

Motivation

Even after three ACLR the participant continued to return to play soccer at an elite level. Perhaps her most prevalent quality was her intrinsic motivation. Intrinsic motivation is described as an innate, internal drive to accomplish a task.^{4,27} Several authors have said intrinsic motivation may be the most important factor for successful rehabilitation.^{35,36} An athlete with high intrinsic motivation typically pushes themselves to have successful rehabilitation to achieve personal goals.⁴ On the opposite end of the spectrum, those with low intrinsic motivation may be motivated by external factors such as avoiding guilt or some form of punishment. Individuals with high intrinsic motivation have higher rehabilitation compliance and better return to play statistics than those with low intrinsic motivation.³⁸ When compared to those with low intrinsic motivation better rehabilitation compliance is one of the most important reasons those who are intrinsically motivated have better return to play outcomes.^{3,27} Throughout the participant's interview she frequently referenced benefitting the most of her rehabilitation because of her personal motivation to play soccer. Since the desire to return to activity was intrinsically

motivated, it likely made her commitment and compliance to proper rehabilitation better. Consistent and dedicated rehabilitation likely increased her confidence when returning to activity. Her high intrinsic motivation was a significant part of what helped her continue to return to play after recurrent ACLRs, which correlates with what is seen in the literature.

For this participant, who has a high internal motivation, the ability to work with her care givers and feel in control of aspects of her rehabilitation helped tremendously. The frequent interaction fueled her internal locus of control, which is a determinant of intrinsic motivation.²⁴ Locus of control is a term used to describe how much an individual believes their actions affect a situation.²⁰ One study¹⁷ argued that locus of control is one of the top three predictors for an athlete's ability to return to play post ACLR. The participant praised her physical therapist and athletic trainer for tailoring her rehabilitation towards her and her sport. This allowed her to feel like her rehabilitation would positively affect her ability to play soccer. The literature on locus of control is supported by this participant's experiences.

Another source of motivation for the participant was her mental toughness. She continued to remain determined through each rehabilitation. Even amongst doubt, she did not waiver in her desire to return to soccer. The participant continued to remain mentally tough through these experiences. An important aspect of mental toughness is the ability to cope with the stress of a high-pressure situation.³⁴ This participant remained confident in her ability to perform rehabilitation time and time again. Another essential factor of mental toughness is an intense belief in one's self to achieve their goals.³⁴ Even through her third ACLR the participant was confident in her ability to return to soccer. This

confidence was built on the fact she had done it before, and she continued to remind herself that she could do it again.

The participant showed a high sense of athletic identity through dedication and focus on her goal of returning to her sport. Through the three injuries she did not allow herself to be distanced from her athletic self. This is present even when she was on the sidelines, unable to play, and taking that opportunity to learn more about the game she loved. Since soccer was so valued, she did not allow these injuries to distance her from and her identity as a soccer athlete. The fact that she so highly regarded herself as an athlete built her confidence when returning to sports participation. Severe injury, such as ACL rupture, may damage an athlete's identity. This damaged view of self negatively impacts a patient's ability to return to activity.²¹ Yet, a strong sense of athletic identity is linked to better overcoming poor psychological responses of ACL injury¹⁷ as well as a major factor in returning to activity.¹⁷ The damage to identity after injury is most severe around return to play.²¹ The participant noted that her rehabilitation being tailored specifically soccer increased her athletic identity, which also aided with the confidence upon return to activity. The continual building of an athletic identity through rehabilitation is part of what built her motivation and confidence throughout each rehabilitation.

Support

Emotional and social support have a tremendous ability to influence a patient's rehabilitation. The benefits of support are increasing self-efficacy, confidence, motivation and facilitating healthy coping.^{3,5,14,17,20} Support systems may be built of a patient's

friends, family or the health care practitioners that are providing therapy.³⁷ Most importantly, strong support systems are linked to better rehabilitation and return to activity outcomes.^{4,37}

One effective form of support is modeling, which has been shown as a useful tool in improving self-efficacy in rehabilitation.^{14,20} The participant in this study did not have formal modeling that was introduced by healthcare providers. Yet the process of modeling did occur naturally through people she knew, including her brother and teammates who had also undergone ACLR. The participant said this support from those she knew was the most helpful support anyone could have given. These individuals understood what it felt like to be in her situation, therefore, offered the best advice and comfort. Secondly, the participant gained confidence because she saw that others successfully returned to activity after ACLR. Since modeling decreases hesitation about returning to pre-injury levels of sports²⁵, having the guidance the participant did from her peers aided her return to activity process.

When she returned to play after her second injury, she was less confident in her ability to play but credited her confidence to her therapy sessions. Therapy sessions played a key role after her third surgery as well. Rehabilitation for her third reconstruction was more frequent and intensive than the previous two. Through her third rehabilitation she interacted with more clinicians every day. This daily interaction aided her confidence because she saw their commitment to her success. Rehabilitation professionals, particularly those involved with athletes, are best equipped to offer support due to their frequent interaction with patients.¹⁷ Along with the frequent interactions the participant had, her clinicians designed rehabilitation protocols specifically for her. The

relationships between the participant and therapists allowed them to understand what she needed to return to soccer, which became another source of confidence. These interactions allowed the participant to trust in her knee because of the time and effort she put into rehabilitation. She knew that she did all that was possible, every day, to rehabilitate her knee. Regular interaction between patient and therapist is a strong part of a good support system.^{3,4} The participant was mentally ready to re-engage in intense physical activity not only because of her therapists, but because of all the health care providers that helped her along the way.

Perhaps the most important form of social and emotional support comes from the patient's family and friends. A support system re-enforces the well-being of a patient.^{3,4} Those closest to the participant understood her, thus understood how to be most helpful to her. She mentioned that her family as well as her teammates were always there and helping her with every phase of rehabilitation. Social support from family and friends is a source of self-efficacy that helps patients overcome fear of re-injury.³ The participant stated that having a support system of family and friends is essential to being able to return from an ACL injury. This support was even more effective when she was in college, due to continuously being surrounded by her teammates. Being surrounded by loved ones helps a patient feel more comfortable and less isolated.^{3,7} Not only does a support system allow patients an opportunity to talk through their frustrations in a healthy environment, it also gives them positive feedback when it is necessary.⁴

The participant believes support was a significant reason she was successful in her returning to play. Support from family and friends, others who are injured, and clinicians all supported this participant emotionally, which increased her confidence.

Knowledge

Many athletes have heard about how devastating an ACL injury may be and therefore have assumptions or expectations that may not be accurate when they are injured.⁴ Education played an important role in increasing confidence after her second injury. Frustration with the re-injury led her to believe that this may end her career. The participant's physical therapist at the time instructed her that a second ACL rupture is also an injury that one can come back from. With the third injury the participant had her most doubts about returning to soccer until an orthopedic surgeon educated her on the stability and success of a different surgery. This education gave her confidence that she could make the return to sports. Education is a foundation of a patient-therapist relationship and plays a necessary role in patient adherence.³⁷ Preoperative education about the injury and rehabilitation processes facilitates proper expectations and increased self-efficacy in rehabilitation.³⁸ The participant was like many other athletes with misconceptions about ACL injury, but she had clinicians to educate her and teach her that a second (or third) ACL injury is not the end of an athletic career.

Additionally, after recurrent injuries the participant knew what to expect from the rehabilitation and knew that if she could do it once she could do it again. Her prior experience also allowed her to make a prospective judgement about the upcoming rehabilitations through her second and third reconstructions. Research has shown that past experiences inform an individual's prospective judgement of the injury.¹⁷ Since the participant had experienced the rehabilitation she knew what areas she could improve on from previous rehabilitations. After re-rupturing her ACL, the participant became more

cautious about returning to activity, just as many patients who naturally become more cautious with age and experience.³ Yet, her knowledge of ACLR rehabilitation, which was built by education from others and her own experiences did allow her to maintain confidence, even when times were tough.

Appraisal

The final factor effecting an athlete's ability to return to sport is their appraisal, or interpretation, of the injury. Although the effect this has on ability to return to play is minimal, the effect it has on their behavior prior to, and during return to play is critical.¹⁷ The first and second ACL injuries occurred while playing basketball. She knew that soccer was most important to her, thus she retired from basketball to focus solely on her goal of soccer. This decision gave her confidence as she only had a single goal to focus on, and she believed she was reducing her risk of re-injury by avoiding basketball. The prioritization of sports in one's life plays a significant role in their desire to return after injury.^{3,17} One study³ found that a majority of those who did not return to activity were transitioning between life stages (i.e. high school to college) or beginning to focus on family or work. Some people who tear their ACL use the injury as a reason to leave their sport to pursue their education or career.⁴ Even though this participant did experience life changes throughout her ACLRs, re-prioritizing her life around soccer allowed her to gain confidence in her ability to perform.

Yet, through each of these reconstructions, and life changes, came difficult challenges. The participant reframed the challenges to find the positives of each situation. While many patients feel that the time investment for rehabilitation may be too long or

the experience will be too painful^{4,17} this participant looked for “the big picture” to positively change who she is. Her consistent reframing allowed the participant to remain confident when others would not have.

The participant’s source of confidence upon return to play changed after each reconstruction. Initially her intrinsic motivation, modeling, return to play testing aided her confidence in return to play. For the second reconstruction she was confident in her knowledge of ACL rehabilitation, her re-prioritization of soccer, and her mental toughness through a longer rehabilitation. Experience also played a large part after her second surgery, as she saw how to improve from the previous rehabilitation. Throughout her third reconstruction the participant was confident in the support she received from the clinicians providing care for her. Between the surgeon, the quality of her rehabilitation, and daily interactions with her athletic trainer, there were many who were helping her. Also, by rehabilitating every day and placing more effort into correct rehabilitation she was confident that she did everything she possibly could to be successful.

One consistent source of motivation noted for all three recoveries was her desire to play soccer. Her strong athletic identity has been an important driving force to overcome the challenges that she did. The participant was also surrounded by teammates, friends and family that understood her challenges and continued to encourage her every step of the way. Emotional and psychological factors that impact recovery after any injury are multifactorial. Therefore, understanding the variables that have the greatest impact on successful return to participation, and then developing ways to increase those variables in patients, may aid clinicians and patients during the rehabilitation process.

Factors Absent in the Case

The information presented in this case correlates with trends seen within published literature. Yet, there are two concepts affecting confidence that have been described in the research that was not identified in this case study. One concept that the participant never mentioned was fear. Several authors have stated that fear, in some form, is present in every athlete post ACLR.^{3,4,17} Fear hinders the confidence of a patient and lower their ability to return to play.^{3,17} Since fear is present in all patients after ACLR this believed to be a significant predictor of return to play.²⁶ However, the participant never mentioned fear during the during the interview. Only once, after her second injury, she mentioned being a little more tentative about returning to activity, although it was unclear if this was fear. Fear was not discussed, even as she talked about her decision to retire from competitive sports. Although the interviewer never specifically asked about fear during the interview, it is possible that the participant experienced the feeling. However, the participant's psychological response to injury may have also prevented her from experiencing high levels of fear.

The participant's apparent lack of fear correlated with the data that individuals with a low fear of re-injury have higher return to play rates.^{5,38} Athletes at higher levels of sports who do return to play have lower levels of fear than other athletes at lower competitive levels.⁵ The participant in this study was able to continually increase her level of play, despite her injuries. Thus, any fear that may have been present was not significant enough to impact her ability to return to play and progress to higher levels of competition. Secondly, the participant's mental toughness may have helped her cope with fear. Her fortitude was a successful coping mechanism for decreasing self-doubt so it is

reasonable to assume that it was also a mechanism to decrease or eliminate fear. Finally, the participant may have felt fear but wasn't sure how to describe it. She mentioned a tentativeness about returning to activity, so she may have interpreted fear as tentativeness based on experiences. Either way, the fact that she never brought it up during the discussion of return to play is interesting.

Psychological readiness is another factor that was not specifically discussed in the case. Psychological readiness is typically a patient-driven hinderance from returning activity that is noticed in the presence of excellent objective criteria,⁴ and is not dependent on a patient's physical readiness.³ If a patient is strong and stable they still may not be able to return to activity due to lack of psychological readiness. Psychological readiness is a broad framework including variables such as fear, low priority of sports, or lack of confidence in their knee.^{3,4} Much of the data collected for this project does influence psychological readiness, but the scope of this project focused on the narrow aspect of confidence. When she was ready to return to sport she was confident in her ability to perform. This confidence was largely due to the quality of her rehabilitation, from her own motivation and clinician investment. Aside from that, her athletic identity and mental toughness kept her focus on soccer, so that at the time of returning to activity her anticipation to play her sport outweighed the hesitation. This participant likely displayed adequate psychological readiness when the return to activity decision came. However, this conclusion cannot be made with certainty because not all aspects of psychological readiness were addressed in this project.

Implications for Clinical Practice

The results of this study may help clinicians as they work with patients after ACLR. Clinicians may consider adding techniques to improve confidence, specifically techniques that increase motivation and positive appraisal, provide support, and effectively educate patients. Patients who exhibit lower self-efficacy may benefit the most from psychological strategies, including positive self-talk and goal setting.⁵ Goal setting is viewed as an essential tool for any rehabilitation program. The participant in this study appeared to have high self-efficacy, but goals were still a primary source of motivation. She had the goal of playing college soccer since a young age. She frequently mentioned “overcoming the odds” by staying dedicated to her goal. Her mental toughness and internal motivation to complete her goal was her motivating force to overcome any obstacle. When a patient has high self-efficacy, goal setting may be useful to focus their motivation to specific, selected areas. However, if the patient has low self-efficacy, then goal-setting becomes more critical to effectively motivate the patient, and provide benchmarks to demonstrate improvement.^{4, 23, 37}

Another important technique a clinician can utilize is patient education. Patients develop higher self-efficacy if they receive thorough education about what to expect during the rehabilitation process.¹⁴ A method of patient education involves the use of modeling, involving other patients who have successfully returned to activity after ACLR.¹⁴ Modeling allows the patient to gain first-hand experience and knowledge about what to expect during and after rehabilitation. They also see that a successful recovery is possible. Aside from modeling, patient education about the process of rehabilitation and return to play outcomes will reduce fear of re-injury and increase motivation.³⁷ Formal

patient education from a clinician builds the patient-therapist relationship, which is a key part of a strong support system.³⁸ This education should include an approximate timeline of rehabilitation, including benchmarks for ROM and strength, a timeline for return to activity, as well as return to play outcomes.¹⁹ When a patient is thoroughly educated, small setbacks are not as devastating to their confidence.^{14,38} The participant in this study identified education as an important part of her recoveries. Her education occurred formally and informally, and both were effective in helping her build confidence to return to activity.

The development of a therapist-patient relationship may be the most important aspect of rehabilitation a clinician directly influences.³⁷ Relationships between patient and clinician allow patients to feel more comfortable sharing insecurities. An open environment where a patient can share insecurities allows the clinician to address those issues and further aid patients. When a therapist becomes part of a patient's support system, it helps the patient feel less isolated and more connected to their rehabilitation.³⁷ A strong relationship between clinician and patient allows clinicians to ask challenging questions, including how much a patient wishes to return to an activity. Some patients may not have a desire to continue playing sports at a high level after an injury. Athletic identity is a strong predictor of return to activity outcomes,⁴ so understanding a patient's athletic identity helps a clinician better utilize their time. Therefore, a better relationship with a patient provides insight into the patient's mental approach to rehabilitation as well as any deficits in confidence.

Conclusion

This qualitative case study was performed on a single collegiate level soccer player who sustained three ACL injuries in the same knee. The participant overcame each reconstruction to successfully return to play and proceeded to advance from high school level of play to NCAA Division 1 collegiate soccer team. The participant described four primary reasons she was confident during return to play after each surgery. The first reason was the participant's *motivation* to succeed. She is a mentally tough athlete that was dedicated to her sport and pushed through challenge that arose during rehabilitation. The second reason was the *support* she received from multiple sources. The participant was a team driven individual that had her family, friends and teammates around her through every step of the process that helped her to overcome her situation. The participant's *knowledge* aided her confidence. Through each surgery she learned something new about rehabilitation and her experience with a prior rehabilitation showed her areas to improve for the next one. Finally, the participant's *appraisal* of each injury impacted her confidence. After two injuries in basketball, she decided to reprioritize her athletic career and retire from basketball to solely focus on soccer. Through each rehabilitation she was met with many challenges yet consistently reframed each negative situation to see the positives. Clinicians can use this information to fuel existing internal motivation, encourage patients develop a social support system that may involve family, friends, or teammates, as well as educate their patients so that they understand how to best perform rehabilitation. Further research should investigate factors that allowed

patients to remain motivated through difficult rehabilitation and/or what clinicians can do to aid motivation during ACLR and improve confidence upon return to play.

References

- 1) Sanders TL, Maradit Kremers H, Bryan AJ, et al. Incidence of Anterior Cruciate Ligament Tears and Reconstruction: A 21-Year Population-Based Study. *Am J Sports Med.* 2016;44(6):1502-1507.
- 2) Grindem H, Snyder-Mackler L, Moksnes H, Engebretsen L, Risberg MA. Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL cohort study. *Br J Sports Med.* 2016;50:804-808.
- 3) Tjong VK, Murnaghan ML, Nyhof-Young JM, Ogilvie-Harris DJ. A qualitative investigation of the decision to return to sport after anterior cruciate ligament reconstruction: To play or not to play. *Am J Sports Med.* 2014;42(2):336-342.
- 4) Burland JP, Toonstra J, Werner JL, Mattacola CG, Howell DM, Howard JS. Decision to Return to Sport After Anterior Cruciate Ligament Reconstruction, Part I: A Qualitative Investigation of Psychosocial Factors. *J Athl Train.* 2018;53(2):000-000.
- 5) Lentz TA, Zeppieri G, George SZ, et al. Comparison of physical impairment, functional, and psychosocial measures based on fear of reinjury/lack of confidence and return-to-sport status after ACL reconstruction. *Am J Sports Med.* 2015;43(2):345-353
- 6) Beynon BD, Vacek PM, Newell MK, et al. The Effects of Level of Competition, Sport, and Sex on the Incidence of First-Time Noncontact Anterior Cruciate Ligament Injury. *Am J Sports Med.* 2014;42(8):1-8.
- 7) Kaeding CC, Pedroza a. D, Reinke EK, et al. Risk Factors and Predictors of Subsequent ACL Injury in Either Knee After ACL Reconstruction: Prospective Analysis of 2488 Primary ACL Reconstructions From the MOON Cohort. *Am J Sports Med.* 2015;43(7):1583-1590.
- 8) Hewett TE, Myer GD, Ford KR. Anterior Cruciate Ligament Injuries in Female Athletes Part 1 , Mechanisms and Risk Factors. *Am J Sports Med.* 2006;34(2):299-311.
- 9) Paterno MV, Rauh MJ, Schmitt LC, Ford KR, Hewett TE. Incidence of contralateral and ipsilateral anterior cruciate ligament (ACL) injury after primary ACL reconstruction and return to sport. *Clin J Sport Med.* 2012;22(2):116–121

- 10) Anderson MJ, Browning III WM, Urband CE, Kluczynski MA, Bisson LJ. A Systematic Summary of Systematic Reviews on the Topic of the Anterior Cruciate Ligament. *Orthop J Sport Med.* 2016;4(3):1-23.
- 11) Kraeutler M, Bravman J, McCarty E. Kraeutler. BPTB V Allograft in ACL reconstruction. *Am J Sports Med.* 2013;41(10):2439-2438.
- 12) Lamblin CJ, Waterman BR, Lubowitz JH. Anterior cruciate ligament reconstruction with autografts compared with non-irradiated, non-chemically treated allografts. *Arthroscopy.* 2013;29:1113-1122.
- 13) Ettinger M, Etter F, Calliess T, Bohnsack M, Becher C. Long term results of bone-patella-tendon-bone ACL reconstruction. *J Orthop.* 2017;14(1):91-94.
- 14) Czuppon S, Racette BA, Klein SE, Harris-Hayes M. Variables associated with return to sport following anterior cruciate ligament reconstruction: A systematic review. *Br J Sports Med.* 2014;48(5):356-364.
- 15) Toole AR, Ithurburn MP, Rauh MJ, Hewett TE, Paterno M V., Schmitt LC. Young Athletes After Anterior Cruciate Ligament Reconstruction Cleared for Sports Participation: How Many Actually Meet Recommended Return-to-Sport Criteria Cutoffs? *J Orthop Sport Phys Ther.* 2017;47(11):825-833.
- 16) Ardern CL, Taylor NF, Feller JA, Webster KE. Return-to-sport outcomes at 2 to 7 years after anterior cruciate ligament reconstruction surgery. *Am J Sports Med.* 2012;40(1):41-48.
- 17) Ardern CL, Taylor NF, Feller JA, Whitehead TS, Webster KE. Psychological responses matter in returning to preinjury level of sport after anterior cruciate ligament reconstruction surgery. *Am J Sports Med.* 2013;41(7):1549-1558.
- 18) Flanigan DC, Everhart JS, Pedroza A, Smith T, Kaeding CC. Fear of reinjury (Kinesiophobia) and persistent knee symptoms are common factors for lack of return to sport after anterior cruciate ligament reconstruction. *Arthrosc - J Arthrosc Relat Surg.* 2013..
- 19) Hsu C-J, Meierbachtol A, George S, Chmielewski T. Fear of Reinjury in Athletes: Implications for Rehabilitation. *Sport Heal A Multidiscip Approach.* 2017;9(2):162-167.

- 20) te Wierike SCM, van der Sluis A, van den Akker-Scheek I, Elferink-Gemser MT, Visscher C. Psychosocial factors influencing the recovery of athletes with anterior cruciate ligament injury: A systematic review. *Scand J Med Sci Sport*. 2013;23(23):527-540.25
- 21) Christino M, Fantry A, Vopat B. Psychological Aspects of Recovery Following Anterior Cruciate Ligament Reconstruction. *J Am Acad Orthop Surg*. 2015;23:501-509.
- 22) Morrey MA, Stuart Mj, Smith AM, Wiese-Bjronstal DM. A Longitudinal Examination of Athletes' Emotional and Cognitive Responses to Anterior Cruciate Ligament Injury. *Clin J Sport Med* 1999;9(2): 63-69
- 23) Cozzi AL, Dunn KL, Harding JL, McLeod TCV, Bacon CEW. Kinesiophobia after Anterior Cruciate Ligament Reconstruction in Physically Active Individuals. *J Sport Rehabil*. 2015;24:434-439.
- 24) Thomeé P, Währborg P, Börjesson M, Thomeé R, Eriksson BI, Karlsson J. Determinants of Self-efficacy in the Rehabilitation of Patient With Anterior Cruciate Ligament Injury. *J Rehabil Med*. 2007;39:486-492.32
- 25) Tripp DA, William S, Ebel-Lam A, Britton B, Birchard J. Fear of Reinjury, Negative Affect, and Catastrophizing Predicting Return to Sport In Recreational Athletes With Anterior Cruciate Ligament Injuries at 1 Year Postsurgery. *Rehabil Psychol*. 2007;52(1):74-81.
- 26) Lentz TA, Zeppieri G, Tillman SM, Indelicato PA, Moser MW, George SZ, Chmielewski TL. Return to Preinjury Participation Following Anterior Cruciate Ligament Reconstructions: Contributions of Demographic, Knee Impairment, and Self-Report Measures. *J Orthop Sports Phys Ther*. 2012; 42(11):893-901
- 27) Chan DKC, Lee ASY, Hagger MS, Mok KM, Yung PSH. Social psychological aspects of ACL injury prevention and rehabilitation: An integrated model for behavioral adherence. *Asia-Pacific J Sport Med Arthrosc Rehabil Technol*. 2017;10:17-20.
- 28) Creswell, JW. (1998). *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. Beverly Hills; CA: Sage.

- 29) Yin, RK. (2017). Case Study Research Design and Methods. Los Angeles; CA: Sage
- 30) Tashakkori, A. Handbook of Mixed Methods in Social and Behavioral Research. Thousand Oaks; CA: Sage
- 31) Bernard, H.R. (1981). Research methods in anthropology: Qualitative and Quantitative Approaches. Beverly Hills; CA: Sage.
- 32) Johnson RB, Christensen L. (2017). Educational Research: Quantitative, Qualitative and Mixed Approaches. Thousand Oaks; CA: Sage
- 33) Onquegbuzie AJ. (2002). A Conceptual Framework for Assessing Legitimation in Qualitative Research.
- 34) Jones G, Hanton S, Connaughton D. What is this thing called mental toughness? An investigation of elite sport performers. In: *Journal of Applied Sport Psychology*. Vol 14. ; 2002:205-218.
- 35) Eastlack M, Axe M, Snyder-Mackler L. Laxity, instability, and functional outcome after ACL injury: copers versus noncopers. *Med Sci Sports Exerc*. 1999;31(2):210-215.
- 36) Pizzari T, McBurney H, Taylor N, Feller J. Adherence to anterior cruciate ligament rehabilitation: a qualitative study. *J Sports Rehabil*. 2002;11:90-102
- 37) McVeigh F, Stephen P. An Exploration of Sports Rehabilitators' and Athletic Rehabilitation Therapists' Views on Fear of Reinjury After Anterior Cruciate Ligament Reconstruction. *J Sport Rehabil*. 2015;24:140-150.
- 38) Ross CA, Clifford A, Louw QA. Factors informing fear of reinjury after anterior cruciate ligament reconstruction. *Physiother Theory Pract*. 2017;33(2):103-114.