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Ways of Experiencing Participation and Factors Affecting the Activity Level after Non-Reconstructed ACL Injury -A Qualitative Study

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Study Design: Phenomenographic, cross-sectional

Objectives: To describe ways of experiencing participation in activities of individuals with a non-reconstructed ACL injury and describe the emotional aspects related to participation. Further, the objective was to explore factors affecting the activity level.

Background: The importance of assessing different factors (knee status, muscle performance, psychological factors, performance-based tests and subjective rating of knee function) after an ACL injury has been emphasized. However, the results of these assessments do not answer the question of how the individuals themselves experience their participation in activities.

Methods: Semi-structured interviews were conducted with 19 strategically selected informants (18-43 years), who had sustained an ACL injury 18-67 month previously. A phenomenographic approach, which describes individuals' ways of experiencing a phenomenon, was used.

Results: Five qualitatively different categories were identified: A) unconditioned participation, B) participation as conditioned by risk appraisal, C) participation as conditioned by experienced control of the knee, D) participation as conditioned by experienced knee impairment and E) participation as conditioned by neglecting the knee injury. Within each category, five interrelated aspects were discerned: focus, level of performance, activities, strategies and feelings. Categories A, C and E reflected experiences of full participation, while categories B and D reflected experiences of modified participation. There were mostly positive feelings regarding participation. Negative feelings were expressed in category D. Factors affecting the activity level were grouped according to the framework of the International Classification of Functioning, Disability and Health described as facilitating or hindering the activity level. Facilitating factors included regaining and maintaining

physical function, regaining confidence in knee function and (re)learning movement patterns. Hindering factors included fear of (re)injury, uncontrollable giving-way, and loss of motivation.

Conclusion: With different strategies, most of the informants achieved a satisfactory activity level, despite impairments and decreased activity level. Both physical and psychological factors were described to affect the activity level, as well as time since injury.

Keywords: *phenomenography, risk appraisal, control of knee, knee impairment, neglect*

INTRODUCTION

An injury to the anterior cruciate ligament (ACL) causes knee instability and long absence from sports participation, or even the end of an athletic career. In addition, the injury can create feelings of uncertainty and fear of how far the injury will affect future function.[37] The extent of the impact the injury has on activity participation varies; some experience instability in daily living, while others are able to return to pre-injury activity levels without reconstruction of the torn ligament. [3, 5, 7, 13, 25, 31] Some can even return to pivoting sports[4, 9], but not always without symptoms and occasional episodes of instability. [23, 28, 29] Movement patterns, self-reported knee function, the leg symmetry index (LSI) in single leg-hop tests and quadriceps strength are factors found to differentiate between those who return to the pre-injury activity level and those who do not.[1, 8, 9, 25] The results of these studies are not consistent, because some individuals do not return, despite high rating of knee function or LSI >85 % in hop tests.[11, 25, 27] The status of the knee is the most commonly reported reason for a decrease in activity level.[5, 23, 31] Advice from surgeons, change of life style[4, 7], and loss of interest, increased age, lack of time or facilities are other reported reasons.[3] Hence, the assessment of a successful outcome after an ACL injury with return to the pre-injury activity level may not always be optimal. Qualitative research can identify and explore factors affecting a return to pre-injury levels of activities that may be important to the individuals themselves, and as well as explore what a successful activity level means in the individual's terms, whereas quantitative research is limited to factors predetermined by others.

The importance of assessing different factors after an ACL injury (knee status, muscle performance, psychological factors, performance-based tests and subjective rating of knee function) has been emphasized.[8, 11, 14] Recent research has also

emphasized psychological factors, such as fear of (re)injury, self-efficacy and confidence in knee function. [15, 30, 37-39] Most of these studies investigated those who have undergone reconstructive management. Whether these results are valid for those undergoing non-reconstructive management has not been investigated. There are factors (e.g. age, activity level and personal traits) that differ between individuals who undergo reconstructive management, and those who do not,[34] which compromise the ability to generalize from studies involving individuals undergoing reconstruction.

Furthermore, results of these assessments do not give information about how the individuals themselves experience their ability to perform or their feelings about participation in activities. Qualitative research can improve understanding of function after a non-reconstructive managed ACL injury from the individuals' perspective. Previous qualitative research on ACL injuries has investigated experiences of the injury, the decision to undergo reconstruction, rehabilitation, and how the injury has affected the individual and the individual's attitude towards his or her body and sports.[10, 20, 37, 40] To our knowledge, no current study has described how individuals experience their ability to participate, how they participate and how they feel about their way of participating in different activities. The aim of this study was to describe ways of experiencing participation in activities in individuals with a non-reconstructed ACL injury and describe the emotional aspects related to participation. Further, the objective was to explore factors affecting the activity level.

METHODS

Sample and Procedures

For this descriptive, qualitative study, 19 individuals with a non-reconstructed ACL injury were interviewed. Medical records for all patients who visited one of four orthopaedic units from 2005 to2008, and had received a diagnostic code for ACL injury or knee distortion were scrutinized. Of the total 2038 medical records scrutinized, 1270 reported ACL injuries and 248 reported unilateral, non-reconstructed, total ACL ruptures. Of these 129 met the inclusion in the study. Inclusions and exclusions criteria's are presented in table 1.

TABLE 1. Inclusions and exclusions criteria

Inclusion criteria	Exclusion criteria
Age 18-45 years	Previous ACL reconstruction
Unilateral ACL total rupture confirmed via MRI or arthroscopy 1-5 years ago	Participation in other studies that may conflict participation in this study
Fluently speaking Swedish	Complex associated injuries (multiple ligament injury, extensive cartilage and/or meniscus injuries)
	Recently reinjured within a month
	Other diagnoses interfering with physical or communicative ability

Abbreviations: ACL, anterior cruciate ligament, MRI, magnetic resonance image

Purposeful sampling was used, in that the informants were selected strategically to maximise variation in ways of experiencing participation. Variables chosen were based on aspects that were reasonable to assume or were found in previous research to impact on participation in physical activities after an ACL injury[27] and were known from the medical records. Informants with variation in age, gender,

time since injury, recruitment location, activity at injury and when indicated in the medical records, activity level before and after injury, were selected. Informants chose the time and location for the interview. The interviews were conducted between March and August 2010. A total of twenty-six informants were contacted. The recruitment stopped when 19 informants had agreed to participate. Eight of the informants stated that it was their own decision to undergo non-reconstructive management, seven that it was not their own decision or that it never was discussed, and four had decided in consultation with the orthopaedic surgeon or the physiotherapist. Informants' characteristics are presented in table 2.

TABLE 2. Description of informants

Gender	Age	Injury activity	Months since injury	Tegner[1] pre-injury	Tegner[1] current	Giving way episodes	Rehabilitation >1 visit (yes/no)
F	18	PE in school	60	7	4	>3	Y
F	27	Horseback riding	23	3	5	1	Y
F	28	Downhill skiing	42	3	3	2	N
F	36	Soccer	47	2	2	>3	N (1)
F	40	Other	32	2	2	0	Y
F	41	Soccer	48	4	4	1-2	Y
F	43	Horseback riding	53	4	4	0	Y
M	18	Motocross	55	9	5	>3	Y
M	21	Floorball	55	8	7	>3	Y
M	24	Soccer	27	9	6	1	Y
M	27	Downhill skiing	27	9	9	0	N (1)
M	29	Soccer	33	9	6	1	N (1)
M	29	Soccer	23†	9	7	1	Y
M	32	Downhill skiing	32	6	6	0	Y
M	34	Floorball	37	7	4	0	Y
M	36	Floorball	18‡	7	7	0‡	N (1)
M	39	Soccer	46†	9	6	1	Y
M	40	Soccer	67*	7	6	0	Y
M	42	Soccer	22	9	4	3	Y
f/m=7/12	m=32 (18-43)		m=38 (18-67)	md=7 (2-9)	md=5 (2-9)		

Abbreviations: PE, physical education, Y, yes, N, no, m, mean, md, median
*verified more than five years ago
†partial ACL rupture
‡first injury about 7-8 years ago, but no verification of whether it was an ACL-injury or not. Has had varying levels of instability since then.

Of the seven who did not participate, four were female, five declined due to personal reasons, and two could not be contacted. At the time of the interview, two informants had been informed that their ACL was not completely ruptured, and one ACL injury was verified five and half years ago. However, the analysis revealed no significant difference in the ways of experiencing participation in these interviews, and they were included in the sample.

Semi- structured interviews were used for data collection (Interview guide is provided in the figure).The interviews were conducted by a registered physiotherapist (A.Ö.), with extensive experience of rehabilitation of ACL injuries and ACL reconstruction and with training in qualitative interviewing. To minimize potential influence on the informants' expectations of the content of the interview and their previous experiences of healthcare, rehabilitation and physiotherapists, the informants were blinded to the interviewer´s occupation. The interviewer introduced herself as PhD student from Linkoping´s University.

The interview guide focused on the informants' experiences of how and what affected their way of participating in activities from the time after the injury until present. Two pilot interviews were conducted (not included in the analysis) and the question *"Do you think differently now, compared to how you did early after the injury (about participating in activities)?"* was added and the question *"What do you believe has affected the way you can function today?*" was reformulated from "*What has been important for you to regain the function you have today?"*

The informants were asked to speak in as much detail as they could. Probe questions were used, such as "how did you feel or think about that" and "can you elaborate". Before the interview the participants were given oral information about the

[1] Tegner Y, Lysholm J. Rating systems in the evaluation of knee ligament injuries. *Clin Orthop Relat Res.* 1985;43-49.

study and signed a consent form, and demographic data were recorded (table 2). The Tegner activity scale was used to record pre-injury and current activity level. [36] The interviews, which range from 26 to 72 minutes in duration (mean 46 minutes) were recorded and transcribed verbatim.

Phenomenography and Analysis Procedure

A phenomenographic approach was used. Phenomenography originates from educational research and describes individual's qualitative different ways of experiencing a phenomenon. The research interest is to identify and map this variation regarding what aspects of the phenomenon are discerned and related to each other and to the phenomenon as a whole entity. Different individuals focus on different aspects of the phenomenon, depending on previous experiences, social and cultural background and the context in which the phenomenon is experienced. [21, 22] Phenomenography differs from phenomenology in the sense that phenomenography aims to describe the *variation* in ways of experiencing a phenomenon, whereas phenomenology aims to describe the *essence* of a lived experience of a phenomenon.[17]

Applying a phenomenographic approach in healthcare can contribute to a wider understanding of different patients needs.[33] For the current study, understanding of how different individuals participate in activities, what is driving the different ways of participation and how that affects the individuals can help to improve treatment strategies.

Phenomenography is an empirical approach.[6, 33] The result of a phenomenographic analysis is presented as an outcome space, which is a set of categories displaying qualitatively different ways a group of informants experience

the phenomenon. The outcome space also portrays the structure, the interrelated aspects within each category and the relationship between the categories (the contrastive phase of the analysis).[21, 22]

The analysis followed consecutive steps described by Dahlgren & Fallsberg[6] (table 3). The categorization was done by one author (A.Ö.). During the analysis, the researcher returned to the transcripts to critically reconsider and assure that the interpretation represented the informants' statements. The content of the obtained categories, the internal relationship and differences between the categories were scrutinized by the two other authors (J.K. and M.A.D). Differences between the researchers were negotiated until consensus was reached.[41] Statements from the informants were used to illustrate and support the categories.[33]

TABLE 3. Analysis procedure according to Dahlgren & Fallsberg 1991[2]

Steps	Description of the steps
1) Condensation	Statements or passages from the transcripts, corresponding to the aim of the study are identified and selected for further analysis
2) Comparison	The selected statements and passages were compared for similarities and differences
3) Grouping	Similar content-related statements and passages were grouped together into categories
4) Articulating	The categories were compared in order to describe the essences of similarities within each category
5) Labeling	Labels that illuminate the essence of the categories were constructed
6) Contrasting	The final categories were compared to each other and scrutinized for differences and borders between them were established

[2] Dahlgren LO, Fallsberg M. Phenomenography as a qualitative approach in social pharmacy research. *J Soc Adm Pharm.* 1991;8:150-156.

For the last aim of the study (describing factors affecting the activity level), identified factors affecting activity level were simply grouped according to the framework of the International Classification of Functioning, Disability and Health (ICF)[42] and described as facilitating or hindering the activity level. A phenomenographic approach could not be used, because some statements were too short and concise to allow a more elaborated analysis.

RESULTS

Five categories of qualitatively different ways of experiencing participation in activities were identified; A) unconditioned participation, B) participation as conditioned by risk appraisal, C) participation as conditioned by experienced control of the knee, D) participation as conditioned by experienced knee impairment, E) participation as conditioned by neglect of the knee injury. The obtained categories comprised of five interrelated aspects: focus, level of performance, activities, strategies, and feelings (table 4). Relationships between the aspects differed between the categories, which also indicated that the experience of participation was different. Variations between the categories are more thoroughly described in the contrastive phase. The informants described different ways of participation depending on what the focus was on (i.e. the activity, risk of (re)injury, controlling the knee or impairments), their ability/inability to participate and strategies used (table 5). Thus, one informant could describe unconditioned participation in one specific activity and participation as conditioned by risk appraisal for another specific activity (table 4). In addition, participation could change during the activity as shown in the statement made by informant 4 about playing soccer (last statement in category E). The descriptions also show how participation changed from early after injury to present. However, the

categories cannot be viewed as consecutive steps over time. Most statements were identified in participation as conditioned by risk appraisal, and the fewest statements were in participation as conditioned by neglect of the knee injury.

TABLE 4. Ways of experiencing participation

	A) Unconditioned participation	B) Participation as conditioned by risk-appraisal	C) Participation as conditioned by experiencing control of the knee	D) Participation as conditioned by experiencing knee impairment	E) Participation as conditioned by neglecting the knee injury
Focus	Activity	Risk	Control	Impairment	Activity
Level of performance	Full	Partial Changed Given up	Altered and controlled Full	Hindered Partial	Full Temporarily limited
Activities*	Daily living Work Sports (soccer, bandy, downhill skiing)	Sports (motocross, downhill skiing, soccer, floor ball) Daily living Work	Daily living Sports (downhill skiing, badminton) Work	Sports (soccer, running) All daily living	Sports (boxing, floorball)
Strategies	Gradual progression	Avoidance Careful Reorientation	Proactive Reactive	None Cessation	Motivation Neglecting Forgetting
Feelings	Satisfied	Acceptance	Surprise Happiness	Negative Acceptance	Tiring, but positive

* The activities are listed in order of commonness within each category

TABLE 5. Distribution of statements made by the informants in the different categories

Informant	Unconditioned participation	Participation as conditioned by risk appraisal	Participation as conditioned by control of the knee	Participation as conditioned by experienced knee impairment	Participation as conditioned by neglecting the knee injury
1	X	X	X		
2		X	X	X	
3		X	X	X	
4		X		X	X
5	X	X			
6		X		X	X
7	X	X	X		
8	X	X			X
9		X	X		X
10	X		X		
11	X	X	X		X
12		X	X	X	
13	X	X			
14		X		X	
15	X	X		X	
16		X		X	
17	X	X	X		X
18		X	X		
19	X				

A. Unconditioned Participation

The focus was on the activity. Unconditioned participation was characterized as a feeling of becoming normalized; that function had been restored, and participation was as it had been before the injury. When participating in activities, there were feelings of safety and security and these were related to confidence in knee function. Unconditioned participation was most commonly mentioned with daily living activities and at work, but also within more demanding activities, such as downhill skiing and soccer. There were some descriptions of minor impairments; loss of range of motion, tenderness or instability, but these did not affect performance or participation. Being able to participate unconditionally was related to satisfaction at achieving this level of activity. The satisfaction was related to their ability to be physical active without limitations.

"I don't have any problems carrying the children. I can manage to carry heavy things and bending the knees whilst lifting and all that kind of stuff. It feels like you've almost forgotten about how it was before (early after injury) but it feels like you´re becoming, that it feels normal. … It feels good in the knee I can do all daily (activities). I don´t feel that I have any limitations" (informant 1)

Attaining unconditioned participation was achieved by gradually increasing performance and participation. Or if the function had been restored, unconditioned participation was possible from the beginning, without considerations of the knee.

"Yeah it was full speed (downhill skiing). So, no I wasn´t afraid of that, it went well. So, no I think it, it felt pretty restored. I don´t notice it (the knee injury) really when I do things like that" (informant 13)

B. Participation as Conditioned by Risk Appraisal

The focus was on risks and the risk appraisal was based on sustaining (re)injury and jeopardizing the currently achieved function, causing loss of ability to participate in other, more prioritized activities or risking future problems such as osteoarthritis (OA). This was most common within different sports, but also in daily living and work. Both negative and positive instances of participation as a function of risk appraisal were described. Negative instances reflected fear of (re)injury, low confidence in knee function, lack of control of the knee or the environment. Positive instances included discovery of, and more time for, other less risky activities.

"I avoid doing certain things because I know in those situations my knee can give way. If we´re out walking in the forest I stick to the path, because I don't willingly walk out since it has happened when we´ve been out with the dogs … So (walk) out into, too unreliable terrain. If I take a wrong step or something I can be laying there…" (informant 11)

Participation was changed as a consequence of risk appraisal. Activities experienced as hazardous were either partly avoided or given up. When parts of the activity were avoided, performance was carried out more carefully. Despite avoidance, there were no feelings of being hindered, since participation in activities was still possible. The informants described happiness at overcoming the fear enough to be able to participate at the current level and still taking part in the activity.

The informants´ accounts show that the decision to give up an activity was not always easy, but the risk was not worth taking. The current situation was accepted, even though some of the informants expressed wishes of ability to continue a specific activity. There were also descriptions of participating from an altered position, for example as a coach within team sports.

“I can run and do what I want to do really, but now I´ve chosen to give up soccer because I don’t want to risk any future disability. … I don´t want to risk not being able to do what I want to do in the future … well, being able to go for a run, go outside and play soccer with friends, or play floorball for recreational … at a lower level. … move around without limitations … Today it feels really good since I´ve taken over the training of the goalkeepers instead. So I´m still involved in the club, and get to meet the guys in that way … it´s a brotherhood … it´s a joyful thing and I still have a passion for soccer” (informant 7)

C. Participation as Conditioned by Experienced Control of the Knee

This category was characterized by the need to control the knee in order to be able to participate. This was experienced within daily living, at work, and in prioritized sport activities. Two strategies were described for gaining control: *proactive and reactive.* Proactive involved conscious actions taken before participating. Actions taken were (re)learning new techniques or movement patterns, doing strength exercises or using a knee brace. The brace gave stability and psychological support.

" but if you ski faster and need to turn more then you have to bend the outer knee inwards and that's the problem for me … I can´t bend the knee inwards the same way as I can when I turn the other way ... but then you can, on the other leg you bend it inwards as well and push there … have an equal amount of weight on both legs and lean inwards … I lean my whole body inwards instead of bending inwards at the knees … it becomes like a different technique … but this means I can never ski as fast with a carve turn to the left as I can to the right, just because I don't have my ACL. In the beginning it didn´t go very well, even poorly … but it´s getting better and better and I actually had to learn a new technique and since then it´s been getting better and is becoming more fun" (informant 17)

Reactive strategies can be described as trial and error. Awareness of the need to learn how to run, turn and stop emerged when participation in activities caused instability and/or pain. At first, a more careful approach was used, and a conscious awareness on how to use the knee was present. Over time the need to be aware decreased, but it was always in the back of the mind.

"The knee hyper-extends … I always have to think of how I run … how I put my feet down because if it´s a little wrong it can hurt for a couple of weeks. So you need to think of it all the time … it´s really hard (to think of it) … I can´t run if I don´t

think of how I run, so it´s either running or staying at home. I´ve learned to live with it, but finally you stop thinking about it … I´m beginning to learn more how, you know, I can run like this … You think ahead when you´re running" (informant 18)

With control there was a feeling of security and of having confidence in the knee. Despite feelings of being forced to take control, the strategies brought the desired result; full participation. There were feelings of surprise, relief, and happiness about the ability to participate.

D. Participation as Conditioned by Experienced Knee Impairment

Within this category, impairments restricted participation and had implications for the overall feeling of limitation of freedom. The restrictions varied in dimension from partial restriction to total hindrance. Participation was carried out until symptoms occurred or loss of confidence in knee function hindered any participation. This was found in a wide range of activities, from demanding sports activities to playing with children, to jogging. Total hindrance meant that the respondent was restricted from participating in activities on his or her own terms and created negative feelings such as frustration, sadness, loss of function, or inability to socialize or exercise on one´s own terms.

"Well I can go along … like when it´s ice and you drive out to the lake, you know, but I can´t be out with them (the children on the ice) and play hockey if that´s what they want (because of instability)… so you can sort of glide a little. You can be with them but you can´t be active so to speak (informant 14)

Partially restricted meant, that participation was adapted due to impairments. Feelings of being hindered were not present, but impairments limited the level of

participation. Participation ceased when pain or instability occurred. This was not related to negative feelings; rather to an acceptance of the situation.

“If you´re out walking and things like that, you might not really feel that you can keep the same pace, thus you may not be able to walk really fast all the time you know, but you may be able to walk faster for a while and then you may slow down a bit, if you get tired in the knee. It´s working, of course, you adapt, you do“ (informant 15)

Soon after the injury, being restricted or worrying about becoming restricted in performing and participating in activities was commonly experienced. Early return to normal daily activities, physical therapy, regaining trust in the knee or learning how to take control, helped to overcome this. However, sometimes these strategies were insufficient to overcome the experience of being hindered, for example when knee instability was beyond one´s ability to learn how to control it.

E. Participation as Conditioned by Neglecting the Knee Injury

The focus was on the activity and this was most commonly found within sports. This was shown by determination and motivation to participate, or forgetting about the injury. When motivation was high, impairments did not affect participation. The desire to participate was superior, even though the physical capacity to perform could be limited. When symptoms such as pain or giving way occurred, a timeout could be taken, but one would return again. There was a persistency, a determination to not be hindered by the injury, not to be disabled. In some cases this was a pre-phase to taking control by being reactive. Even though there were tiring feelings because of the knee, there were positive feelings because of the ability for full participation in activities of importance.

"I can, you know, load the knee but it´s like, in certain moments when there is load on the knee, it doesn't work it can happen when you play golf as well … that it´s popping a little, then it´s popping right back so it´s like it only moves (making a double clicking sound) … it has never locked and been out, it´s always popping back all the time … it hurts for a while then you go again" (informant 9)

Even though there might have been perceptions of risk of (re)injuring the knee, the motivation and the effort to participate took over, as one informant described: *"It depends on how motivated I am right then, because either you try and then it will simply hold or break, or you are a bit more careful … it depends on what I´m about to try and if I can calculate how big of a risk it is to injure myself … when I was about to try to play soccer for the first time, then I started as a goalie to avoid running and twisting, but then I really wanted to play out in the field because I love playing soccer and tried, did a rush and turned fast and felt that it (the knee) popped"* (informant 4).

Soon after the injury, before learning how to perform, or at times after longer periods without symptoms, feelings of being normal were present, and the person could become oblivious to the knee injury. Participation in activities continued as before the injury, with no consideration given to the knee. At times of instability, awareness of the injury came to mind. This led to learning either to change the way an activity was performed or to avoid a particular part of the activity. It could lead to an experience of being hindered from participation because of inability to control the instability.

Contrastive Analysis

In the contrastive phase of a phenomenographic analysis, differences and similarities are compared between the categories. Full participation was found in category A, C and E. The contrastive analysis showed that, although full participation was reached, the strategies to achieve full participation differed. In category A, full participation was performed as before the injury with focus on the activity. In category E the focus was also on the activity, but with temporary occurrence of instability or pain. In category C the focus was on controlling the knee and different strategies were used to control the knee.

Altered or decreased participation was found in category B and D. In category B, some participation was avoided due to lack of confidence in knee function or fear of (re)injury and participation was sometimes altered to a non-active position (coach within the team). The differences between these two categories were that, in category B, it was the individual's own decision to decrease or stop participation, whilst in category D the impairments directed activity limitations and the degree of participation.

Impairments (instability, pain or decreased flexion) were present in all categories. The differences were in how, or if impairments were managed, and whether impairments affected participation or not. In category A, impairments were minor and did not affect either performance or participation. In category C, impairments were controlled, whereas in category D they were directing participation and in category E impairments were neglected. Within categories B and D, there were impairments on a psychological level (fear of (re)injury or loss of confidence in knee function). In these two categories impairments affected participation, but in categories A, C or E they did not.

Factors Affecting the Activity Level

Factors facilitating or hindering the activity level can be described within the ICF framework[42] and are shown in table 6. Relations were described between the physical components (degree of instability, impairments and regaining physical function) and the psychological components (degree of fear of (re)injury and confidence in knee function). Better physical function resulted in higher confidence in knee function and lower fear of (re)injury and promoted participation in activities, and vice versa.

One facilitating factor mentioned that is not included in the ICF framework, was time. There were descriptions that as time passed by, the knee had become better, resulting in an increased activity level. There were perceptions of healing, resting from strenuous activity and (re)learning over time.

TABLE 6. Factors facilitating or hindering participation in activities

	Facilitating	Hindering
Body structure	Stable knee	The injury Unstable knee
Body function	Muscle function Coordination Balance Overcoming fear Confidence in knee function	Loss of muscle function Pain Fear of (re)injury Low confidence in knee function
Activity/ Participation	Ability to run Early return to normal activities Continuously being active (Re)learning technique or movement pattern Learning about situations in which instability occur	 Periods of inactivity Inability to control instability Inability to learn about situations in which instability occur
Personal factors	Taking control Avoidance of hazardous situations Consciously aware of the knee Motivation – not being hindered by the knee Neglecting injury	Age Avoiding participation due to risk appraisal Lack of strategies
Environmental factors	Physical therapy Knee brace	Denied reconstruction Changes within team Opponents Surface (uneven ground, wet grass)
Other	Time	

DISCUSSION

Participation in activities was experienced in five different ways. Despite impairments, change of activity or decrease in activity level, participation was achieved at a satisfactory level in most cases. Modification of activity level is considered an unsuccessful outcome when return to pre-injury activity level is used as the primary outcome.[2] In addition, modification of activity level in order to reduce the risk of further injury to the knee results in a lower score of knee-related quality of life (QoL) when assessed with the Knee Injury and Osteoarthritis Outcome Score (KOOS).[19, 26] One of the four questions in KOOS-QoL is; “Have you modified your life style to avoid

potentially damaging activities to your knee?" The category of risk appraisal in this study show that modification of activity level was generally not experienced as negative after reprioritizations of activities of importance or choosing less hazardous activities. A few previous studies have reported that other factors, more common than the status of the knee, lead to a decrease in activity level i.e. change of life style and advice not to return to pre-injury activity.[4, 7] Despite an extensive literature search, only three studies were found that reported satisfaction with knee function and/or activity level after non-reconstructive management. These studies show that most patients were satisfied with their knee function and activity level.[3, 24, 32] Empirically, we know that not everyone has the ambition or motivation to return to pre-injury activity level, and considering the risk of further injuries and developing of OA, modification of activity level can be considered a successful outcome, as was shown in the current study and is supported by previous research.[13, 24]

The contrastive analysis showed that modification of activity level was not always accepted. Dissatisfaction with knee function and activity level was found in the category of participation as conditioned by knee impairments. In this category, modification of activity level was not always a result of one´s own choice. When the experience of being hindered was present, impairments had a major impact on functioning, causing disability and were related to negative feelings such as frustration, loss of function and inability to socialize on one's own terms. Thus, the injury may affect physical, psychological and social well-being.[42] Negative feelings have been found to exist soon after injury, during rehabilitation and at the time of returning to sports.[16, 20, 43] As shown in this study, these feelings can remain when impairments hinder participation in activities. It is not known whether the impairments can be resolved by rehabilitation or ACL reconstruction and if that would lead to

satisfaction with activity level. This suggests further investigation of factors that may affect acceptance for modification of activity level.

Unrestricted participation, especially within less demanding activities such as daily living, work and recreational activities, is probably the most desirable outcome for the individuals. In three of the categories (A, C and E), participation was possible without limitations. Even though there were at different demand levels, unrestricted participation was also present in highly demanding activities. Considering the risk of further injury and the risk of developing OA[5, 19, 24, 32] some caution may be warranted regarding returning to highly demanding activities. Unconditioned participation and participation as conditioned by experienced control of the knee; when instability is not present or actions have been taken to control instability may limit the risk. However, there is still exposure to risk when participating in highly demanding activities. In clinical practice it may be important to identify those experiencing participation as conditioned by neglecting the knee injury. In short-term perspective, there may be a high level of satisfaction because of the ability to participate, but what will the status of the knee and ability to participate be in the future after repeatedly episodes of giving way? Subsequent injuries can result in poorer self-reported outcome.[35] Previous studies have described individuals returning to pre-injury activity level with occasional episodes of instability.[23, 28, 29] Whether this is a common way of participation needs to be further investigated as well as whether this way of experiencing participation increases the risk for further injuries and likelihood of developing OA.

Motivation and determination were the incentives for participation as conditioned by neglecting the knee injury. However, to our knowledge there is no research investigating whether high motivation soon after the injury may predict a

return to pre-injury activity level or whether motivation may change over time after an ACL injury.

This study is unique in the way it describes different ways of experiencing participation in activities by individuals after a non-reconstructed ACL injury. The contrastive analysis shows variations in ways of participation, which could be of practical use in developing advice to patients with ACL injuries on how to think about their participation in physical activities. The study also adds a dimension to the concept of return to pre-injury activity. All the five categories had descriptions of return to pre-injury activity level, but in some instances, with limitations due to impairments (category D) or parts of the activity avoided due to fear of (re)injury (category B). In three categories (A, C and E) participation was as before the injury, but with the use of different strategies.

The strategies used to achieve full participation in the categories unconditioned participation (category A) and participation as conditioned by experiencing control of the knee (category C), that is, gradual progression and taking control over the knee are relevant to consider during rehabilitation and especially when returning to more demanding activities. The proactive strategy with descriptions of (re)learning how to run, jump and doing pivoting motions may correspond to the frontal plane control of the knee that has been found to be a risk factor for ACL injuries.[12] Preventive programs that aim to enhance neuromuscular control of the knee has been shown to reduce the risk for ACL injuries.[44] Future studies need to investigate whether this is the same technique as the proactive strategy used by the informants in this study and whether teaching this during the rehabilitation after an ACL injury can enhance control of the knee, reduce the risk of new injuries and as shown in this study enhance the ability to participate in activities.

Physical and psychological factors affecting the activity level are supported by previous research conducted after ACL reconstruction.[8, 9, 14, 16] Previous research about psychological factors (i.e. fear of (re)injury, self-efficacy and confidence in knee function) has mostly been addressed within reconstructive management.[15, 16, 39] The current study, with support from Thomeé et al (2007)[38], shows that these psychological factors are also present after non-reconstructive management. The psychological factors most frequently described by the informants were confidence in knee function and fear of (re)injury. These factors were described to be related to physical function and level of participation in activities. Low confidence in knee function was found within the category of being restricted due to knee impairment (category D) and participation as conditioned by risk appraisal (category B), and was related to a decrease in activity level. Thomeé et al [38] using the Knee injury and Osteoarthritis Outcome Score, found correlations between self-reported knee function and self-efficacy in patients with an ACL deficient knee. Whether physical deficits are present within the categories B and D in the current study, or whether physical deficits are related to fear of (re)injury and low confidence in knee function within the population of non-reconstructed ACL injuries is not known and needs to be further investigated. Fear of (re)injury has also been found to hinder a return to pre-injury activity level after ACL reconstruction, and thus regarded as negative.[15, 16] Fear of (re)injury was found in the risk appraisal category, but was not always perceived as negative because of re-orientation to other activities and re-evaluation of future prioritized activities. Consequently, fear of (re)injury prevented participation in hazardous activities without compromising satisfaction.

Regaining physical function, (re)learning techniques and movement patterns, and accepting and adapting to the new ways of participating in activities may take a

long time. Some of the informants described that it was not until the last couple of years they felt they had reached a plateau in knee function. Some informants, more recently injured, still struggled with learning to control the knee. Participants in this study indicated that time since injury was an important facilitator of return to activities, which is in line with Moksnes[25] et al in which 70 % of those classified as lacking the potential to return to pre-injury activity level without reconstruction, actually returned without surgery one year later.[25] Informing patients about that it may take some time to recover and advice to modify activity, especially during the first years, seems important for a good outcome.[5, 13] Future studies needs to investigate a more precise timeframe for regaining the physical function and factors affecting the progression towards an acceptable and satisfactory activity level.

In Sweden, the general process of deciding on reconstructive or non-reconstructive treatment after ACL injury begins with a rehabilitation period of 3-6 month.[18] If an acceptable knee function and activity level can be achieved without reconstruction, non-reconstructive management is chosen. The individuals in the current study were chosen to represent the non-reconstructed population after this algorithm and represent copers, non-copers and adapters. The sample included those who returned to pre-injury activity level with and without episodes of giving way (non-copers and copers) and those who reduced their activity level because of the knee injury (adapters). There were also some who have increased their activity level. Despite whether they would have been classified as copers, non-copers or adapters, most of the informants had an acceptable to satisfactory activity level and considered themselves as well-functioning.

Methodological Considerations

Credibility was enhanced by continuously returning to the transcripts to critically reconsider and assure that the interpretations represented the informants' statements, and by the two other researchers, who scrutinized the obtained categories, their content and the differences.[33] Even though the analysis was done thoroughly, only one of the authors was involved in the first steps. The credibility might have increased if another author had done a separate analysis of the first steps.

The purposeful sampling of the informants was done to enhance variations in experiences. It is important to note that purposeful sampling is done to maximize variation, not to achieve maximum variation, and was based on aspects that were reasonable to assume or has been indicated in previous research to have an impact on participation in physical activities after a knee injury. [27] In phenomenography, 20 informants have been shown to be enough to capture most of the different ways a phenomenon can be experienced. Our aim was to include 15-20 informants. After 19 interviews and the seven that declined participation or were unable to be contacted, inclusion was stopped because of the risk of a further skewed selection. Normally, saturation is not a used method for deciding sample size in phenomenography. However, the last interviews did not contributed with any new information.

Although there were variations in age, the distribution for female informants was skewed towards older age. Only a few females between 18-25 years of age were eligible and four declined participation. Two of the informants had been informed that their ACL were partially ruptured, one ACL rupture was verified half a year earlier than the inclusion criteria required. This might have influenced the results, however when compared with the other interviews there were no obvious

differences in their ways of experiencing participation. Neither were their experiences unique or more prominent in any of the five obtained categories.

The variation among the informants is a strength of this study and covers different ways of experiencing a phenomenon. According to the philosophy of phenomenography, individuals with different backgrounds, perceive the same phenomenon differently. However, phenomenography does not claim to be able to cover all ways a phenomenon can be experienced.[21, 22] Despite the achievement of variation amongst the informants, further investigation is needed to find out whether the results from this study can be generalized to a larger ACL population, e.g. within another timeframe post-injury, from countries with other health care systems and treatment traditions.

The informants were encouraged to describe their way of participation from soon after injury until present. Because those in the sample were between 18 and 67 months post-injury, the results of this study should be interpreted with caution for other timeframes post-injury, and the results may not be transferable for individuals within other timeframes.

The study population consisted of individuals at different activity level and not everyone was active in sports. So, the described ways of experiencing participation in activities is not sport specific but include all types of activities that the informants described and should not be interpreted as to be valid solely for sports.

CONCLUSION

Most of the informants had achieved a satisfactory activity level using different strategies, despite impairments and a reduced activity level. Modification of activity level was accepted in most cases in this study. However, when modification of

activity level was not one's own choice, as described in "participation as conditioned by knee impairment" and strategies were insufficient, further rehabilitation or even reconstruction may be indicated.

Full participation, even in highly demanding activities, was possible for some of the informants in this study. However, when symptoms were neglected, as was the case in "participation as conditioned by neglect of the knee injury", the risk of further injuries and developing of OA may increase. Therefore, this way of experiencing participation may be important to identify.

The described factors facilitating (physical functions, psychological factors, physical activities, learning and (re)learning, awareness, motivation and time) or hindering (physical impairments, psychological factors, inactivity, inability to learn and control the knee and lack of strategies) participation in activities can help physical therapists to enhance facilitators or help overcome hindrances during the rehabilitation.

Key points

Findings: The informants in this study used different strategies in order to achieve full participation or modification of activity level at a satisfactory level and to attain this described both physical and psychological factors as being important to address over time.

Implications: Several new hypotheses can be generated from this study. Can the different ways of experiencing participation be identified soon after the injury? Do they differ over time and impact prognosis? Can the different ways of experiencing participation be affected by interventions during the rehabilitation?

Cautions: The informants in this study were 18-67 month post-injury. Even though the informants described their participation from soon after injury until present, the results should be interpreted carefully for times other than 18-67 months post-injury.

References

1. Alkjaer T, Simonsen EB, Jorgensen U, Dyhre-Poulsen P. Evaluation of the walking pattern in two types of patients with anterior cruciate ligament deficiency: copers and non-copers. *Eur J Appl Physiol.* 2003;89:301-308.
2. Ardern CL, Webster KE, Taylor NF, Feller JA. Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play. *Br J Sports Med.* 45:596-606.
3. Bonamo JJ, Fay C, Firestone T. The conservative treatment of the anterior cruciate deficient knee. *Am J Sports Med.* 1990;18:618-623.
4. Buss DD, Min R, Skyhar M, Galinat B, Warren RF, Wickiewicz TL. Nonoperative treatment of acute anterior cruciate ligament injuries in a selected group of patients. *Am J Sports Med.* 1995;23:160-165.
5. Casteleyn PP, Handelberg F. Non-operative management of anterior cruciate ligament injuries in the general population. *J Bone Joint Surg Br.* 1996;78:446-451.
6. Dahlgren LO, Fallsberg M. Phenomenography as a qualitative approach in social pharmacy research. *J Soc Adm Pharm.* 1991;8:150-156.
7. Daniel DM, Stone ML, Dobson BE, Fithian DC, Rossman DJ, Kaufman KR. Fate of the ACL-injured patient. A prospective outcome study. *Am J Sports Med.* 1994;22:632-644.
8. Eastlack ME, Axe MJ, Snyder-Mackler L. Laxity, instability, and functional outcome after ACL injury: copers versus noncopers. *Med Sci Sports Exerc.* 1999;31:210-215.
9. Fitzgerald GK, Axe MJ, Snyder-Mackler L. A decision-making scheme for returning patients to high-level activity with nonoperative treatment after anterior cruciate ligament rupture. *Knee Surg Sports Traumatol Arthrosc.* 2000;8:76-82.

10. Heijne A, Axelsson K, Werner S, Biguet G. Rehabilitation and recovery after anterior cruciate ligament reconstruction: patients' experiences. *Scand J Med Sci Sports.* 2008;18:325-335.
11. Herrington L, Fowler E. A systematic literature review to investigate if we identify those patients who can cope with anterior cruciate ligament deficiency. *Knee.* 2006;13:260-265.
12. Hewett TE,Myer GD,Ford KR, et al. Biomechanical measures of neuromuscular control and valgus loading of the knee predict anterior cruciate ligament injury risk in female athletes: a prospective study. *Am J Sports Med.* 2005;33:492-501.
13. Kostogiannis I, Ageberg E, Neuman P, Dahlberg L, Friden T, Roos H. Activity level and subjective knee function 15 years after anterior cruciate ligament injury: a prospective, longitudinal study of nonreconstructed patients. *Am J Sports Med.* 2007;35:1135-1143.
14. Kvist J. Rehabilitation following anterior cruciate ligament injury: current recommendations for sports participation. *Sports Med.* 2004;34:269-280.
15. Kvist J, Ek A, Sporrstedt K, Good L. Fear of re-injury: a hindrance for returning to sports after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc.* 2005;13:393-397.
16. Langford JL, Webster KE, Feller JA. A prospective longitudinal study to assess psychological changes following anterior cruciate ligament reconstruction surgery. *Br J Sports Med.* 2009;43:377-378.
17. Larsson J, HolmstrÃ¶m I, *Phenomenographic or phenomenological analysis: does it matter? Examples from a study on anaesthesiologists' work*, in *International Journal of Qualitative Studies on Health & Well-Being*. 2007, Co-Action Publishing. p. 55-64.
18. Lidgren L J, O, Indikationer för behandling inom ortopedi - Behandlingsindikationer för tre ortopediska sjukdomsgrupper, Lund, 2005

19. Lohmander LS, Ostenberg A, Englund M, Roos H. High prevalence of knee osteoarthritis, pain, and functional limitations in female soccer players twelve years after anterior cruciate ligament injury. *Arthritis Rheum.* 2004;50:3145-3152.

20. Mainwaring LM. Restoration of Self: A model for the psychological response of athletes to severe knee injuries. *Can J Rehabil.* 1999;12:145-156.

21. Marton F. Phenomenography - Describing conceptions of the world around us. *Instruc Sci.* 1981;177-200.

22. Marton F, Booth S. Learning and awareness. Mahwah, N.J: Erlbaum; 1997

23. McDaniel WJ, Jr., Dameron TB, Jr. Untreated ruptures of the anterior cruciate ligament. A follow-up study. *J Bone Joint Surg Am.* 1980;62:696-705.

24. Meunier A, Odensten M, Good L. Long-term results after primary repair or non-surgical treatment of anterior cruciate ligament rupture: a randomized study with a 15-year follow-up. *Scand J Med Sci Sports.* 2007;17:230-237.

25. Moksnes H, Snyder-Mackler L, Risberg MA. Individuals with an anterior cruciate ligament-deficient knee classified as noncopers may be candidates for nonsurgical rehabilitation. *J Orthop Sports Phys Ther.* 2008;38:586-595.

26. Moller E, Weidenhielm L, Werner S. Outcome and knee-related quality of life after anterior cruciate ligament reconstruction: a long-term follow-up. *Knee Surg Sports Traumatol Arthrosc.* 2009;17:786-794.

27. Muaidi QI, Nicholson LL, Refshauge KM, Herbert RD, Maher CG. Prognosis of conservatively managed anterior cruciate ligament injury: a systematic review. *Sports Med.* 2007;37:703-716.

28. Myklebust G, Holm I, Maehlum S, Engebretsen L, Bahr R. Clinical, functional, and radiologic outcome in team handball players 6 to 11 years after anterior cruciate ligament injury: a follow-up study. *Am J Sports Med.* 2003;31:981-989.

29. Noyes FR, Matthews DS, Mooar PA, Grood ES. The symptomatic anterior cruciate-deficient knee. Part II: the results of rehabilitation, activity modification, and counseling on functional disability. *J Bone Joint Surg Am.* 1983;65:163-174.

30. Ross MD. The relationship between functional levels and fear-avoidance beliefs following anterior cruciate ligament reconstruction. *J Orthop Traumatol.* 2010;11:237-243.

31. Scavenius M, Bak K, Hansen S, Norring K, Jensen KH, Jorgensen U. Isolated total ruptures of the anterior cruciate ligament--a clinical study with long-term follow-up of 7 years. *Scand J Med Sci Sports.* 1999;9:114-119.

32. Segawa H, Omori G, Koga Y. Long-term results of non-operative treatment of anterior cruciate ligament injury. *Knee.* 2001;8:5-11.

33. Sjostrom B, Dahlgren LO. Applying phenomenography in nursing research. *J Adv Nurs.* 2002;40:339-345.

34. Swirtun LR, Eriksson K, Renstrom P. Who chooses anterior cruciate ligament reconstruction and why? A 2-year prospective study. *Scand J Med Sci Sports.* 2006;16:441-446.

35. Swirtun LR, Renstrom P. Factors affecting outcome after anterior cruciate ligament injury: a prospective study with a six-year follow-up. *Scand J Med Sci Sports.* 2008;18:318-324.

36. Tegner Y, Lysholm J. Rating systems in the evaluation of knee ligament injuries. *Clin Orthop Relat Res.* 1985;43-49.

37. Thing LF. "Voices of the broken body." The resumption of non-professional female players' sports careers after anterior cruciate ligament injury. The female player's dilemma: is she willing to run the risk? *Scand J Med Sci Sports.* 2006;16:364-375.

38. Thomeé P, Wahrborg P, Borjesson M, Thomeé R, Eriksson BI, Karlsson J. Self-efficacy, symptoms and physical activity in patients with an anterior cruciate ligament injury: a prospective study. *Scand J Med Sci Sports.* 2007;17:238-245.

39. Thomeé P, Wahrborg P, Borjesson M, Thomeé R, Eriksson BI, Karlsson J. Self-efficacy of knee function as a pre-operative predictor of outcome 1 year after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc.* 2008;16:118-127.

40. Thorstensson CA, Lohmander LS, Frobell RB, Roos EM, Gooberman-Hill R. Choosing surgery: patients' preferences within a trial of treatments for anterior cruciate ligament injury. A qualitative study. *BMC Musculoskelet Disord.* 2009;10:100.

41. Wahlstrom R, Dahlgren LO, Tomson G, Diwan VK, Beermann B. Changing Primary Care Doctors' Conceptions - A Qualitative Approach to Evaluating an Intervention. *Adv Health Sci Educ Theory Pract.* 1997;2:221-236.

42. WHO, International classification of functioning, disability and health, ICF, World Health Organization, Geneva, 2001

43. Wiese-Bjornstal DM, Smith AM, Shaffer SM, Morrey MA. An Integrated Model of Response to Sport Injury: Psychological and Sociological Dynamics. *Journal of Applied Sport Psychology.* 1998;10:46-69.

44. Yoo JH, Lim BO, Ha M, et al. A meta-analysis of the effect of neuromuscular training on the prevention of the anterior cruciate ligament injury in female athletes. *Knee Surg Sports Traumatol Arthrosc.* 2010;18:824-830.

FIGURE 1. Interview guide

- Can you tell me what happened to your knee?
- What do you know about the injury?
- Can you tell me what happened after your injury?
- Has the injury affected you or your life?
- Do you think differently now, compared to how you felt soon after the injury (about participating in activities)?
- What do you believe has affected the way you can function today?
- Can you tell me about the decision not to undergo surgery?
- If you look back, is there anything you wish had been different in the healthcare or rehabilitation you received?