

# Kinesiophobia Following Anterior Cruciate Ligament Reconstruction

Ön Çapraz Bağ Rekonstrüksiyonu Yapılan Hastalarda Kinezyofobi

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## Abstract

Objective	The aim of the study was to explore the effect of kinesiophobia on daily and sport activities of the patients following their anterior cruciate ligament (ACL) reconstruction. We correlated Tampa scale of Kinesiophobia (TSK) with Tagner Activity score (TAS). We hypothesized that high level of Tam-pa scale of Kinesiophobia decreases Tagner Activity score. ( <i>Sakarya Med J</i> 2019, 9(2):289-296 )
Materials and Methods	A total of 50 patients, who had Anterior cruciate ligament (ACL) reconstruction surgery between January 2010 and December 2016 were included to this study. KT-1000 arthrometer at 30 de-grees knee flexion was performed for both knees. Patients completed Lysholm Knee, TAS and TSK questionnaires postoperatively and TSK score was correlated with TAS and Lysholm knee score
Results	Mean age was 29.6 (18-50) and minimum follow-up was 12 months. Twenty out of 50 patients (%40) had meniscal tears. There was significant and inverse correlation between TAS and TSK. Higher TSK led to lower TAS whilst lower TSK led to higher TAS. However, there was no correla-tion between Lysholm knee score, TAS and TSK in patients with or without meniscal tear.
Conclusion	Our study showed that good knee function is not the only indicator to return preinjury daily and sport activities but kinesiophobia may also play a significant role even if Lyshman knee score is higher. Therefore, the patients with ACL injury should be informed about the kinesiophobia. We suggest that a kinesiophobia test could be added to the patients assessments with ACL injury. The patients who have high rate of kinesiophobia preoperatively, may benefit from psychotherapy postoperatively in addition to their physical therapy.
Keywords	Anterior Cruciate Ligament; Kinesiophobia; Lysholm knee score; Meniscal tear

## Öz

Amaç	Kinezyofobi'nin gündelik ve sportif aktivitelerin üzerindeki rolünü, Tempa Kinezyofobi skorunu (TSK) Tagner aktivite skoru (TAS) ile karşılaştırarak araştırmayı amaçladık. Hipotez: Yüksek Tempa Kinezyofobi skoru Tagner aktivite skorunu düşürür. ( <i>Sakarya Tıp Dergisi</i> 2019, 9(2):289-296 ).
Gereç ve Yöntemler	Ocak 2010-Aralık 2016 yılları arasında ön çapraz bağ rekonstrüksiyonu yapılan 50 hasta çalışmaya dahil edildi. Tüm hastalara Lysholm diz skorlaması, Tagner aktivite skorlaması ve Tempa Kinezyofobi skorlaması uygulandı. Hastaların her iki dizine 30 derecede KT-1000 arthrometre uygulandı. Tempa Kinezyofobi skoru, Tagner aktivite skoru ve Lysholm knee skoru ile karşılaştırıldı.
Bulgular	Hastaların ortalama yaşı 29.6 (18-50) ve minimum takip süreleri 12 ay idi. Hastaların 20'sinde (%40) aynı zamanda menisküs yırtığı mevcuttu. Tagner aktivite skoru, Tempa Kinezyofobi skoru ile karşılaştırıldığında anlamlı ve ters yönde bir korelasyon olduğu görüldü. Yüksek Tempa kinezyofobi skoru olan hastalarda Tegner aktivite skoru düşük; düşük Tempa kinezyofobi skoru olan hastalarda Tegner aktivite skoru anlamlı olarak yüksek olduğu görüldü. İstatistiksel olarak TKS, TAS, Lysholm skorları ve menisküs yırtığı olan ve olmayan hastalar arasında anlamlı bir fark bulunamadı.
Sonuç	Çalışmamız, diz fonksiyonlarının yaralanma öncesi gündelik aktivite ve sportif aktiviteye geri dönüş için tek başına yeterli olmadığını gösterdi. Lysholm skoru yüksek olsa bile kinezyofobinin, hasta-ların gündelik ve sportif aktivitelerine geri dönüşlerinde negatif bir rol oynadığı görüldü. Çalışmamızın sonuçlarına göre, tüm ön çapraz bağ yırtığı için opere edilecek hastalarda, kinezyo-fobi hakkında ameliyattan önce bilgilendirilmesi ve kinezyofobi testi yapılması tavsiye edilir. Yüksek kinezyofobi skoru olan hastalar, ameliyat sonrası fizik tedavinin yanında psiko-terapiden de fayda-lanabilirler.
Anahtar Kelimeler	Ön çapraz bağ; Kinezyofobi; Lysholm diz skoru; Menisküs yırtığı

## INTRODUCTION

Anterior cruciate ligament (ACL) rupture is a common injury in professional and amateur athletes.<sup>1</sup> ACL rupture frequently causes disability in athletes and usually occurs during sport activities following sudden turning, jumping, or pivoting movement.<sup>2,3</sup> The standard surgical treatment of ACL rupture is reconstruction of the ligament. It stabilises the knee joint and helps preventing further injuries and returning to previous levels of activity.<sup>4</sup> After surgery, rehabilitation aids to restore range of motion, strength, movement control, and knee function.<sup>5</sup> During rehabilitation, not only physical but also psychological factors could be indicators of success in outcome. However, only 65% of patients return to their preinjury level or sportive activity after anterior cruciate ligament reconstruction.<sup>6,7</sup>

Kinesiophobia is fear of movement or fear of re-injury after or before operation. It is also the most extreme form of fear of movement and is defined as irrational and debilitating fear of physical movement or activity resulting from a feeling of vulnerability to painful reinjury.<sup>8</sup> The Cognitive Fear Avoidance Model describes this as when a painful experience is interpreted as threatening, it can generate catastrophizing (or catastrophic) cognitions in a way that the activity will result in more pain and re-injury. As this goes on, it can lead to avoidance behavior, which in the long run, causes disability, disuse and depression as well as patient feeling trapped in a cycle of increased fear of pain, more pain and disability.<sup>9</sup> In recent years, the integration of the biopsychosocial model in rehabilitation has been receiving attention in clinical research. Implementing psychological factors assessment and management in rehabilitation for patients with musculoskeletal injuries/pain can aid in the decision-making process and improve outcomes. Therefore, it is important to know which psychological factors are related to the rehabilitation process and can contribute to a good recovery. The psychological influences such as self-efficacy, confidence in function, catastrophizing pain, kinesiophobia or reinjury may modulate individual perception and response to the illness,

and may influence functional level after musculoskeletal injury.<sup>10,11,12</sup> These fears can decrease daily activities and sportive success.

In this study, we aimed to explore the effect of kinesiophobia on daily and sport activities of the patients following their anterior cruciate ligament (ACL) reconstruction. We correlated Tampa scale of Kinesiophobia (TSK) with Tegner Activity score (TAS). We hypothesized that high level of TSK decreases TAS but may or may not be correlated with Lysholm knee score (LKS).

## MATERIALS and METHODS

A total of 61 patients were evaluated who were surgically treated with ACL reconstruction surgery according to the data from our medical records of the patients. We did not exclude the patients with additional meniscal tears. Inclusion criteria were the patients aged between 16–50 years who underwent elective, primary ACL reconstruction with hamstring autogenous graft between January 2010 and December 2016. Exclusion criteria were previous surgery on the ipsilateral knee, multi-ligamentous reconstruction, concomitant bony procedure and the patients who were unwilling to undergo evaluation. To identify the accurate rate of kinesiophobia, we also excluded the patients with revision ACL surgery. All the surgical procedure of the patients included to this study were performed by the same surgeon. A total of 50 patients were included to the study after excluding 6 patients due to revision and 5 patients due to multi-ligament reconstruction. All the patients underwent an arthroscopic ACL reconstruction with double-looped autogenous semitendinosus and gracilis tendons. All grafts were fixed with close-looped Endobutton® (Smith & Nephew) proximally. On the tibial side, all the grafts were fixed with staples (Smith & Nephew) and interference screws (Smith & Nephew). Meniscal tears were repaired with inside-outside technique.

Postoperatively, all patients underwent physiotherapy with the same protocol. Patients with ACL reconstruction were

allowed full weight bearing but patients with additional meniscal repair kept on non-weight bearing status for 4 weeks and after then, they started full weight bearing on the operated side. All the patients had a knee brace applied on the operated limb in the beginning and allowed 0 to 90 range of motion.

The patients completed Lysholm Knee, Tegner activity score and TSK questionnaires postoperatively. Both knees of the patients (operated and unoperated sides) were assessed with KT-1000 arthrometer at 30 degrees knee flexion. The differences of anterior shifts between the knees were calculated using metric system (in millimetres).

Kinesiophobia was measured using a 17-item version of Tampa Scale of Kinesiophobia (TSK-17). In the 17 items of the scale, each item had 4 response options; all anchored with the answers from “strongly disagree”, which scores 1 point to “strongly agree”, which scores 4 points. The total sum score is calculated and can range between 17 and 68 points. Vlaeyen et al. defined a cut-off of > 37 as showing a high degree of kinesiophobia.<sup>6</sup> A high score indicates strong fear of movement / (re)injury. The Lysholm knee score is a measure of knee function, symptoms and disability. It consists of 8 components related to knee function on a 100-point scale. Tegner activity score measures a person's activity level and it is numbered between 0 and 10, where 0 is ‘on sick leave/disability’ and 10 is ‘participation in competitive sports such as soccer at a national or international elite level.

This research has been approved by the IRB of the authors' affiliated institutions (Sakarya University). (Number: 71522473/050.01.04/183. Date: 02.07.2018)

This study is a cross-sectional type research.

### Statistical Analysis

Descriptive analyses were performed to provide information on general characteristics of the study population.

Kolmogorov-Smirnov test was used to evaluate whether the distribution of numeric variables were normal. Accordingly, it was seen that all scales displayed a normal distribution. Therefore, two independent sample t test was used to compare the numeric variables between two groups. The numeric variables were presented as the mean  $\pm$  standard deviation. Categorical variables were compared by Chi-Square test. Categorical variables were presented as a count and percentage. Pearson correlation coefficient was performed for relation between Lysholm knee score (LKS) and Tampa scale of Kinesiophobia (TSK) and with Tegner Activity score (TAS). A p-value <0.05 was considered statistically significant. Analyses were performed using SPSS statistical software (IBM SPSS Statistics, Version 23.0. Armonk, NY: IBM Corp.)

### RESULTS

This study was performed on 50 subjects among the age group between 18 to 50 years (mean age was 29.6). All the patients were male. Minimum follow-up was 12 months after primary ACL reconstruction and the mean follow up was 34.18 months (12-60). Twenty out of 50 patients (%40) had meniscal tears and all were repaired with inside – out technique. Fifteen of them were for medial meniscus and 5 were for lateral meniscus tears (Table 1).

The mean Tegner activity score was 6.76(0-10). The mean Lysholm knee and postoperative Tampa Kinesiophobia scores were 92.3 (85-100) and 35.8 (20-64) respectively. There was no difference in the mean of anterior translation of the knees (operated and un-operated) using the KT-1000 arthrometer side-to-side. There was no difference when correlating Lysholm scores to TSK score. For the patients with additional meniscal tear, the mean Tegner activity score for meniscal tear patients was 5.85(0-10). Again, the mean Lysholm knee and postoperative Tampa Kinesiophobia scores were 90.25(85-100) and 42.1 (20-64). Similarly, there was no difference in Lysholm score compared to TSK score in patient with or without meniscal tear. Also, there was no difference in TAS in the patient

**Table 1. Distributions of socio-demographic and treatment characteristics of groups**

		Total (n=50)	Non-Meniscal Tear (n=30)	Meniscal Tears (n=20)	P
Side	Right	36 (72)	22 (73.3)	14 (70)	1.000
	Left	14 (28)	8 (26.7)	6 (30)	
Cigarette	User	34 (68)	21 (70.0)	13 (65.0)	0.951
	Non-user	16 (32)	9 (30.0)	7 (35.0)	
Complica-tion	Negative	49 (98)	29 (96.7)	20 (100)	1.000
	Positive	1 (2)	1 (3.3)	0	
Meniscal tear Treatment	Lateral Meniscal tear	5 (25)		5 (25)	
	Medial meniscal tear	15(75)		15 (75)	
	Inside- Outside	20 (100)		20 (100)	
Age		29,32±9,63	27.07±9.13	32.7±9.58	<b>0.041</b>
BMI ( Body Mass Index)		27,44±3,58	27.27±2.65	27.7±4.71	0.680
Follow-up		34,18±12,52	34.17±12.37	34.2±13.07	0.993

Data were shown as n (%) and mean ± standard deviation.

with or without meniscal tear (Table 2).

(Figure 1). The TAS had significant and inverse correlation with TSK (Figure 2). Higher TSK led to lower TAS and vice versa. (Table 3) (Figure3).

There was moderate correlation between TSK and LKS

**Table 2. Distributions of socio-demographic and treatment characteristics of groups. The table shows correlation between TSK, TAS and LKS. KT1000 arthrometer Knee Score of operated and non-operated knees are given in this table.**

	Total (n=50)	Non-Meniscal Tear (n=30)	Meniscal Tears (n=20)	p
Postop Tempa Kinesiophobia Score	35,8±13,2	31.6±8.85	42.1±16.14	0.013
Postop Tegner Activity Score	6,76±2,85	7.37±2.4	5.85±3.27	0.084
Lysholm KNee Score	92,3±5,99	93.67±5.86	90.25±5.73	0.047
OPKT100015P	4,49±1,42	4.57±1.38	4.37±1.5	0.638
OPKT100020P	6,16±1,57	6.13±1.46	6.21±1.78	0.875
OPKT100030P	8,1±1,85	7.87±1.7	8.47±2.06	0.268
NPKT100015P	3,53±1,32	3.7±1.26	3.26±1.41	0.265
NPKT100020P	4,8±1,55	5.03±1.45	4.42±1.68	0.182
NPKT100030P	6,33±1,95	6.7±2	5.74±1.76	0.093

Data were shown as mean ± standard deviation  
 OPKT1000 = operated knee KT1000, NPKT1000 = nonperated knee KT1000, P= pound

**Table 3. Pearson's correlation coefficients between Lysholm knee score (LKS) and Tampa scale of Kinesiophobia (TSK) and with Tegner Activity score(TAS). It shows the correlation between LKS and TAS postoperatively**

	Postop Tempa Kinesio-phobia Score		Postop Tegner Activity Score	
	r	p	r	p
Lysholm Knee Score	-0.530	<0.001	0.517	<0.001
Postop Tegner Aktivity Score	-0.897	<0.001		

r: Pearson's Correlation coefficient

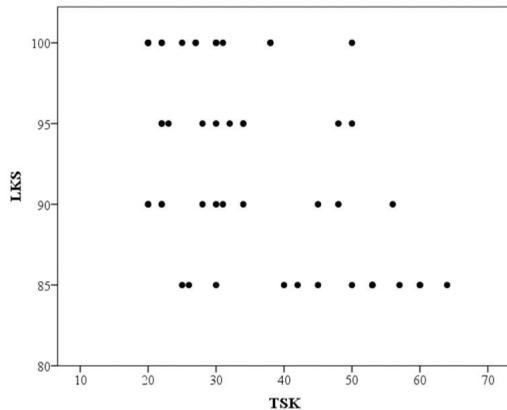


Figure 1. Scatter plot between LKS and TSK

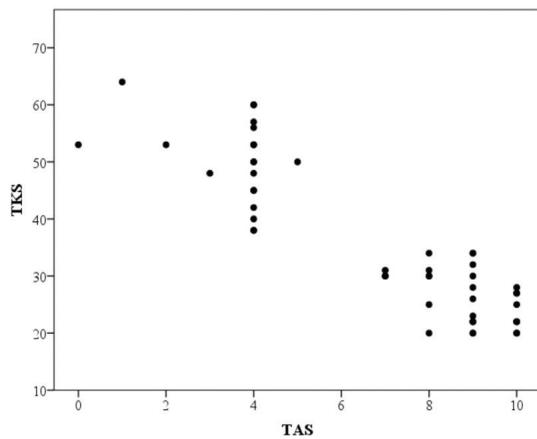


Figure 2. Scatter plot between TKS and TAS

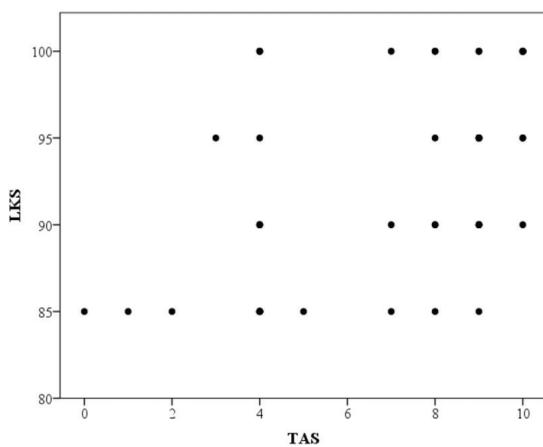


Figure 3. Scatter plot between LKS and TAS

## DISCUSSION

Probably the most important aspect of the current study was to emphasise the role of kinesiophobia in returning sportive and daily activity after ACLR. The aim of ACLR surgery is to stabilize the knee joint, to prevent further injuries and to allow patients return to their previous level of activity. Rehabilitation helps to restore range of motion, strengthen the muscles and improve knee functions.<sup>5</sup> However, most patients with ACL reconstruction do not return to their preinjury activity levels.<sup>13,14,15</sup> Despite recent improvements in surgical and rehabilitation techniques to restore knee function, it was reported that 20-50% of ACLR patients do not return to the same sport activity level after the surgery.<sup>13,14,15,16</sup> Physical therapy is not the only benchmark for surgical success but psychological factors are also as important. Several factors play roles in returning pre-injury activities. Some authors are proponents of a delayed return to sport until specific strength and function goals are met.<sup>17,18</sup> Social factors such as job changes or childbirth may also cause patients to reduce activity levels.<sup>14</sup> In a review of psychological predictors of outcome, a consistent relationship was demonstrated between a patient's self-confidence, optimism and motivation to recover from injury, and the actual outcome of the surgery.<sup>12,19</sup> In order to optimize rehabilitation outcomes, it is also important to understand the psychological aspect of the patients after an injury and during the rehabilitation process.<sup>20</sup> One of the psychological factors is fear of reinjury or kinesiophobia and it may play a significant role in some patient's inability to successfully return to their previous level of sports participation.<sup>20</sup>

In the current study, higher kinesiophobia scores led to low activity scores (TAS). This might mean that participation to daily and sport activities is not fully related to the knee function but could be related to fear of re-injury, stress or psychological block. In return, those factors might create feelings of uncertainty and also fear of how far the injury will affect future function.<sup>21</sup> Additionally, these feelings can cause the individual's negative attitudes toward

the body and participating in daily activities and sports. Catastrophizing pain and fear of pain is a major cause of delayed re-recovery and discharge after musculoskeletal injury and surgery according to some articles.<sup>22,23,24</sup> George et al. also highlighted that a physiotherapist should identify people with a continued high kinesiophobia level and then address it. Many studies emphasize that psychological responses to the initial injury, to surgery, to recovery and rehabilitation might be an important additional determinant of reintegration into usual activities and returning to sport after the surgery.<sup>25</sup> In our study, the patients who had high kinesiophobia before operation had high fear of pain and high kinesiophobia postoperatively.

Kvist et al. reported that only 53% of their patients returned to their pre-injury level of activity at 3 to 4 years after ACL reconstruction. They used the Tampa Scale of Kinesiophobia (TSK) by aiming at quantifying fear of re-injury due to movement and physical activity to evaluate their patients. They found that the patients who did not return to pre-injury levels scored higher on TSK, which meant that they had greater fear of pain, or re-injury and this was correlated to low knee-related quality of life.<sup>12</sup> In the current study, the patient who had high rate of TSK had low rate of TAS. Despite this, they had high rate of LKS. Additionally, there was no correlation between TSK and LKS.

In current study, age was also an important factor in outcome and the age >40 had positive correlation with the TSK and inverse correlation with TAS and LKS. The younger patients have high score of TAS and LKS and low score of TSK. They were more likely to return their pre-injury sport activities. Teenagers and young adults are less likely to encounter many of the life-related events, such as childbirth, increased job demands, and marriage; therefore, a younger patient may have a greater potential for returning to sport than an older patient of equivalent knee health and overall fitness. Older patients may be less motivated by intrinsic factors such as athletic self-identity.<sup>26,27,28</sup> In

a prospective study by Brewer et al., high levels of athletic self-identity strongly predict-ed rehabilitation compliance in younger patients (mean age, 18 years) but had essentially no relation to compliance rates among older patients (mean age, 30 years).<sup>28</sup>

In a pilot study of Ana Tichonova et al, they claim that a high level of kinesiophobia was significantly correlated with experience of more difficulties in daily activities and poorer knee-related quality of life before and after rehabilitation.<sup>11</sup> Our study also showed that high rate of kinesiophobia effects the daily activities and sportive activities but was not correlated with knee function. The postoperative LKS with both high and low kinesiophobia rates was significantly high.

Gobbi et al. found that there were no significant differences when using various knee outcome scores between athletes who “returned” to their pre-injury sport level (65%) and those who did not return. This meant that for their cohort, knee outcome instruments like LKS was not able to predict return to sports post-ACL reconstruction. The authors suggested the use of Marx knee activity rating and evaluation of the athlete’s psychological profile as additional scales to determine which patients have a greater chance of returning to their pre-injury levels.<sup>29</sup> In our study, LKS was also high for both patients’ groups with both high and low TSK. The patients with high TSK score had lower TAS and vice versa. There was no correlation between TSK and LKS. Therefore, the knee outcome instrument may not be able to predict return to sport.

Psychological factors also effect patients’ return to preinjury activity. In another review of patients with minimum 5-year follow-up by Dave YH Lee et al. also indicated that fear of re-injury is an important psychological factor for these patients not returning to sports. They also suggested that the surgeon to counsel the ACL deficient patient, who has been considered for surgical reconstruction, about the likelihood of an eventual return to sports.<sup>14</sup>

In ACL-deficient patients without gross knee instability, it may be useful to identify those who are at increased risk for not returning to sport after surgical intervention. A psychological screening approach may eventually be feasible because several recent studies in the ACL rehabilitation literature indicate that psychological screening can be predictive of patient outcomes.<sup>12,14,30</sup> In particular, preoperative or early postoperative screening can be performed for factors such as level of self-motivation, depression, and even personality traits that are associated with future rehabilitation compliance rates, post-rehabilitation pain scores, higher levels of pain, and return to sport although baseline psychological factors do not appear to be predictive of short-term outcomes in the early rehabilitation phase. Determining the patients with high kinesiophobia is important, in order to optimize and improve rehabilitation outcomes and also, it is important to understand the psychological aspect of the patients after an injury during the rehabilitation process and after surgery.<sup>31</sup> We suggest that the patients determined with high kinesiophobia preoperatively should have a psychotherapy for kinesiophobia in addition to their physical therapy.

Westermann et al. reported that meniscal repair failure rate was 14% in their six-year follow-up study with concurrent meniscal repair and ACL reconstruction patients. They also reported that there was no difference in the suture number or type when assessing repair success and failure.<sup>32</sup>

In addition, Uzun E. et al reported that there was not any superiority of meniscal tear in outcome of patients with ACL reconstruction.<sup>33</sup> In our study, we also did not find any differences of ACLR patients with or without meniscal repair.

### CONCLUSION

Our study showed that good knee function is not the only indicator to return preinjury daily and sport activities but

kinesiophobia may also play a significant role even if the Lyshman knee score is higher. Therefore, The patients with ACL injury should be informed about the kinesiophobia. We advise that a kinesiophobia test could be added to the patients' assessment who had ACL injury. The patients who have high rate of kinesiophobia preoperatively, may benefit from psychotherapy postoperatively in addition to their physical therapy.

### Limitations

This study had limitations, such as some patients did not only have ACLR, but also had additional meniscal repair. The small sample size might also be a limit for generalisation of the findings.

### Conflict of interest

The authors reported no conflict of interest for this study.

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