

## ORIGINAL ARTICLE

# Comparison of mobility and quality of life levels in sedentary amputees and amputee soccer players

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**Purpose:** We aimed to compare the mobility and quality of life in male sedentary amputees and amputee soccer players.

**Methods:** A total of 25 amputees who had a unilateral transtibial amputation, 12 soccer players and 13 sedentary individuals, were involved in this study. The Locomotor Capability Index-Turkish Version and the Trinity Amputation and Prosthesis Experience Scales (TAPES) were used to assess mobility and quality of life level, respectively.

**Results:** The groups had no significant difference in mobility level ( $p>0.05$ ). In accordance with the results on the quality of life, the soccer group had significantly better values than the sedentary group in two parameters of the TAPES measurement: the general psychosocial adjustment and the athletic activity restriction ( $p<0.05$ ). Except psychosocial adjustment and athletic activity restriction subheadings, no significant different was observed in others of the TAPES between two groups.

**Conclusion:** As a result, playing soccer was found to be effective for increasing the quality of life level of the amputee population, while its effects on mobility level were not clear.

**Keywords:** Amputees, Quality of life, Soccer.

## Sedanter ve futbolcu amputelerin mobilite ve yaşam kalitesi seviyelerinin karşılaştırılması

**Amaç:** Sedanter ve futbolcu amputelerin mobilite ve yaşam kalitelerini karşılaştırmayı amaçladık.

**Yöntem:** Unilateral transtibial amputasyonu olan 25 ampute, 12 futbolcu ve 13 sedanter, çalışmaya dahil edildi. Lokomotor Kapasite İndeksi-Türkçe Versiyonu ve Trinity Amputasyon ve Protez Deneyim Ölçeği (*Amputation and Prosthesis Experience Scales* (TAPES)) sırasıyla mobilite ve yaşam kalitesi düzeyini ölçmek için kullanıldı.

**Bulgular:** Grupların mobilite düzeylerinde anlamlı bir fark yoktu ( $p>0,05$ ). Yaşam kalitesi ile ilgili sonuçlara göre futbolcu grubun TAPES ölçeğindeki iki parametrede: genel psikososyal uyum ve atletik aktivite kısıtlamasında daha iyi sonuçları vardır ( $p<0,05$ ). Psikososyal uyum ve atletik aktivite kısıtlaması başlıkları haricinde TAPES başlıklarının diğerlerinde iki grup arasında anlamlı fark görülmedi.

**Sonuç:** Sonuç olarak, futbol oynamak ampute popülasyonunun yaşam kalitesini artırmak için etkili bulunurken, mobilite düzeyindeki etkileri açık değildir.

**Anahtar kelimeler:** Amputeler, Yaşam kalitesi, Futbol.

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Many authors have aimed to improve and regain the mobility of people with lower-limb amputations.<sup>1-3</sup> Because a lower-limb amputation causes permanent disability, a decrease in mobility and changes in body image, amputees often have problems with self-confidence and social participation,<sup>3-6</sup> these deteriorate their quality of life.<sup>6</sup>

Regular physical exercise has multiple benefits.<sup>4</sup> It increases the strength of weak muscles and improves emotions, such as self-respect, and self-efficacy; therefore, it facilitates the solving of problems regarding mobility and quality of life.<sup>7,8</sup> Today, exercising regularly or participating in any sport activity is specifically recommended for the people who have physical and psychological challenges, to facilitate their rehabilitation results and maintain their independence level.<sup>4</sup> In recent years, amputees have been shown to make progress by participating in sports.<sup>8-10</sup> The popularity of soccer among amputees has grown, and most amputees in Turkey prefer to participate in amputee soccer compared to the other the various branches of sports. However, no study has adequately determined whether or not this sport is effective for solving mobility problems and increasing the quality of life of amputees.

Moreover, several papers have stated the necessity for further research regarding the effects of regular physical activity among amputees.<sup>3,9</sup> Therefore, this study aimed to investigate the effects of playing soccer on the mobility and quality of life among the amputee population. In order to do so, amputee soccer players and sedentary amputees who do not regularly participate in any sport/physical activity were compared according to the levels of mobility and quality of life.<sup>10</sup> Our hypothesis was that amputees who played soccer had higher levels of mobility and a greater quality of life than the sedentary amputees.

## METHODS

### Subjects

A total of 25 male amputees, 12 amputee soccer players and 13 sedentary amputees, were involved in the study. Demographic information, including age, level of education, occupation, existence of any systemic disease,

and the use of a walking aid, was obtained. Additionally, the features of the amputation of each individual were asked. The study was conducted in the Physiotherapy and Rehabilitation Department, Health Sciences Faculty of Hacettepe University.

Soccer players with a unilateral transtibial amputation, whose ages ranged from 18 to 45 years, were included in the study group. Sedentary peer amputees were included as the control group. The Hacettepe Amputee Football Team was involved in the study group, whereas the sedentary amputees were patients at the Prosthetics Unit of the University. Only males were included, as there was no female team. The amputees who were admitted to the study all had a unilateral transtibial amputation and had adequate cognitive levels to answer the questions found in the tests that were included in the study. Additionally, the inclusion criteria for the soccer group included amputees who continuously played soccer for at least a year, and amputees who did not participate regularly in any sport for at least 6 months were included in the sedentary group. Amputees who had severe visual and cognitive defects, had surgery on their lower limbs causing functional sequels, or had diseases causing neurological dysfunctions, such as hemiplegia or multiple sclerosis, were excluded from the study. Before participating in the study, all of the participants were informed about the purpose of the study and signed informed consent forms approved by the Hacettepe University Ethical Committee (GO 13/233).

### Assessments

Prosthetic mobility can be assessed in three ways: performance tests, functional tests and self-reported tests.<sup>11</sup> People are asked to do several tasks in both performance and functional tests, whereas self-reported tests require responding to the questions about mobility. The Locomotor Capabilities Index (LCI) is a self-reported test that was used to determine the mobility level of the participants.

It is one of the most commonly used tests in the literature to measure the locomotor abilities and independence level of amputees. It provides a practical and self-reported measure, as it takes approximately 6 minutes to complete and consists of 10 items.<sup>11-13</sup>

The responses to the LCI range from “unable” (0 points) to “able to do myself” (3 points), and a total score is derived by summing the items. Therefore, higher scores show higher levels of perceived mobility. Its reliability and validity have been proven in the literature.<sup>13,14</sup>

The Trinity Amputation and Prosthesis Experience Scales (TAPES) is used to measure the quality of life of amputees. It includes self-answered questions related to the prosthetic body region of the amputee.<sup>15</sup> Various features of the prosthetic use are assessed using TAPES. Psychosocial adjustment (maximum possible score for each scale: 25, 25 and 20), activity restriction (maximum possible score for each scale: 20, 5, and 25), and satisfaction with the prosthesis are three sections of the TAPES.<sup>15,16</sup> Psychosocial adjustment includes the subheadings general, social, and limited psychosocial adjustment, and a higher score shows a greater adjustment. Activity restriction is divided into the subheadings athletic, functional, and social restrictions. A higher score represents a greater restriction.<sup>15,16</sup> Lastly, satisfaction with the prosthesis is assessed using three aspects: aesthetics, weight, and function of the prosthesis, and a higher score shows a greater satisfaction. Additionally, stump pain, phantom pain, and experiences related to other medical issues are investigated to reveal the quality of life using the TAPES.<sup>15</sup> The reliability and validity of its Turkish version have been demonstrated.<sup>16</sup>

#### Statistical analysis

The analysis was conducted using the statistical package SPSS software, version 17.0 (SPSS Inc., Chicago IL, USA). A difference at the  $p < 0.05$  level was considered to be statistically significant. For the power analysis, a pilot study was conducted with a total of 8 amputees to obtain estimates of the variances and group differences to determine the effect size. The data obtained in the pilot study were used for a power analysis, which showed that a sample size of at least 11 participants in each group would provide 80% power ( $\alpha = 0.05$ ,  $\beta = 0.20$ ) with a 95% confidence interval. The mean  $\pm$  standard deviation (Mean $\pm$ SD) was used to analyze the collected data from the tests. The percentage (%) was calculated to indicate the categorical variables. Kolmogorov-

Smirnov was used to test the data distribution and non-normally distributed data were obtained. The Mann-Whitney U test was used to reveal the differences between the groups. Chi-square tests were also used to compare the amputation sides and the reasons for amputation in the groups.

## RESULTS

The soccer players and sedentary amputees were 26.67 ( $\pm 7.76$ ) years of age and 33.92 ( $\pm 7.23$ ) years of age, respectively. A statistically significant difference was found between the ages of the two groups ( $p = 0.036$ ). None of the individuals had a systemic disease or used walking aids. Table 1 presents the demographic information for the groups. Table 2 shows information regarding the features of the amputation and prosthetic use for the groups. All of the participants used patellar tendon bearing prostheses manufactured in the Prosthetics Unit of the University.

Table 1. Education and occupation of the amputees.

	Soccer (N=12) n (%)	Sedentary (N=13) n (%)
<b>Level of education</b>		
Elementary	1 (8.3)	4 (30.8)
Secondary	3 (25.0)	2 (15.4)
High-School	7 (58.3)	6 (46.2)
University	1 (8.3)	1 (7.7)
<b>Occupation</b>		
Student	5 (41.7)	1 (7.7)
Unemployed	5 (41.7)	2 (15.4)
Private Sector	2 (16.6)	3 (23.1)
Civil Servant	0 (0.0)	6 (46.2)
Military Personnel	0 (0.0)	1 (7.7)

According to the LCI results, all of the individuals in the soccer group had higher scores ( $30 \pm 0$ ), whereas the sedentary group had an average score of  $28.8 \pm 0.8$ ; no significant difference was found ( $p = 0.166$ ).

The findings of the TAPES can be seen in Table 3. No significant difference between the groups was found in regards to their social psychosocial adjustment, limited psychosocial adjustment, functional activity limitations, social activity limitations, aesthetic satisfaction, weight satisfaction or functional satisfaction.

Two sub-items, general psychosocial adjustment and athletic activity limitations, were significantly different between the two groups ( $p=0.009$  and  $p=0.002$ , respectively). The soccer amputee players had higher psychosocial adjustment than the sedentary group, whereas the soccer group was limited less than the other.

In addition, within the TAPES measure, both groups stated that they did not suffer from any pain that could affect their daily activities.

## DISCUSSION

Amputees participate in sports to improve their physical condition and overall well-being.<sup>8</sup> According to the findings of this study, no difference was observed between the mobility levels of amputees who participated in soccer and who were sedentary, whereas amputee soccer players had higher levels of several subheadings of quality of life than sedentary amputees.

The inclusion criteria aimed to make the two groups as similar as possible, in order to reach the identified goals of the study, so when the groups were compared in terms of their demographic information and the features of their amputation, they were mostly similar. Among the features of the amputation, having similar stump lengths that were longer than 15 cm was essential, as Arwert et al. reported that a stump length shorter than 15 cm negatively affects the mobility of individuals with transtibial amputations.<sup>17</sup> Therefore, any difference in the stump lengths of the groups could have prevented revealing the actual effects of playing soccer on mobility.

Because both groups had a high level of mobility according to the LCI and no significant difference was found between the groups, it may not be possible to conclude that playing soccer does not increase mobility level in the amputee population.

Rau et al. conducted a controlled study to investigate the effects of a 3-day rehabilitation program on the functional performance of amputees.<sup>18</sup>

A total of 58 men with a unilateral lower limb amputation were involved in the study, and 43 of the participants (74%) had a transtibial amputation. A 2-minute walk test, a Timed up and Go test, a weight transfer to the extremities test and the LCI test were assessed to determine the effects of this program. With the exception of the LCI test, all of the other measured outcomes improved following the program. Similar to our findings, all of the amputees scored high points in the LCI. This may indicate that the LCI test may not be an appropriate method for showing changes in mobility among individuals with transtibial amputations.

Moreover, Johnson et al. compared the mobility levels of young people both before and after a transtibial amputation and investigated the effects of age and chronic diseases on their mobility.<sup>19</sup> They scored the mobility level of their cases according to a six-level scale. Therefore, young amputees with no medical problems were deemed as having no significant change in mobility following amputation.<sup>19</sup> The cases of the study by Johnson et al were similar to the cases in this study in regards to age and amputation level.<sup>19</sup> Consequently, it may be possible to state that young people with transtibial amputations have no decrease in mobility, or their mobility may only undergo small changes; therefore, more sensitive measures, such as laboratory measurements, should be used in the future.<sup>2</sup> On the converse, Yazicioglu et al compared the mobility levels of young soccer players with non-soccer individuals who had transtibial amputations and reported that the soccer group had significantly higher LCI points than the non-soccer group.<sup>6</sup> Therefore, further research is required to fully understand and reveal the effects of playing soccer on mobility. It is also essential to involve amputee groups of various ages, in addition to other amputation levels, such as at the transfemoral level.

Lower limb amputations cause functional, psychological, and social limitations, and therefore, individuals with lower limb amputations have a lower quality of life compared to the general population.<sup>20-23</sup> The

Table 2. Prosthetic use and amputation features.

	Soccer Mean±SD	Sedentary Mean±SD	p
Duration of prosthetics use (year)	12.2±7.2	13.3±7.4	0.624
Stump length (from the tip of the bone) (cm)	17.0±2.8	17.3±3.8	0.978
Stump length (from soft tissue) (cm)	17.7±2.8	18.6±3.6	0.585
	n (%)	n (%)	
Amputation side			
Right	4 (33)	7 (54)	0.529
Left	8 (67)	6 (46)	
Amputation reason			
Traumatic	8 (67)	9 (69.2)	0.261
Vascular	0 (0)	2 (15.4)	
Congenital	4 (33)	2 (15.4)	

Table 3. Comparison of the Trinity Amputation and Prosthesis Experience Scales (TAPES).

	Soccer Mean±SD	Sedentary Mean±SD	p
General psychosocial adjustment	23.1±4.1	20.4±2.6	0.009*
Social psychosocial adjustment	21.3±3.4	19.6±3.6	0.229
Limited psychosocial adjustment	15.4±5.6	16.0±2.9	0.353
Athletic activity limitation	1.±1.0	4.2±2.1	0.002*
Functional activity limitation	0.5±1.8	1.2±1.8	0.195
Social activity limitation	0.5±1.24	0.9±1.2	0.119
Aesthetic satisfaction(prosthesis)	14.4±5.7	14.9±2.3	0.374
Weight satisfaction (prosthesis)	4.7±3.3	3.6±1.0	0.352
Functional satisfaction (prosthesis)	19.0±6.2	20.0±2.6	0.637

\* p<0.05.

assessment of quality of life is a commonly used method to determine the success of amputee rehabilitation.<sup>23</sup> Among the various quality-of-life tests, TAPES has been improved to measure the quality of life of individuals who have undergone an amputation and use prosthetics.<sup>22</sup>

According to the findings acquired via the TAPES assessment, both groups approached to the upper ends of the psychosocial adjustment scores and the prosthetic satisfaction scores. The soccer group showed a higher general psychosocial adjustment level than the

sedentary group. Moreover, both groups had minimal activity limitations, with the exception of athletic restrictions. The sedentary amputees perceived themselves as having a higher athletic restriction, and there was a statistically significant difference between the groups. With the exception of these two parameters (psychosocial adaptation and athletic limitation), there was no significant difference between the groups based on the results of the TAPES. No difference was found in the subheadings related to social and functional limitations. These were not expected

results as sport may increase functions and social participation.<sup>24</sup> Further randomized control trials with larger sample sizes may present more accurate results. Satisfaction scores related to prosthesis were also similar between the groups as all participants had similar types of prosthesis.

Nevertheless, it is possible to conclude that playing soccer improves the quality of life in amputees. The results related to the athletic restrictions were expected because participating in soccer gives amputees a chance to perceive their abilities and success in physical activities. Therefore, the amputees who did not participate in any sport were unaware of their physical performance. Furthermore, Yazicioglu et al used the SF-36 questionnaire to compare the levels of the quality of life of amputee soccer players and non-soccer playing amputees.<sup>6</sup> Similarly, they revealed that playing soccer is effective for increasing the quality of life of amputees.

Deans et al performed a study that included 25 amputees.<sup>3</sup> They used the activity restriction section of the TAPES assessment to specify the physical activity limitations of the amputees, and the World Health Organization Quality-of-Life Scale was used to measure their quality of life. In contrast to this study, Deans et al.<sup>3</sup> found weak correlations between the activity restriction subscales and the quality-of-life domains. However, their study had a small sample size and a non-homogeneous sample group, as people of various ages and with different amputation levels were included; therefore, these limitations may make comparisons inappropriate.

### Limitations

Although the power analysis indicated that the sample size was adequate, a larger sample size could have provided more robust results. The age difference between the groups is another limitation of this paper. Nevertheless, all of the cases involved in the study conformed to the inclusion criteria, and they were all under 45 years of age. Additionally, an age difference would affect the level of mobility of the groups, as an older, sedentary group would have a lower level of mobility, but both groups had a high level of mobility.

Moreover, in the study by Yazicioglu et al,<sup>6</sup> there was no statistically significant difference between the ages of the soccer and non-soccer

groups, and despite the age homogeneity, the soccer group had a higher level of mobility than the non-soccer group. This may show that the age difference may not be an influential factor on the results of this study. In addition to these limitations, female amputees should also be involved in future studies.

Although amputees have made progress in participating in sports in recent years, they still participate less than the healthy population.<sup>4,8</sup> More research is required to motivate amputees to engage in sports and to make them more independent. This study showed that being an amputee soccer player has advantages on quality of life compared to sedentary amputees. As a result, our hypothesis was only accepted for the effects of playing soccer on the quality of life of amputees.

### Conclusion

There are no adequate studies revealing how participating in any sport affects the level of mobility and the quality of life of individuals with amputations. Consequently, in this paper, no effect was found in regards to the mobility level of individuals with transtibial amputations, while the quality of life was increased by playing soccer.

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