



Future Campus Recreation: The Use of Virtual Reality in Overcoming Constraints

Okan ÜNVER¹ , Tuğçe ÖRSOĞLU² , Bilgetekin Burak GÜNAR³ , Onur AKGÜN⁴ ,
Abdulmenaf KORKUTATA⁵ 

Abstract

Aim: This study aims to identify university students' perceived barriers to campus recreation activities and explore how virtual reality (VR) applications can facilitate overcoming these obstacles.

Method: A mixed-method approach was used. First, the Leisure Constraints Scale was administered to 154 students. Then, 12 students with the highest perceived barriers participated in a VR session. They engaged in games or 360° videos, preferably. After the session, a focus group discussion was conducted. Structured interview questions were derived deductively from the sub-dimensions of the Leisure Constraints Scale, and the data were analyzed thematically.

Results: In the quantitative part of the study, a significant difference was found based on the grade variable ($p < 0.05$). In the qualitative part, 50 codes were identified under three themes: intrapersonal, interpersonal, and structural constraints/negotiations. Participants viewed VR as an alternative to activities inaccessible in real life. While most evaluated this positively, one participant highlighted the potential for dissatisfaction due to its inability to replicate real-life experiences. VR was highlighted as a preferable option over field-based activities due to its ability to address financial, facility, and time constraints, and its perceived advantage in time management.

Conclusion: The revealed key insights: (i)VR can serve as an alternative to inaccessible activities in daily life, (ii)campus recreation activities are limited and poorly advertised; VR provides broader access, (iii)the diversity and cost-free nature of VR is attractive, and (iv)VR may lack the interpersonal interactions inherent in face-to-face activities.

Key words: *Campus Recreation, Constraints Negotiation, Leisure Constraints, Virtual Reality.*

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INTRODUCTION

Recreational activities are considered a type of living space that provides individuals with many benefits in physical, psychological, and social areas. On university campuses, where students spend a significant part of their time, recreational activities offer opportunities for social interaction, focusing on goals, managing time effectively, and approaching problems with a solution-oriented mindset, supporting informal learning. In addition, these activities contribute to formal learning environments by enhancing academic success, as reflected in the increase in grade point averages (Forrester, 2014; Hoffman, 2016). Campus recreation, which positively impacts the lives of university students (Lindsey & Sessoms, 2006), includes various events such as spring festivals, student club activities, concerts, sports events, physical exercises, and artistic activities organized on campuses (Mercanoğlu et al., 2015). Campus recreation appears as a collection of activities that go beyond individual benefits. It is stated that participation in campus recreation activities can promote social harmony among students, create different environments, and strengthen a sense of belonging to the institution (Astin, 1998; Forrester, 2014). Through sports and physical activity, students' quality of life can improve, and benefits for sustainable public health can also be achieved (Warburton et al., 2006)

Students may face various constraints to accessing campus recreation activities and benefiting from their individual and social advantages. The restrictions students encounter during their free time on campus when participating in campus recreation activities are defined as constraints (Crawford & Godbey, 1987). These constraints are explained through the hierarchical leisure constraints theory as individual, interpersonal, and structural barriers. According to this theory, individuals first face individual constraints (such as lack of time, psychological factors, or lack of interest) when trying to participate in leisure activities. Those who overcome these constraints may then encounter interpersonal constraints

¹ Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Recreation, Turkey, okan.unver@comu.edu.tr

² Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Physical Education and Sports, Turkey, tugcekarasahinoglu@comu.edu.tr

³ **Corresponding Author:** Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Physical Education and Sports, Turkey, burakgunar@comu.edu.tr

⁴ Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Sports Management, Turkey, onur.akgun@comu.edu.tr

⁵ Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Recreation, Turkey, akorkutata@comu.edu.tr



(such as not having friends or friends not participating in the activity). Finally, individuals who overcome or do not experience these two constraints may face structural constraints (such as lack of facilities or equipment, transportation issues, or lack of information) before participation (Crawford et al., 1991). Identifying the constraints that may prevent participation in campus recreation, which offers benefits for students, their social environment, and institutions, and determining strategies to overcome these constraints are important. Recently, studies have focused not only on identifying leisure constraints but also on finding negotiations to address these constraints (Emir et al., 2022; Kono & Ito, 2023; Son et al., 2024; Yaşartürk et al., 2022).

Virtual reality offers individuals participating in leisure activities the opportunity to overcome physical boundaries and constraints independently of location. Virtual reality technology provides opportunities for physical activity, sports, cultural events, and travel in a virtual environment, enabling different leisure experiences (Ekinci & Özer, 2019). It aims to eliminate many accessibility constraints through the nature of the virtual environment. While studies have focused on the use of virtual reality in leisure activities (Günçan, 2021b; Siani & Marley, 2021), research on the use of such technological applications to remove constraints in campus recreation activities remains limited. Current studies mainly address the use of virtual reality for entertainment and personal leisure activities. However, the inclusion of virtual reality in campus recreation activities and its potential to eliminate existing constraints through this technology has not yet been explored. To fill this gap in the literature, the aim of this study is to identify the constraints perceived by university students in participating in campus recreation activities and to examine the use of virtual reality applications facilitate overcoming these constraints.

METHOD

Research model

The research was designed using a mixed-method approach, where both qualitative and quantitative methods were applied together. While quantitative studies provide generalizable data through large samples, qualitative data emphasize exploration, understanding, introspection, and theory development. Additionally, qualitative research offers a broad foundation for quantitative studies (Böke, 2009). In the study, the survey model, one of the quantitative research techniques, was used to identify students with the highest levels of perceived leisure constraints. To examine the experiences of these students with virtual reality applications and the effects on their perceived constraints in detail, phenomenological research, one of the qualitative research techniques, was used. Phenomenology, defined as describing the meaning of lived experiences of a few individuals regarding a phenomenon or concept (Creswell, 2013), allows for an in-depth examination of the participants' virtual reality experiences.

Population and sample

The research group consists of a total of 154 students studying in the 1st and 2nd grades of the Faculty of Sports Sciences. According to Morgan (1997), the interview group should include 6 to 12 people. Accordingly, 12 students with the highest perception of constraints among the participants took part in the virtual reality application and then in the focus group interview. The demographic information of the participants is presented in Table 2.

Data collection tools

The *Leisure Constraints Scale (LCS)*: developed by Alexandris & Carroll (1997), adapted into Turkish by Karaküçük & Gürbüz (2006), and shortened by Gürbüz et al., (2020), was used. The scale consists of 18 items and 6 sub-dimensions. The sub-dimensions are: (a) Individual Psychology (3 items), (b) Social Environment and Lack of Information (3 items), (c) Facilities/Services and Transportation (3 items), (d) Lack of Friends (3 items), (e) Time (3 items), and (f) Lack of Interest (3 items). In their study, Alexandris & Carroll (1997) obtained reliability coefficients ranging from 0.64 (Time) to 0.85 (Lack of Friends) for the sub-dimensions, while Karaküçük & Gürbüz (2006) reported reliability coefficients ranging from 0.67 (Time) to 0.82 (Lack of Information) (Gürbüz et al., 2020).

Based on the total scale scores, 12 students with the highest perception of constraints participated in a single-session virtual reality application. In the application, participants either played a game or watched a 360° video according to their preferences. After the application, a 52-minute focus group interview

was conducted with the participants. The structured interview questions were categorized into themes using a deductive approach, based on the classification of leisure constraints defined by Crawford et al. (1991). Figure 1 presents the hierarchical model of leisure constraints (Crawford et al., 1991). In the sub-categories of the themes, the sub-dimensions of the Leisure Constraints Scale were used.

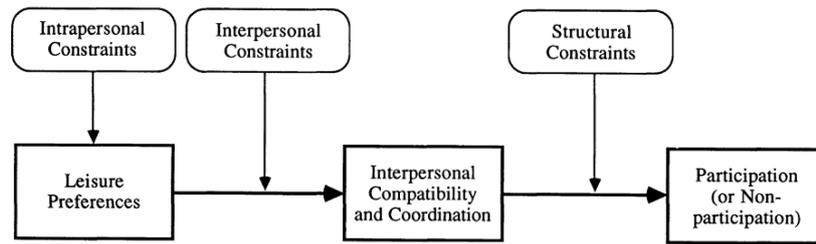


Figure 1. Hierarchical model of leisure constraints.

Data analysis

The total scale scores were calculated using the Jamovi statistical software program to identify the sample for inclusion in the qualitative research. The research data showed a normal distribution. To reveal differences based on participants’ gender, department, and class variables, a t-test and one-way ANOVA test were applied. The scale’s internal consistency coefficient was calculated as 0.83. The data transcribed after the focus group interview were analyzed using the thematic analysis method with the MAXQDA software program. Thematic analysis, defined by Braun & Clarke (2006) as “a method for identifying, analyzing, and reporting patterns (themes) within data,” is considered both a fundamental and flexible qualitative method due to its theoretical freedom (Boyatzis, 1998). The stages of thematic analysis (Braun et al., 2019) are presented in Table 1.

Table 1. Stages of Thematic Analysis

Stage	Description of the Process
Familiarizing	Transcribing the data (if needed), reading the data, and noting initial ideas.
Generating Initial Codes	Systematically coding interesting features of the data across the entire dataset and gathering data for each code.
Creating Themes	Grouping codes under potential themes and organizing all data into possible relevant themes.
Reviewing Themes	Checking if themes relate to the coded extracts (Level 1) and the entire dataset (Level 2), creating a thematic “map” of the analysis.
Defining and Naming Themes	Refining the analysis to identify the features of each theme and summarizing the overall story of the dataset, clearly defining and naming each theme.
Reporting	The final opportunity for analysis. Selecting vivid, compelling examples, performing the final analysis of the data, connecting findings to research questions and literature, and creating a scientific report of the analysis.

Validity and Reliability

A validated and reliable scale was utilized for the quantitative data in the study. The triangulation analyst strategy was employed to enhance the internal validity or credibility of the qualitative data. This approach entails having two or three individuals independently in the data analysis process, which involves analyzing the same qualitative data independently and comparing the analysis (Patton, 2002). Detailed descriptions and purposeful sampling techniques were used to ensure external validity or transferability. In the findings section, themes and codes were presented in detail without adding any interpretation. Direct quotations were used as evidence to show how the themes and codes were formed during the analysis. The audit trail strategy was used to enhance reliability. This strategy involves explaining in detail the research design, data collection, analysis, interpretation, theme or category creation, and reporting of the findings (Merriam, 2013; Patton, 2014).

RESULTS

Demographic Findings

This section includes findings regarding the demographic data of the participants.

Table 2. Demographic Information of Participants

Variables	Group	f	%
Department	Sport Management	58	37.7
	Coaching Education	48	31.2
	Physical Education	21	13.6
	Recreation	27	17.5
Grade	1	104	67.5
	2	50	32.5
Gender	Female	76	49.4
	Male	78	50.6
Total		154	100

Table 2 shows the demographic data of the participants. It was found that 37.7% of the participants study sports management, 31.2% study coaching education, 13.6% study physical education, and 17.5% study recreation. According to the grade variable, 67.5% of the participants are 1st-year students, while 32.5% are 2nd-year students. Regarding gender, 49.4% of the participants are female, and 50.6% are male students.

Quantitative Findings

This section includes the distribution of participants' total scale scores according to variables and the results of statistical analysis.

Table 3. Comparison of scale scores according to gender variability

Scale	Gender	f	\bar{X}	S.D.	t	p
LCS	Female	76	3,03	0,363	-0,337	0,737
	Male	78	3,05	0,369		

* $p > 0,05$ LCS: Leisure Constraints Scale

The results of the t-test conducted to determine the differences in leisure constraints based on gender are presented in Table 3. It was found that there is no significant difference between genders.

Table 4. Comparison of scale scores according to grade level variable

Scale	Grade	f	\bar{X}	S.D.	t	p	d
LCS	1	104	3,00	0,361	-0,124	0,048*	-0,343
	2	50	3,12	0,363			

* $p < 0,05$ LCS: Leisure Constraints Scale; d: Effect size

Table 4 presents the analysis of leisure constraints based on grade level. It was observed that 1st-year students have a statistically lower perception of constraints compared to 2nd-year students ($p < 0.05$).

Table 5. Comparison of scale scores according to department variable

Scale	Department	f	\bar{X}	S.D.	t	p
LCS	Sport Management	58	2,98	0,369	1,91	0,138
	Coaching Education	48	3,12	0,320		
	Physical Education	21	2,96	0,432		
	Recreation	27	3,10	0,357		

* $p > 0,05$ LCS: Leisure Constraints Scale

The results of the ANOVA test conducted to examine the differences in leisure constraints based on the academic department are presented in Table 5. It was determined that no significant differences were observed.

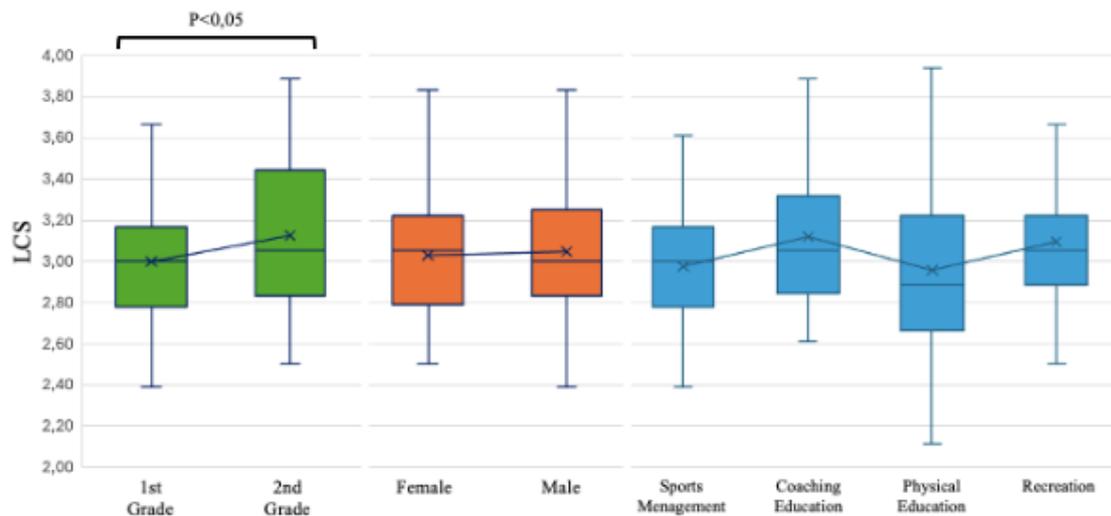


Figure 2. Comparison of LCS scores according to different variables

The analysis results of the Leisure Constraints Scale based on grade, gender, and department variables are shown in figure 2.

Table 6. Scale LCS scores of the participants included in the focus group interview

Groups	f	%	Min	Max	\bar{X}	S.D.
Qualitative Research Group	12	7,78	3,61	4	3,76	0,14
Total	154	100	1,88	4	3,04	0,365

The data comparing the total scale scores of the 12 participants included in the focus group interview with all participants are shown in Table 6. Accordingly, the average score of the Leisure Constraints Scale responses for the 12 participants in the qualitative study group was 3.76, representing 7.78% of the total sample.

Qualitative Findings

The codes identified after thematic analysis are presented in tables under their respective themes. Each dimension in the leisure constraints classification represents a theme, which has been reported under a separate heading.

Theme 1. Intrapersonal Constraints

Intrapersonal constraints include individual psychological states and characteristics that interact with preferences. These constraints involve stress, depression, anxiety, religiosity, attitudes of reference groups within and outside the family, prior socialization toward certain leisure activities, perceived personal skills, and subjective evaluations regarding the suitability and accessibility of various leisure activities (Crawford & Godbey, 1987).

Table 7. Codes for Intrapersonal Constraints

Code	Category
Strange (1), positive (6), desire (1), fun (4), stressful (2), exciting (3), beautiful (2), dizziness (3), uncomfortable onset (3), unreality (1), euphoric (1), mixed emotions (1), preference for reality (1), enjoyable (1), close to reality (1), detachment from reality (2), low risk of injury (2), lack of effect (1), safe (1), alternative (4), adverse effect (1), rehabilitation (1), relaxation (1)	Individual psychology
Limited announcement (4), limited information (3), limited activity (4), unattractive activities (1), limited support needs (5), without support (1)	Lack of knowledge
Variety (2), new experiences (1), discovery (1), open access (1), unrealistic (1), limitless (2)	Lack of interest

In the Leisure Constraints Scale, the "intrapersonal constraints" theme consists of three subdimensions: individual psychology, lack of information, and lack of interest (Gürbüz et al., 2020). These subdimensions form the categories of the intrapersonal constraints theme. The codes derived from the responses to these categories are presented in Table 7.

All participants stated that they did not feel any physical fatigue during the virtual reality (VR) activity. This situation may be related to the duration of the activity and its level of physical intensity.

- P2: After taking off the headset, I didn't want to remove it. I wanted to stay in that moment. There was no feeling of fatigue...
- P3: ... I didn't feel physically tired because I was very focused, and it entertained me, so it was positive...

Some participants viewed virtual reality as an alternative to activities that cannot be done in real/daily life. While most of them evaluated this alternative positively, only one participant mentioned that this experience might make people unhappy because it cannot be replicated in real life.

- P3: For example, this is a bit impossible for individuals with disabilities to do in real life. But when they can perform these activities with VR headsets, they might feel very happy. This could be an advantage, but it could also be a disadvantage because they might think, 'I want to do this in real life,' and that might upset them...
- P4: The fatigue level in VR is lower, and the opportunities it offers are more, so within a certain time, we can do activities in VR that we want to do in real life. It is better in terms of time and fatigue.

Participants stated that the risk of injury in virtual reality applications is much lower than in field/real-life activities. Additionally, one participant mentioned that VR could be used for rehabilitation purposes for athletes after injuries.

- P2: ... The risk of injury is definitely higher outside. I don't think there is any risk of injury in VR. There is none, zero.
- P4: ... In VR, the danger is less, and the risk of injury is lower. It's higher in real-life settings. In terms of movement, in VR, the frequency of movement is lower. We can perform movements in a limited space, but that's not the case in real life. The frequency and intensity of movement are higher. For example, I have a fear of heights. I can't go to high places, but in VR, I can do it because I know I won't really fall. This gives me confidence.

All participants noted that the events organized on campus were limited and that the announcement and information processes for these events were insufficient. Most participants found VR applications positive because of their unlimited variety and openness to new experiences, while only one participant expressed that these applications could not create the same real feelings and impact.

- P1: ... There aren't many activities. As sports sciences students, we actually need to do more diverse activities.
- P3: ... They announce campus recreation activities on Instagram. For example, we went to the cinema the other day. It was at the Faculty of Science. But they complain that no one shows up. It doesn't attract students' attention. It's not appealing.
- P11: I don't see it on social media accounts, even if it's there. I follow the university's page, but I don't see it. Maybe it's there, but it doesn't show up for me.

Theme 2: Interpersonal Constraints

Table 8. Codes for Interpersonal Constraints

Code	Category
Pleasure to be together (1), preference for solitude (1), boring (1), not needing friends (3)	Lack of friends

Interpersonal constraints result from interactions or relationships between individuals. These constraints can be the outcome of intrapersonal constraints accompanying marital relationships. Such constraints may influence shared preferences for leisure activities or arise as a result of interactions between spouses. These types of constraints can interact with preferences for leisure activities and subsequent participation. Additionally, the concept of interpersonal constraints can generally apply to interpersonal relationships. If an individual cannot find a suitable partner for a specific activity, they may experience an interpersonal leisure constraint (Crawford & Godbey, 1987). In the Leisure Constraints Scale, there is a sub-dimension under the theme of 'interpersonal constraints': lack of friends (Gürbüz et al., 2020).

This sub-dimension constitutes the only category of the interpersonal constraints theme. The codes generated from responses to this category are presented in Table 8.

Some participants responded to the question, "Do you need a friend to participate in field activities?" by stating that they prefer joining with friends because it is more enjoyable. Others, however, considered not needing a friend in virtual reality as an advantage.

- P1: *Yes, because I enjoy it. I can also join an activity alone, but participating with a friend makes the activity feel more enjoyable.*
- P3: *VR allows us to play without needing anyone else.*
- P7: *In virtual settings, we can play tennis against the computer.*

Theme 3: Structural Constraints

Table 9. Codes for Structural Constraints

Code	Category
Free access (2), space access (1), material access (1), time restriction (1), waiting time (4), crowd (5)	Facility
Time management (5)	Time

Structural constraints represent the factors that intervene between leisure preferences and participation. Examples of structural constraints include the stage of the family life cycle, family financial resources, season, climate, work schedule, availability of opportunities, or suitability of activities (Crawford & Godbey, 1987). In the Leisure Constraints Scale, there are two sub-dimensions under the theme of 'structural constraints': facilities and time (Gürbüz et al., 2020). These sub-dimensions form the categories of the structural constraints theme. The codes generated from responses to these categories are presented in Table 9.

Most participants stated that crowds in field activities negatively affect waiting time and stress levels, while only one participant expressed that the crowd also serves as a motivating factor by offering support.

- P1: *Crowds have both positive and negative aspects. The negative ones are the waiting time and getting bored while waiting in line. In VR, there is no such thing as getting bored. You just turn it on and play by yourself. However, playing with a friend would still be more enjoyable.*
- P2: *In real life, there are people in the crowd who support me, but not in VR. Waiting in a crowd is negative, yes, but a positive aspect is that having people who support me makes me perform better. It motivates me. Even if there are opposite reactions, it pushes me to do better.*
- P4: *Crowds make me stressed because I have anxiety. But in VR, since I'm alone, I can play more comfortably the way I want.*
- P11: *I'm not someone who can handle big crowds. In this sense, VR might be more beneficial.*

Participants stated that virtual reality applications are more preferable than field activities because they eliminate financial and facility limitations as well as time constraints.

- P2: *In VR, you can play whenever you want. You can't canoe in the dark at night, but in VR, you can go rafting at night.*
- P4: *VR becomes more economical over time. You only need one piece of equipment, but in real settings, more financial resources are necessary. For example, in VR, I use a paddle without paying for it, but in real life, a boat starts at 30,000 euros. So, VR is advantageous in this regard.*

Participants also mentioned that virtual reality applications are more preferable in terms of time management.

- P2: *In VR, I can play anything I want. But in real life, I also play because our gym is suitable. However, I can't play at any time I want in the gym because there are lessons.*
- P7: *For example, during an intense training period, we get bored. I'm a triathlete. I swim in the morning, bike at noon, and run in the evening. I might want to try other sports too. If I have VR*

at home, I can do activities like rowing or canoeing without spending time traveling to another place or going to the seaside. This positively affects my time management.

DISCUSSION

In this study focusing on the perceived intrapersonal, interpersonal, and structural constraints on university students' participation in campus recreation activities, the facilitating effect of VR technology has been demonstrated. The findings of the study were evaluated in two sections. In the first section, the results of the Leisure Constraints Scale (LCS) applied to the participants were analyzed. In the second section, the data obtained from structured focus group interviews with 12 participants who had the highest constraint perception scores based on the scale results were examined.

In the quantitative part of the study, the Leisure Constraints Scale (LCS) results of 154 participants were analyzed. It was found that the scale scores differed based on the participants' grades. Students in their second year had a higher perception of constraints compared to first-year students. This difference may be due to more years spent on campus, allowing them to gain more experience and awareness of the facilities or limitations on campus. However, the scale scores did not differ according to the participants' gender or the department they were studying in.

It is known that many factors affect individuals' participation in recreational activities. Gender is one of the significant factors influencing participation in recreational activities (Torkildsen, 1999). When the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the participants' gender, it was found that male participants had a higher perception of constraints compared to female participants. However, the difference was not statistically significant. Serdar (2021), in his study with fitness center participants, concluded that there was no significant difference between the subdimensions of the Leisure Constraints Scale and the gender variable. This result supports this research findings. However, some studies suggest that leisure constraints vary based on gender. For instance, Kaçay et al. (2023), in their study with university students, found a significant difference in the individual psychology subdimension of the Leisure Constraints Scale based on gender. Similarly, Karadeniz et al. (2019), in their study with students at Muğla Sıtkı Koçman University, identified significant differences in the individual psychology and lack of information subdimensions of the Leisure Constraints Scale based on gender. Another study by Deniz (2020) with sports science students revealed significant differences in the lack of information, facilities/services, and time subdimensions based on gender. Additionally, Solakumur et al. (2019), in their study with university students, found significant differences in the facilities/services, time, lack of interest subdimensions, and the total scale score based on gender.

When the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the class variable, a significant difference with a medium effect size was identified. Supporting this study's findings, Bosna et al. (2017) found significant differences in the time, lack of interest, and individual psychology subdimensions of university students' constraint perceptions based on the class variable. On the other hand, results different from this study findings are also present in the literature. For instance, in Güler's (2017) study, the subdimensions and total scores of the LCS were examined based on class levels. Although second-year students had higher average scores than other classes, the differences were not statistically significant. Similarly, Tolukan (2010), in a study conducted with students admitted to universities through special talent exams, reported no significant differences between the LCS subdimensions and the class variable. Additionally, Solakumur et al. (2019) found no significant differences between the LCS scores and the class variable in their study on university students' leisure constraints. As highlighted above, varying results regarding grades and leisure constraint perceptions exist in the literature. These differences may be attributed to factors such as the student structure in the campuses where the studies were conducted, the perception of social support, and the availability of recreational facilities.

According to findings of this work, when the total scores obtained from the Leisure Constraints Scale (LCS) were analyzed based on the department variable, the highest average score was observed in the Coaching Education department, while the lowest average score was in the Sports Management department. However, no significant difference was identified. In Deniz's (2020) study, which analyzed

the subdimensions of leisure constraints among students in the Faculty of Sport Sciences based on the department variable, no significant difference was found. These results align with this study's findings. Similarly, Çebi et al., (2018) examined the subdimensions of the LCS among students from the Faculty of Sport Sciences and other faculties and found no significant differences based on the department variable. However, as with other demographic variables, some studies report results that differently from findings of this study regarding the department variable. For example, Tolukan (2010), in a study with university students enrolled in talent-based programs, found significant differences in the individual psychology, lack of friends, and lack of interest subdimensions of the LCS based on the department variable. Karadeniz et al., (2019) examined students from different faculties and identified a significant difference in the facilities/services subdimension of the LCS based on the department variable. Similarly, Solakumur et al., (2019) found statistically significant differences in the time and facilities/services subdimensions and the total LCS score in favor of the Recreation department. Uzun & İmamoğlu (2020), in their study with female university students, reported significant differences in all LCS subdimensions and total scores based on the department variable. It has been determined that findings regarding department-specific differences vary. Although these studies primarily included students from the Faculty of Sport Sciences, the differing results may be attributed to factors such as course intensity, content, and student structures, as the studies were conducted at different universities.

Intrapersonal constraints, one of the barriers to participation in campus recreation, can be associated with students' lack of motivation to engage in recreational activities. The insufficient variety of recreational activities offered and their inability to spark students' interest and curiosity may be among the reasons for this lack of motivation. In this study, it was found that VR applications, with their variety and ability to create curiosity, could serve as a tool to encourage students to participate in recreational activities. Warburton et al., (2007), in their study examining the effects of interactive video games on physical activity and health, reported findings similar to those of this study. They highlighted that such games provide both individual and structural advantages to users. The study evaluated the low cost and entertaining nature of interactive video games as advantages, making physical activity easily accessible for individuals experiencing motivation problems in participating in recreational activities. Additionally, the fact that VR activities are less risky compared to real-world activities and offer a fun environment (Schwartz et al., 2011) can be considered a factor encouraging individuals to engage in VR activities during their leisure time. Evidence also suggests that the use of VR, particularly with virtual characters, has a motivating effect on individuals and makes understanding activities easier (Kojić et al., 2024). Based on this study and previous research findings, VR can be used as a facilitator in recreational activities to overcome intrapersonal constraints such as psychology, lack of knowledge, and lack of interest.

In recreational activities, the social environment of students is considered a factor that encourages individuals to participate. According to the findings of this study, the role of VR applications in removing interpersonal barriers can be explained by their ability to provide new opportunities for social interaction. Parsons & Cobb (2011) stated that VR helps reduce individuals' social anxiety, strengthens social bonds, and creates a more comfortable environment for social communication. Another study examined the leisure experiences of university students in virtual reality and suggested that VR applications could increase levels of social participation (Alanazi, 2023). Günçan (2021a), in a study on the applicability of virtual reality in recreation, emphasized that VR users gain social and psychological benefits. He also noted that VR supports socialization by offering opportunities for interaction through digital platforms.

VR has the potential to enhance the participation of students with physical disabilities in sports and recreational activities. Through VR technology, students can engage in sports, meditation, or fitness activities at their convenience, facilitating greater accessibility. Moreover, traditional sports and recreational practices can be transformed into more engaging and enjoyable experiences. VR-based fitness applications provide students with entertaining and motivational training opportunities, while multiplayer VR games and sports contribute to the development of social connections among students. Advancements in haptic technology and artificial intelligence are expected to make VR experiences more immersive, particularly within virtual training stations implemented in campus fitness centers. Additionally, personalized programs tailored to individual fitness levels and health data can be

introduced. Furthermore, VR applications integrating education with extracurricular activities—such as virtual laboratories and museum tours—are likely to gain wider adoption in the future.

University campuses have differences in terms of facilities. These differences directly affect the recreational areas and variety offered to students. The lack of recreational facilities or weak variety in activities that match students' interests impacts their participation. For example, activities like golf, surfing, skiing, or parachuting, which require special areas and equipment, cannot be offered by many campuses. This research findings show that structural barriers such as facilities, equipment, and time management can be removed through campus recreation with VR. Studies (Özkeroğlu & Akyıldız Munusturlar, 2020; Schwartz et al., 2011) support findings this work, showing that individuals can experience activities with VR without being limited by time and space. According to Williams (2024), VR experiences can give university students access to recreational opportunities independent of location. Choi et al., (2019) studied the differences between virtual and real-world golf experiences as a leisure activity, focusing on leisure constraints. The study suggested that virtual experiences eliminate barriers like cost, weather, and facilities compared to real-world experiences. Another study highlighted the advantages of VR in sports activities, such as creating a sense of reality, not needing equipment or space, and avoiding weather-related constraints (Merians et al., 2002). Based on this information, VR technology can be used as a tool to provide students access to activities that are often unavailable on campuses due to limitations like facilities, equipment, and time. It allows students to have virtual experiences in line with their interests.

CONCLUSION

This study presents important findings supporting the potential of virtual reality (VR) technology to remove barriers in campus recreation. However, more research is needed on the long-term effects of VR and its applicability for different user groups. Since there are only a few studies on this topic in the literature, this research fills an important gap both theoretically and practically.

Etical Approval and Permission Information

Ethics Committee: Çanakkale Onsekiz Mart University Rectorate, Institute of Graduate Studies Ethics Committee, and the Scientific Research and Publication Ethics Commission

Protocol/Number 03.33

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