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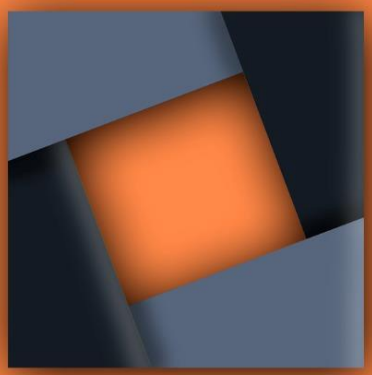

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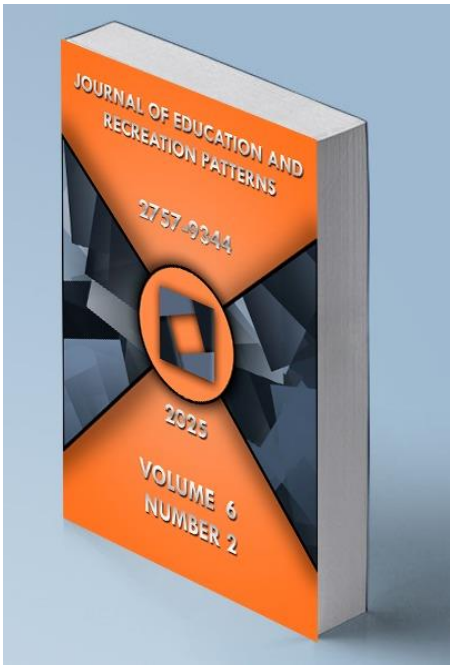

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Investigation of Perfectionist Thinking, Dispositional Flow State, and Leisure Satisfaction Among Exercise Participants

Gaye ERKMEN HADİ[1], Kader ÇELİK[2], Zeyd YAMANER[3]

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Investigation of Perfectionist Thinking, Dispositional Flow State, and Leisure Satisfaction Among Exercise Participants

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ABSTRACT

This study aimed to investigate the relationship between perfectionist thinking, flow state, and leisure satisfaction levels among exercise participants. The scores related to these variables were analyzed based on gender and gym membership status. The sample consisted of 238 exercise participants, including 139 women (age=27.08±8.79) and 99 men (age=25.79±6.82), determined using a convenience sampling method. Participants engaged in fitness, pilates, swimming, zumba, fencing, football, and running activities. Data was collected using a personal information form, the Perfectionist Thinking Scale, the Dispositional Flow State Scale, and the Leisure Satisfaction Scale. For data analysis, descriptive statistical analyses were conducted, followed by Pearson's product-moment correlation to reveal relationships between variables, and independent samples t-tests to examine differences based on gender and gym membership status. The results indicated a significant relationship between perfectionist thinking, flow state, and leisure satisfaction ($r=.627$, $p<.01$). A moderate positive relationship was found between perfectionist thinking and flow state ($r=.307$, $p<.01$), and a low positive relationship between perfectionist thinking and leisure satisfaction ($r=.297$, $p<.01$). Gender differences were observed in perfectionist thinking ($t=-2.006$, $p<.05$) and flow state ($t=-2.664$, $p<.05$), while no significant difference was found in leisure satisfaction ($t=.013$, $p>.05$). Gym membership status did not result in significant differences in perfectionist thinking scores ($t=-.462$, $p>.05$), but significant differences were found in flow state ($t=2.258$, $p<.05$) and leisure satisfaction ($t=1.999$, $p<.05$). Overall, the findings demonstrate that perfectionist thinking is associated with somewhat more positive exercise-related experiences, mainly through a moderate relationship with flow state and a weaker relationship with leisure satisfaction.

Keywords: Leisure Satisfaction, Flow State, Perfectionist Thinking.

INTRODUCTION

In today's context, exercise is frequently emphasized as having significant potential to enhance individuals' quality of life, given its physical and psychological effects. Therefore, understanding the various factors that may influence exercise, either positively or negatively, is essential for promoting behavior change, developing interventions, and recognizing beneficial behavioral patterns (Deck et al., 2019). Research has demonstrated how enjoyment and boredom can impact or predict exercise behavior. While enjoyment derived from exercise has been associated with increased participation, boredom has been linked to shorter exercise durations (Hagberg et al., 2009; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Experiencing positive emotional states is believed to play a critical role in enabling exercise participants to sustain their engagement with intrinsic, autotelic motivation. Petosa and Holtz (2013) indicated that the flow state theory is highly useful in promoting physical activity adherence among young adults. A study conducted with fitness center members demonstrates that more frequent participation in physical activity is positively associated with higher levels of leisure participation, flow experience, and life satisfaction (Doğan & Ünal, 2024). Flow state, as defined, is a holistic feeling experienced when individuals are fully immersed in an activity. It represents a positive psychological state achieved when abilities and demands of the activity are balanced (Csíkszentmihályi, 1990). Moreover, it is a harmonious and subjective experience where the mind and body work effortlessly together, leaving individuals with a sense of something special (Csíkszentmihályi, 1990). Flow occurs when individuals challenge their own limits but perceive their resources as proportionate to the task demands. This results in a psychological state characterized by intense concentration, automaticity, and a sense of control (Csíkszentmihályi, 2002).

According to Csíkszentmihályi et al. (2005), this emotional state is described as a desirable outcome, as it serves as a powerful motivator for individuals and represents a pleasurable experience within the exercise environment. One dimension of the flow state, the autotelic experience, defined as an intrinsic reward, plays a crucial role in fostering adherence to physical activity. Previous studies indicate that the satisfaction individuals derive from their leisure activities is closely linked to their experience of positive emotional states and that leisure satisfaction is a necessary concept for sustaining these positive emotions. The definition of leisure satisfaction reflects the extent to which individuals are satisfied with their leisure time and the quality they experience while engaging in leisure activities (Kovacs, 2007). Leisure satisfaction is defined as the positive satisfaction individuals achieve, gain, and attain because of participating in leisure activities. In other words, it refers to the positive feelings individuals acquire by fulfilling their personal needs through participation in leisure activities (Seigenthaler, 1997). Participation in leisure activities can enhance leisure satisfaction through the experience of flow state (Wu & Liang, 2011). Positive emotional states may play a role in individuals' stages of engaging in activities and forming habits to sustain them. This study aims to provide a perspective on the relationship between positive exercise experiences, satisfaction levels, and perfectionist thinking in ensuring the continuity exercise participation. Positive emotional states, which are believed to have a strong relationship with exercise, and the potential impact of individuals' perfectionist thinking on exercise behavior are considered worthy of further investigation.

Perfectionism can be considered either a positive or negative source of energy, depending on an individual's level of self-awareness. Feelings of inadequacy in meeting standards set by oneself or others may lead to performance below expectations. Although there are differing views on whether perfectionism has positive or negative effects, researchers agree that the pursuit of flawless performance lies at the core of the concept of perfectionism (Flett & Hewitt, 2002). Perfectionism can lead to extraordinary creative achievements and an intense struggle (flow experience) that pushes a person beyond the limits of their abilities. Perfectionists, when

freed from external judgments or time constraints, can experience elevated emotions and enter a complete state of flow, transforming the activity itself into a reward (Silverman, 1999). For this reason, perfectionism can be said to play a significant role in the cognition, emotions, and behaviors of exercise participants and athletes.

Studies investigating the reflections of high levels of perfectionism among athletes across various cognitive, affective, and behavioral dimensions (Hall et al., 1998; Gould et al., 1996; Hasse, Prapavessis, & Owens, 2002) reveal that perfectionism is also associated with cognitive and behavioral patterns reflecting fear of failure in adhering to exercise, anxiety about inability to exercise, and avoidance of physical activity (Martin et al., 2006). Existing research highlights perfectionism as a prevalent personality trait that extends to individuals' perceptions of leisure, an important component of life (Blatt, 1995; Slaney & Ashby, 1996). When examining the relationship between the flow state and perfectionism, it has been argued that socially prescribed perfectionism, characterized by fear of failure, hypersensitivity to mistakes, setting high standards, and critical self-evaluation (Flett & Hewitt, 2002; Frost et al., 1990), may negatively impact the flow state. Conversely, it is suggested that individuals can experience a high sense of control during the flow state without worrying about making mistakes, and that self-oriented perfectionism may positively influence the flow state (Schüler & Bruner, 2009). Anshel and Seipel (2006), in their study with university students, found that maintaining an exercise regimen was positively and significantly associated with dimensions of perfectionism, such as organization. For both male and female university students, organization, which is positively linked to personal perfectionism standards, predicts the continuation of an exercise regimen.

When the flow experience is considered an important psychological process that contributes to leisure time satisfaction and life satisfaction when an individual engages in meaningful activities requiring focus and conceptual integrity during their leisure time, it can be said that perfectionism, if it is adaptive and directed toward the individual's internal standards, plays a contributing role in this process. Slaney and Ashby (1996) noted a potential connection between perfectionism and emotions or attitudes toward leisure. Interviews conducted with individuals in their study revealed that participants reported having high personal standards in interpersonal relationships and work environments. Many also indicated that having such high standards was often problematic for them, occasionally hindering their ability to engage in and derive enjoyment from leisure activities. The findings of this study reveal that perfectionists may experience difficulties in effectively using their leisure time to improve their quality of life. For example, while the findings indicated that perfectionists place greater value on leisure and hold more positive beliefs about leisure than non-perfectionists, they also showed that perfectionists experience less freedom, enjoyment, and engagement in leisure activities than their non-perfectionist counterparts. As perfectionists tend to have high personal standards, they may possess an exaggerated perception of the risks associated with certain leisure activities and an undervalued perception of their own competencies (Ashby, Kottman, & DeGraaf, 1999). In other words, if an individual is critical, anxious, and stressed, the maladaptive aspect of perfectionism can overshadow the benefits of the flow experience or leisure time satisfaction.

Maintaining enjoyment and intrinsic motivation during regular exercise participation is a key goal. Given the significant functions of exercise, regular participation and the ability to sustain it with enjoyment are considered critical for ultimately improving individuals' quality of life. It is well established that the satisfaction levels and positive emotional states derived from exercise play a role in helping individuals achieve a higher quality of life. Perfectionism is also recognized as a psychological concept that impacts the quality of life. In this context, this study aimed to examine the relationship between perfectionist thinking, flow state, and leisure satisfaction among exercise participants. Additionally, the scores for these variables

were analyzed based on gender and gym membership status. The hypotheses for the study were determined as follows:

H1: There are significant positive correlations among the perfectionist thinking, flow state, and leisure satisfaction of exercise participants.

H2: There are statistically significant differences in the perfectionist thinking, flow state, and leisure satisfaction of exercise participants based on gender and gym membership status.

METHOD

Research Design

This study adopted a relational survey design aimed at examining perfectionist thinking, flow state, and leisure satisfaction among exercise participants and revealing the relationships between these variables.

Research Population and Sample

The study population consists of exercise participants who engage in regular exercise. The sample was determined using a nonprobability sampling method, specifically the convenience sampling method. The sample included 238 exercise participants, comprising 139 women (mean age = 27.08 ± 8.79) and 99 men (mean age = 25.79 ± 6.82). Participants regularly engaged in various activities such as fitness, pilates, swimming, Zumba and fencing, football, running, yoga, cycling, basketball, and taekwondo. The reported reasons for exercise participation included maintaining physical health (38.2%), maintaining psychological health (13%), feeling that they use their leisure time productively (11.3%), deriving satisfaction from exercise (10.5%), achieving a physically appealing appearance (10.1%), allocating time for themselves (8.8%), and socializing (8%). Table 1 presents the participants' gym membership durations, the length of time they have been engaging in regular exercise, and the frequency of their weekly exercise sessions based on their gym membership status.

Table 1

Mean and Standard Deviation Values of Participants

Variables	Gender	Mean	SD
Gym membership duration (months)	Female (n= 51)	24.82	11.87
	Male (n= 38)	25.90	14.96
Exercise duration (months)	Female (n= 139)	31.08	10.11
	Male (n= 99)	34.26	13.94
Exercise frequency (number of days)	Female (n= 139)	3.08	1.97
	Male (n= 99)	3.84	1.24

Data Collection Instruments

In this study, data were collected using a Personal Information Form, the Perfectionist Automatic Thoughts Inventory, the Dispositional Flow State-2 Scale, and the Leisure Satisfaction Scale.

***Personal Information Form*:** The form, prepared by the researcher, was designed to gather information about participants' gender, age, weight, height, marital status, gym membership status, gym membership duration, types and durations of activities participated in, preferences for participating in activities, and reasons for participation.

Perfectionist Automatic Thoughts Inventory (PATI): Developed by Flett et al. (1998), this scale measures perfectionist cognitions by focusing on automatic thoughts associated with perfectionism. It consists of 25 items evaluated on a four-point Likert scale and is assessed as a single dimension. Aydın and Yerin Güneri (2018) adapted the scale into Turkish. Higher scores on the scale indicate a greater presence of perfectionist thoughts. Scores on the scale range from 0 to 100. The reliability of the scale was calculated as 0.95 (Flett et al., 1998), and the internal consistency coefficient (Cronbach's alpha) for this study was 0.92.

Dispositional Flow State-2 Scale (DFSS): Developed by Jackson and Eklund (2004), this scale assesses individuals' flow experiences related to a specific activity. It consists of 36 items and 9 subdimensions, each subdimension comprising 4 items. The subdimensions are: balance between challenge and skill, merging of action and awareness, clear goals, unambiguous feedback, concentration on the task, sense of control, loss of self-consciousness, transformation of time, and autotelic (intrinsic) experience. Licensed usage permission for the scale was obtained from Mind Garden. Aşçı et al. (2007) conducted the Turkish validity and reliability study. The internal consistency coefficients for the nine subdimensions ranged from 0.49 to 0.88. In this study, the overall Cronbach's alpha for the scale was 0.94.

Leisure Satisfaction Scale (LSS): Beard and Ragheb (1980) developed the original form of the scale. In 2002, it was revised into a short form with 24 items by Idyl Arbor Inc. Gökçe and Orhan (2011) adapted the scale into Turkish. The scale is in a five-point Likert format, scoring between 5 (Almost always true) and 1 (Almost never true). The subdimensions of the scale are psychological, educational, social, relaxation, physical, and esthetic satisfaction. In this study, the internal consistency coefficients for the 6 subdimensions ranged between 0.67 and 0.79, while the overall Cronbach's alpha was 0.94.

Data Collection Process

Approval for data collection was obtained from the Research Ethics Committee of Selçuk University Faculty of Sports Sciences (No: 04/10/2022-40990478-050.99-379112/138). Before the scale form, including the data collection tools, was distributed to participants, brief information about the study was provided. Voluntary consent was obtained from the participants after completing their exercises at sports centers or during their leisure time via an online form. Completion time was approximately 10–12 minutes.

Data Analysis

In this study, preliminary analyses (assumption testing and descriptive statistical analysis) were conducted first. Pearson’s product-moment correlation coefficients were analyzed to examine the relationships between perfectionist thoughts, flow state, and leisure satisfaction. Additionally, independent samples t-test analysis was used to assess participants’ perfectionist thoughts, flow state, and leisure satisfaction based on demographic variables such as gender, gym membership status, and reasons for exercise participation. All analyses were conducted using IBM SPSS Statistics (Version 22.0).

FINDINGS

The relationship between exercise participants' levels of perfectionist thoughts, flow state, and leisure satisfaction was examined, and significant positive correlations were identified among these variables (Table 2).

Table 2

Pearson Product-Moment Correlation Analysis Results for PATI, DFS, and LSS Scores

Variables	PATI	DFS	LSS
PATI	-		
DFS	.307**	-	
LSS	.297**	.627**	-

A moderate positive correlation was found between participants' perfectionist thought scores and flow state scores (r=.307, p<.01). A low positive correlation was identified between perfectionist thought scores and leisure satisfaction scores (r=.297, p<.01). Additionally, a strong positive correlation was observed between participants' flow state scores and leisure satisfaction scores (r=.627, p<.01), whereas a moderate positive correlation was found between perfectionist thought scores and flow state scores (r=.307, p<.01).

The results of the t-test analysis conducted to examine the perfectionist thoughts, flow state, and leisure satisfaction levels of exercise participants based on the gender variable are presented in Table 3.

Table 3

Independent Samples t-Test Analysis Results of Participants PATI, DFSS, and LSS Scores based on Gender and Gym Membership Status

	Gender	**Mean**	**SD**	**t**	**p**
PATI	Female (n=139)	75.34	16.64	-2.006	**.046***
	Male (n=99)	79.99	18.94		
DFS	Female (n=139)	126.12	18.74	-2.664	**.008***
	Male (n=99)	132.76	19.21		
LSS	Female (n=139)	89.96	13.88	.013	.990
	Male (n=99)	89.94	15.60		

According to the results of the independent samples t-test analysis, the perfectionist thought scores of exercise participants significantly differed based on gender (t=-2.006, p<.05) (Table 3). Male participants had higher perfectionist thought scores than female participants. When examining flow state scores, a significant difference was found based on gender (t=-2.664, p<.05), with male participants scoring higher than female participants. However, no significant difference was observed in the mean scores of leisure satisfaction based on gender (t=.013, p>.05).

The results of the t-test analysis conducted to examine the perfectionist thoughts, flow state, and leisure satisfaction levels of exercise participants based on the gym membership variable are presented in Table 4.

Table 4

Independent Samples t-Test Analysis Results of Participants PATI, DFSS, and LSS Scores based on Gender and Gym Membership Status

	Membership	Mean	SD	t	p
PATI	No (n= 149)	76.58	19.13	-.462	.644
	Yes (n= 89)	77.68	16.92		
DFSS	No (n= 149)	132.48	18.32	-2.258	**.025***
	Yes (n= 89)	126.73	19.42		
LSS	No (n= 149)	92.34	13.78	1.999	**.047***
	Yes (n= 89)	88.53	14.91		

When the perfectionist thought scores of exercise participants were examined based on their gym membership status, no significant difference was found (t=-0.462, p>.05) (Table 4). Perfectionist thought scores were similar between participants with and without gym memberships. However, flow state scores significantly differed based on gym membership status (t=-2.258, p<.05), participants without gym memberships reported higher leisure satisfaction than those with memberships. Additionally, leisure satisfaction scores showed a significant difference based on gym membership status (t=1.999, p<.05). Participants without gym memberships had higher leisure satisfaction scores than those with gym memberships.

DISCUSSION

This study, conducted to examine the relationships between perfectionist thoughts, flow state, and leisure satisfaction levels among individuals engaging in exercise, revealed significant correlations among these variables. Furthermore, perfectionist thought and flow state scores significantly differed based on the gender variable, whereas no significant difference was found in leisure satisfaction scores. Although no significant difference was observed in perfectionist thought scores based on gym membership status, significant differences were identified in flow state and leisure satisfaction scores.

The findings revealed low yet significant positive correlations between perfectionist thoughts, flow state, and leisure satisfaction. Accordingly, the theoretical framework of this study rests on a multi-layered structure that explains the interaction between perfectionism, motivational processes, flow experience, and leisure time satisfaction. This integrated approach facilitates the conceptual positioning of the relationships between variables and provides a strong theoretical framework for discussing the findings. Research consistently indicates that dispositional flow experienced during leisure activities contributes to higher levels of leisure satisfaction (Wu & Liang, 2011). When individuals enter a state of flow in their free-time pursuits, they tend to feel more satisfied because the activity captures their full attention and involvement (Ahn & Song, 2024; Lee et al., 2019). Similarly, a study focusing on recreational sports participants (Erkmen Hadi et al., 2021) reported that dispositional flow was positively associated with leisure satisfaction, reinforcing the notion that deeper engagement enhances the overall quality of the leisure experience. Longbottom, Grove, and Dimmock (2012) demonstrated that perfectionism dimensions have a positive relationship with aerobic exercise through autonomy and self-presentation. The positive and indirect effect of self-oriented perfectionism on exercise behavior, mediated by autonomy and self-presentation, highlights the beneficial aspects of perfectionism dimensions in the context of exercise behavior. In Erkmen's (2015) study, self-oriented perfectionism was found to significantly and positively predict continuous flow states. Perfectionism can be perceived as either a positive or negative source of energy, depending on an individual's level of awareness. Gözmen and Aşçı (2016) revealed that self-oriented perfectionism significantly predicts the flow state among athletes. Athletes

who strive for perfection, set high standards for themselves, and aim to achieve excellence immersed themselves in the activity, becoming fully engaged and deriving intrinsic satisfaction. Silverman (1999) proposed that under favorable conditions, perfectionists can fully experience the flow state. Additionally, perfectionism is seen as an inspiration leading to extraordinary creative achievements, such as the flow state. In this study, the positive aspects of perfectionism appear to be emphasized. Within the study context, it can be inferred that exercise participants experienced the positive side of perfectionism, leading to better and more fulfilling experiences. This result partially aligns with the literature indicating that increased participation in recreational activities is associated with higher perceived life satisfaction and lower levels of automatic thoughts (Çolak et al., 2023). When evaluated within the framework of Csikszentmihalyi's (1990) flow theory, it can be said that perfectionist individuals' tendencies toward setting high standards and intense task orientation allow them to more easily achieve a skill-challenge balance; this, in turn, increases their cognitive and affective readiness for the flow experience. In this context, the fact that perfectionist thinking supports the flow tendency can be explained through processes such as focus, perceived competence, goal orientation, and self-discipline, which are necessary for flow. This finding is consistent with previous studies in the literature that emphasize the positive effects of adaptive perfectionism on performance and motivation processes.

Studies on multidimensional perfectionism show mixed findings regarding gender differences. Some studies report no significant differences based on gender (Doğan & Ünal, 2024; Flett, Blankstein, Hewitt, & Koledin, 1992; Hassan, Abd-El-Fattah, Abd-El-Maugoud, & Badary, 2012; Jonge & Waller, 2003), while others identify significant differences (Çağlar, Bilgili, Karaca, Ayaz, & Aşçı, 2010; Erkmen & Hadi, 2015). In the reviewed studies, self-oriented and socially prescribed perfectionism scores differed significantly by gender, with male participants scoring higher than females. Similarly, in this study, male participants were found to have higher perfectionist thought scores than female participants. Exercise participants draw on perfectionist thoughts while achieving their goals. Male exercise participants may perceive the exercise environment as more competitive than females and adopt perfectionist standards during the completion of exercises.

A review of the literature on flow state reveals mixed findings regarding gender differences. Some studies suggest no significant gender differences (Altıntaş, Aşçı, & Çağlar, 2010; Csíkszentmihályi, 1990; Murcia et al., 2008; Russell, 2001; Stavrou et al., 2007), while others indicate the presence of such differences (Erkmen & Hadi, 2015; Han, 1992; Sharp et al., 2007). In this study, male participants were found to have higher flow state scores than female participants. Similarly, Erkmen Hadi and Denktaş (2023) reported that male participants had higher flow state scores than females. This finding shows that male participants derive greater enjoyment and happiness from their exercise experiences, resulting in higher flow experience scores. Furthermore, the reasons for continuing regular exercise may differ between male and female participants in terms of intrinsic motivation, potentially contributing to differences in experiencing autotelic states.

Studies examining leisure satisfaction based on the gender variable reveal mixed findings. Some studies indicate no significant differences between men and women (Ardahan & Yerlisu Lapa, 2010; Berg et al., 2001; Lu & Hu, 2005; Yerlisu Lapa, 2013), while others suggest that leisure satisfaction may vary by gender (Çakır, 2017; Gökçe, 2008; Serdar & Ay, 2016; Vong Tze, 2005). Our study concluded that gender is not a determining factor for differences in participants' leisure satisfaction levels. When the mean scores of male and female participants are examined, it is seen that both groups have high levels of leisure satisfaction. From this perspective, regular exercise plays a role in maintaining high levels of leisure satisfaction for both male and female participants.

It was hypothesized that various elements likely to trigger perfectionist concerns and influence perfectionist standards could be present in gym environments, and that the gym atmosphere might positively or negatively affect individuals' perfectionist thoughts. Research indicates that adaptive perfectionism, which reflects the positive aspects of perfectionism, is associated with motivational states related to exercise, such as enjoyment, well-being, embracing challenges, and a positive understanding of health (Duda & Treasure, 2021; Vincent et al., 2021). Conversely, maladaptive perfectionism, highlighting the negative aspects of perfectionism, has been linked to experiences such as lack of motivation, greater barriers to exercise participation, body image concerns, exercise dropout, and disengagement (Brannan, Petrie, Greenleaf, Reel, & Carter, 2009; Jowett, Mallinson, & Hill, 2016; Petrie, Greenleaf, Reel, & Carter, 2009; Taranis & Meyer, 2010; Madigan, Stoeber, & Passfield, 2017). From this perspective, the exercise environment may be associated with either positive or negative experiences depending on individuals' perfectionist thought patterns.

Contrary to the findings of this study, it was expected that gym membership status would create differences in participants' levels of perfectionist thinking. Although no studies specifically addressing the relationship between gym membership and perfectionist thoughts were identified, this study found no significant difference in perfectionist thought levels based on gym membership status. When participants' flow state and leisure satisfaction levels were examined based on gym membership status, it was found that individuals without gym memberships had higher levels of flow state and leisure satisfaction than those with memberships. Positive subjective experiences, such as flow state and leisure satisfaction, are experienced in various suitable environments (Csikszentmihalyi, 1990). The intrinsic motivation to persist in exercise, enjoyment derived from fully focusing on the activity, and positive feedbacks received are thought to increase the likelihood of experiencing such positive emotional states. Engaging in an enjoyable activity is also believed to enhance the experience of leisure satisfaction. Therefore, the findings indicate that gym membership is not a prerequisite for individuals who engage in regular exercise to experience flow state and leisure satisfaction. Individuals can experience enjoyable subjective states in an unlimited range of settings where they perceive their competence positively, feel a sense of pleasure in participating in exercise, and engage fully in the activity.

Conclusion

The findings of this study contribute to a deeper theoretical understanding of how perfectionist thinking operates within exercise-based leisure contexts. The observed associations between perfectionist thinking, flow state, and leisure satisfaction provide evidence that cognitive evaluation processes—traditionally viewed as potentially maladaptive—may under certain conditions function as motivationally activating mechanisms that facilitate more engaged and meaningful exercise experiences. This aligns with emerging theoretical perspectives that view balanced and focused perfectionist cognitions as contributors to intrinsic motivation and sustained participation. From a flow theory standpoint, the results indicate that individuals with higher levels of perfectionist thinking may be more likely to experience the attentional absorption and performance-focused engagement characteristics of flow states. This relationship offers a theoretical contribution by positioning perfectionist cognition as a potential cognitive precursor to flow, thereby enriching current models of flow experience in leisure and exercise settings. Similarly, the link between perfectionist thinking and leisure satisfaction adds nuance to existing leisure satisfaction frameworks, highlighting the subtle but meaningful role of cognitive dispositions in shaping the quality of leisure participation.

Beyond its conceptual implications, the study also offers practical insights for exercise promotion. Encouraging individuals to set challenging yet attainable goals may help translate

perfectionist tendencies into adaptive motivational patterns that support regular exercise engagement. Positive aspects of perfectionist thinking can be used to encourage exercise participation and sustain continuity. Setting high standards and striving for excellence may increase participation in exercise and transform this into a positive intrinsic motivation, contributing to regular exercise habits. Achieving positive experiences and ensuring exercise continuity could be facilitated by setting challenging yet attainable, realistic, and balanced goals for exercise participation. Furthermore, raising awareness that individuals can enjoy a variety of exercise experiences without the necessity of gym memberships could support the development of a mindset that promotes regular exercise as a lifestyle. Emphasizing the importance of participating in exercise and fostering regular exercise awareness is essential. The effective use of leisure time and the satisfaction derived from it are believed to contribute to enhancing participants' quality of life. Encouraging exercise participants to use effective time management skills to balance their exercise participation with leisure, socialization, and rest may play a significant role in maintaining exercise continuity and satisfaction. Leisure satisfaction gained through exercise not only provides individual fulfillment but may also serve a moderating role by enhancing the effect of social relationships on happiness (Yalçın, Altındöker, & Yıldız, 2025). This perspective highlights the importance of integrating exercise into daily life to improve overall well-being.

Limitations and Recommendation

This study has several limitations. First, it is a cross-sectional study conducted solely on exercise participants who voluntarily participated and were included using a convenience sampling method. Therefore, its generalizability and applicability to the research topic are limited. While relational findings concerning the study variables can be expressed, no causality can be determined. The sample was selected using a nonprobability convenience sampling method. The sample size and limited range of exercise types present disadvantages for generalizing the findings. The study variables were assessed based on total scores. The DFSS comprises nine subdimensions, and the LSS comprises of six subdimensions. Including subdimensions in future studies could provide more detailed insights. Additionally, due to the unequal distribution of participants across different exercise types, it was not possible to examine whether the type of exercise made a difference in participants' experiences. Considering participants' reasons for engaging in exercise could provide valuable perspectives for interpreting the results.

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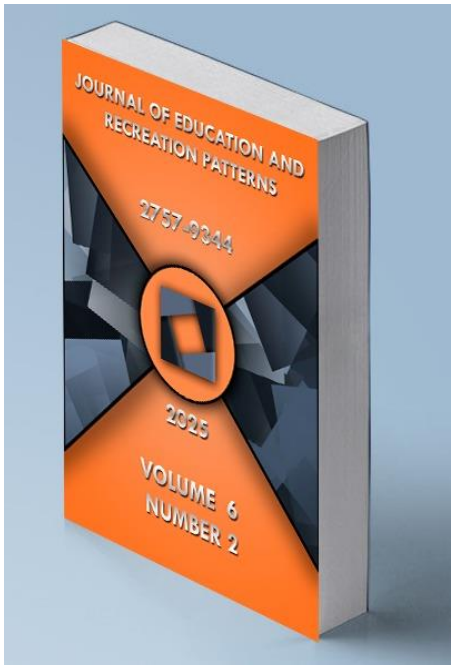

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The Effect of University Students' Participation İn Recreational Sports Activities on Their Life Satisfaction and the Utility of Recreational Activities

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ABSTRACT
The aim of this study is to examine the effect of university students' participation in sports activities on their life satisfaction and recreational benefit levels. Another aim of the study is to examine whether life satisfaction and recreational benefit levels vary according to some demographic characteristics. In the study, relational screening and causal comparison models were applied. Life satisfaction and recreational benefit scales were applied to the participants. The universe of the study consisted of students of Istanbul Gelişim University School of Physical Education and Sports, and the sample consisted of 441 volunteer participants selected from this universe by simple random sampling method. Recreational benefit scale and life satisfaction scale were used as data collection tools in the study. The analyzes of the study were defined in SPSS 25.0 package program system and the relevant analyzes were performed using this program. Mann Whitney U, Kruskal Wallis and Spearman Correlation analysis were applied as statistical analysis. As a result, it was determined that there was a significant difference in the sub-range of recreational benefit and reproductive benefit in the gender variable. In the age variable, the differences observed in the psychological benefit sub-systems in the 21-23 age range and 30 and above age range and in the 18-20 age range and 21-23 age range are permanently significant.
Conclusion: A weak negative correlation was found between life satisfaction and recreational benefit level.

Keywords: Benefit, Life satisfaction, Recreation.

INTRODUCTION

In the contemporary era, the lifestyles of individuals have become progressively more sedentary in conjunction with the advent of advanced technologies and the expansion of urbanisation. In particular, the younger demographic is witnessing a notable decline in social engagement and physical activity as a consequence of their reliance on digital technologies and online platforms (Helvacı & Taylan, 2025). This situation has a detrimental impact on both physical and psychological health. These effects are particularly pronounced among university students, who are subject to both academic responsibilities and evolving social dynamics. The period of university life is typified by a number of processes, including identity formation, the development of social networks and the planning of future careers (Xiao at al., 2025). It is also a time characterised by periods of intense stress and uncertainty. It is therefore crucial for university students to engage in activities that will support both their physical and mental health (Diener, 1984). Recreational sports are physical activities in which individuals engage during their leisure time. They are typically undertaken for purposes of entertainment, relaxation and social interaction, rather than for competitive purposes. Such sports provide numerous benefits to the individual, including spiritual and social advantages, as well as protection and enhancement of physical health. The principal objective of recreation is to bolster both physical and mental wellbeing through pursuits that individuals engage in according to their own preferences and inclinations, apart from the pressures and obligations of daily life. The relaxing and regenerating effects of recreational sports are of significant benefit in coping with the pressure and stress that can result from intense academic and professional life (Grasdalsmoen et al., 2020).

Recreational sports have been demonstrated to enhance the physical activity levels of individuals, while simultaneously offering the chance to socialise and expand their social networks. The findings of research studies indicate that regular physical activity has a beneficial impact on an individual's general health status, reduces the risk of disease and prolongs life expectancy (Rhodes at al., 2025). Furthermore, recreational sports have been demonstrated to have a beneficial impact on mental health (Ekinci et al., 2025; Karaman et al., 2024). In particular, participation in sports has been shown to contribute to a reduction in stress levels, an increase in self-confidence and an increase in overall life satisfaction (Collins et al., 2018). In this context, the psychosocial effects of recreational sports on individuals are related not only to physical development but also to emotional and social development (Ryff and Singer, 2008). For university students, recreational sports are regarded as an efficacious method of coping with the demands of both academic and social life. The undertaking of recreational activities based on physical activity has been observed to enhance individuals' motivation, improve their mental health and enhance their quality of life by creating opportunities for social interaction (Sarol et al., 2024). It can therefore be posited that participation in recreational sports by university students may have a significant impact on their overall life satisfaction and general well-being (Li at al., 2024).

The impact of recreational sports activities on life satisfaction is contingent upon individuals' endeavours to ascertain meaning and happiness in their lives (Deci & Ryan, 2000). The concept of life satisfaction is subjective and based on the general evaluation of individuals' lives. It can be defined as the level of satisfaction that individuals receive from their lives. The life satisfaction of young adults, particularly university students, is contingent upon a number of factors, including expectations for the future, personal goals and interactions with the social environment (Ryff & Singer, 2008). In this process, recreational sports both support physical health by increasing the physical activity of individuals and contribute to the psychosocial development of students by creating opportunities for interaction with the social environment (Chalip, 2006). Furthermore, the manner in which university students employ their leisure time and the recreational benefits they derive from this process are among the factors that influence

their life satisfaction. The term 'recreational benefits' is used to describe the physical, psychological and social gains that individuals obtain from leisure time activities. Such benefits assist individuals in relieving stress, enhancing social interactions, bolstering self-confidence, and fostering general well-being. In particular, participation in sports activities enables university students to cope with the considerable academic pressures they face and to establish stronger ties with their social environment (Penedo & Dahn, 2005). In this context, the psychological and social benefits of sport are acknowledged as a significant stabilising factor in the multifaceted challenges of university life. The principal objective of this study is to investigate the impact of university students' engagement with recreational sports on their levels of life satisfaction and recreational utility. While the impact of recreational sport on individual quality of life has been extensively examined in existing literature, the specific effects on university students have been addressed in only a limited number of studies. In this context, the objective of our study is to make a contribution to the existing literature by elucidating the effects of recreational sports that facilitate the social, psychological and physical development of university students on life satisfaction (Doğan & Ünal, 2024). Furthermore, the study is expected to yield significant insights into the role of sport-based interventions in enhancing the life satisfaction of university students and the necessity of expanding such activities (Ye at al., 2025).

This study offers significant insights by examining how university students allocate their leisure time and which activities they find beneficial to enhance their overall life satisfaction. Additionally, it underscores the potential impact that universities can have on enhancing students' life satisfaction.

METHOD

This section provides a comprehensive account of the research model, the population and sample, the data collection tools and the data analysis processes.

The objective of this study is to examine the impact of university students' participation in sporting activities on their life satisfaction and perceived levels of recreational utility. Specifically, the study seeks to address the following research questions:(1) Does a significant relationship exist between university students' life satisfaction and their recreational utility levels? Secondly, we inquire whether this relationship varies according to students' demographic characteristics, such as gender and age. (3) How does participation in recreational sports affect students' life satisfaction and perceived utility from recreational activities? By addressing these inquiries, the study seeks to underscore the significance of recreational sports in enhancing the well-being of university students and their contribution to life satisfaction.

The inclusion criteria were as follows: first, the participant must be a student at Istanbul Gelisim University School of Physical Education and Sports; second, the participant must voluntarily agree to participate in the study. Exclusion criteria included being a student at the aforementioned educational institution and declining to participate in the study.

Research Model

The research was conducted using the relational screening model (Karasar, 2017) in order to disseminate the life satisfaction of universities' participation in recreational sports activities and their distribution in the region. Benefits from recreational activities. Within the scope of the research, an online survey was used as a data collection tool, and the data was obtained from the owners on a voluntary basis.

Universe and Sample

The study population comprises students from Istanbul Gelisim University School of Physical Education and Sports. A simple random sampling method was employed as the

sampling technique, whereby all individuals within the population are afforded an equal chance of inclusion in the sample (Yazıcıoğlu and Erdoğan, 2004). The total number of participants in the research sample was 441, with all of them having volunteered to take part.

Data Collection Tools

The data collection tools employed in the study are delineated below.

The Descriptive Information Form is provided below for your reference. The form includes demographic information on the participants, such as gender, age, and department.

The Recreation Benefit Scale (RFS) is a measurement tool designed to assess the benefits derived from recreational activities. This scale, which was developed by Ho (2008) and subsequently validated by Akgül et al. (2016) through the use of confirmatory factor analysis, is employed to assess the benefits that participants derive from recreational activities. The scale is a 5-point Likert scale comprising 24 items and three sub-dimensions:

a) Physical (7 items),

b) Psychological (8 items),

c) Social (9 items).

The Life Satisfaction Scale This scale, developed by Diener et al. (1985) for the purpose of measuring life satisfaction and subsequently adapted into Turkish by Bekmezci and Mert (2018), comprises five items. The item expressions include the following statements: "I have a life close to my ideals," "my life conditions are perfect," "I am satisfied with my life," "I have had the important things I want from life so far," and "I would not change almost anything in my life if I were born again." Participants were invited to indicate their level of agreement with each item on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

Data Analysis

The data were subjected to analysis using the IBM SPSS 25.0 package programme. The normality of the data was evaluated through the examination of normal distribution curves, the calculation of skewness-kurtosis (skewness-skewness) values, and the analysis of histograms. Furthermore, the Kolmogorov-Smirnov test was employed when the group size exceeded 50. It was established that the data set did not exhibit a normal distribution, thus necessitating the utilisation of non-parametric tests. Spearman correlation analysis was employed to examine the relationships between the variables. The objective was to examine the relationships between recreational sport participation and life satisfaction and recreational benefit levels. The Mann-Whitney U test was employed to assess the disparities between the life satisfaction and recreational benefit levels of disparate groups. The aforementioned methods were selected in accordance with the characteristics of the data set, and the analyses were conducted accordingly.

Ethical Approval

The research was conducted with the permission of Istanbul University-Cerrahpaşa Rectorate Social and Human Sciences Research Ethics Committee (Date: 03.06.2025, Decision No: 2025/430).

FINDINGS

The findings obtained in the research are presented below.

Table 1

Demographic Characteristics of the Participants

		Frequency	Percentage
Age	18-20	136	30.8
	21-23	174	39.5
	24-26	69	15.6
	27-29	50	11.3
	30+	12	2.7
	Total	**441**	**100.0**
Gender	Women	155	35.1
	Men	286	64.9
	Total	**441**	**100.0**
What is the subject area in which you are studying?	Department of Coaching Education	92	20.9
	Department of Sports Management	122	27.7
	Department of Recreation	79	17.9
	Department of Exercise and Sports Sciences	99	22.4
	Department of Physical Education and Sport Sciences for People with Disabilities	49	11.1
	Total	**441**	**100.0**

An analysis of Table 1 shows that 30.8% of the subjects participating in the study were between 18 and 20 years old, 39. 5% were in the age group 21-23 years, 15.6% were in the age group 24-26 years, 11.3% were in the age group 27-29 years, 2.7% were in the age group 30 and above, 35.1% were female, 64.9% were male, 20. 9% were from the Department of Coaching Education, 27,9% were from the Department of Sport Management, 17,9% were from the Department of Recreation, 22,4% were from the Department of Exercise and Sport Science and 11,1% were from the Department of Exercise and Sport Science for the Disabled.

Table 2

Presents the Results of the Skewness, Kurtosis and Kolmogorov-Smirnov Test Significance Level for Life Satisfaction and Recreational Utility Scale Scores.

Dimensions	N	Skewness	Kurtosis	P
Physical Benefits	441	-,233	.432	,000
Psychological Benefits	441	-.582	.987	,000
Social Benefits	441	-.213	.482	,000
Total Score of Recreation Utility Scale	441	-.687	1.065	,000
Total Life Satisfaction Scale Score	441	.175	-.854	,000

Upon examination of the life satisfaction and recreational benefit scales in Table 2, it becomes evident that the scores obtained from the sub-dimensions deviate from the normality assumption. The Kolmogorov-Smirnov test is one of several methods used to ascertain whether the data in question follows a normal distribution. The normal distribution curves were

examined and it was determined that there were deviations from normality. As Büyüköztürk (2007) observed, if the skewness and kurtosis values of the variables employed fall within the range of ±1, this indicates that there are no significant deviations from normality. Similarly, Tabachnick and Fidell (2013) noted that if the skewness and kurtosis coefficients of the variables are between ±1.5, the data can be considered to exhibit normal distribution. It was thus established that the scale scores exhibited deviations from normality, with the coefficients falling outside the ±1 and ±1.5 range and the data failing to display a normal distribution.

Table 3

A Descriptive Analysis of the Responses Provided by the Participants in Relation to the Life Satisfaction and Recreational Benefit Scale.

Sub Dimensions	N	Min	Max	Mean±Sd
Physical benefits	441	7.00	34.00	20.72± 4.01
Psychological benefits	441	7.00	39.00	25.21± 4.47
Social benefits	441	10.00	40.00	25.21± 4.48
Total Score of Recreation Utility Scale	441	30.00	100.00	68.17±10.10
Total Life Satisfaction Scale Score	441	9.00	35.00	20.97±6,00

Upon analysis of Table 3, it becomes evident that the participants' responses to the life satisfaction and recreational benefit scale, the physical benefit sub-dimension, exhibit an average of 1.79 ± 0.72. The psychological benefit sub-dimension, on the other hand, demonstrates an average of 3.85 ± 0.77. The social benefit sub-dimension averages 3.83 ± 1.00. The total scores for the recreation benefit scale are 2.49 ± 0.54, while the life satisfaction scale total scores are 3.11 ± 0.89.

Table 4

Evaluation of Life Satisfaction and Recreational Benefit Levels of the Participants according to Their Gender

Sub Dimensions	Gender	N	Rank Mean	Rank Total	U	Cohen's d	p
Physical benefits	Women	155	219.53	34026.50	21936.50	0.05	.858
	Men	286	221.80	63434.50			
Psychological benefits	Women	155	238.55	36974.50	19445.50	0.21	**.033**
	Men	286	211.49	60486.50			
Social benefits	Women	155	218.32	33839.00	21749.00	-0.02	.744
	Men	286	222.45	63622.00			
Total Score of Recreation Utility Scale	Women	155	228.16	35365.50	21054.50	0.08	.384
	Men	286	217.12	62095.50			
Total Life Satisfaction Scale Score	Men	155	226.28	32334.50	19652.50	-0.01	.952
	Women	286	221.25	34293.50	22126.50		

Upon closer examination of the life satisfaction and recreational benefit scale scores of the participants according to their gender, as illustrated in Table 4, it becomes evident that there

is no statistically significant difference between the total scores of the physical benefit and social benefit sub-dimensions and the total scores of the recreational benefit scale and the total scores of the life satisfaction scale. In the psychological benefit sub-dimension, the difference in the direction of women is statistically significant.

Table 5

Evaluation of Life Satisfaction and Recreational Benefit Levels of the Participants according to Their Ages

	Age	N	Rank Mean	sd	X^2	η2	p	difference
Physical benefits	18-20[1]	136	214.28		3.658	1.21	.454	-
	21-23[2]	174	223.02					
	24-26[3]	69	231.70					
	27-29[4]	50	231.18					
	30 +[5]	12	163.96					
Psychological benefits	18-20[1]	136	217.29		9.490	0.96	**.050**	**2>5**
	21-23[2]	174	231.55					
	24-26[3]	69	230.45					
	27-29[4]	50	204.55					
	30 +[5]	12	124.25					
Social benefits	18-20[1]	136	196.42		16.124	0.04	**.003**	**1<2**
	21-23[2]	174	244.00					
	24-26[3]	69	236.09	4				
	27-29[4]	50	203.21					
	30 +[5]	12	153.46					
Total Score of Recreation Utility Scale	18-20[1]	136	206.00		8.254	3.44	.083	-
	21-23[2]	174	235.24					
	24-26[3]	69	232.09					
	27-29[4]	50	213.42					
	30 +[5]	12	152.33					
Total Life Satisfaction Scale Score	18-20[1]	136	227.85		7.382	3.32	.117	-
	21-23[2]	174	205.25					
	24-26[3]	69	239.28					
	27-29[4]	50	217.06					
	30 +[5]	12	283.04					

1 = 18–20 years, 2 = 21–23 years, 3 = 24–26 years, 4 = 27–29 years, 5 = 30 years and above

Table 5 reveals that there is no statistically significant difference between the physical benefit sub-dimension of the recreational benefit scale and the total scores of the recreational benefit scale and the total scores of the life satisfaction scale, when the life satisfaction and recreational benefit levels of the participants according to their ages are examined. A statistically significant difference was identified between the psychological benefit sub-dimension and the social benefit sub-dimension, with individuals aged 21-23 exhibiting a higher level of benefit than those aged 30 and above, and individuals aged 18-20 demonstrating a higher level of benefit than those aged 21-23.

Table 6

Relationship between Life Satisfaction and Recreational Benefit

		Physical benefits	Psychological benefits	Social benefits	Total Life Satisfaction Scale Score
Life Satisfaction	r	-.073	-.065	-.145**	-.109*
	p	.124	.172	.002	.023

Upon examination of Table 6, it becomes evident that there is a weak negative correlation between life satisfaction and the recreational benefit scale, as well as the physical, psychological and social benefit sub-dimensions and the total scores for the life satisfaction scale.

DISCUSSION & CONCLUSION

The findings of the present study demonstrated that there was no statistically significant discrepancy between the physical benefit, social benefit sub-dimensions, and total scores of the recreational benefit scale and the life satisfaction scale total scores of women and men. However, it was observed that women reported higher scores in the psychological benefit sub-dimension compared to men, indicating that women derive more psychological benefits from recreational sports activities. The study's findings suggest that women's engagement in recreational sports leads to notable psychological benefits, including reduced stress, enhanced mood, and elevated self-esteem. These outcomes potentially contribute to an increase in their overall life satisfaction. This observation aligns with the findings of previous studies (Lee et al., 2016).

The study also revealed that there were differences in life satisfaction and recreational benefit levels according to the age groups of the participants. In particular, individuals in the 21-23 age group were found to report higher levels of psychological benefits compared to individuals aged 30 years and older. Similarly, individuals in the 18-20 age group perceived more social benefits than those in the 21-23 age group. These findings suggest that young adults may derive more psychological and social benefits from recreational sport activities (Ertüzün et al., 2020). Moreover, these results are in line with previous studies emphasizing the potential of recreational sports to provide young adults with social support, a sense of belonging, and peer interaction.

The study also identified a weak negative relationship between life satisfaction and recreational benefit level, suggesting that individuals with higher life satisfaction may perceive less benefit from recreational activities. This finding aligns with the literature suggesting a complex relationship between life satisfaction and the benefits obtained from leisure activities (Güldür and Yaşartürk, 2020). Consequently, individuals with elevated life satisfaction may have a diminished need for recreational activities because they are generally satisfied with their lives. Conversely, individuals with diminished life satisfaction may regard such activities as a means of enhancing their quality of life.

The present study is not without its limitations. Firstly, the cross-sectional design precludes definitive inferences regarding the causal direction of the relationship between life satisfaction and recreational utility. Secondly, the convenience sample of students from a single university in Istanbul may limit the generalizability of the findings. Thirdly, the self-reported nature of the data introduces the risk of social desirability bias.

Notwithstanding these limitations, the findings offer significant implications for enhancing university students' life satisfaction and recreational benefits. It is recommended that

universities provide students with opportunities to participate in recreational sports activities and inform them about alternative methods to increase life satisfaction (Chen et al., 2013).

Future research should include longitudinal designs to examine the causal dimensions of the relationship between life satisfaction and recreational utility, particularly among participants from diverse cultural contexts, as this may offer valuable insights into the generalizability of these findings to other populations.

The present study observed that female subjects reported a greater degree of psychological benefits from recreational sports than their male counterparts. The findings further indicated that individuals within the 21-23 age bracket reported higher levels of psychological benefits compared to those aged 30 and above. Additionally, individuals in the 18-20 age group exhibited a stronger perception of social benefits compared to those in the 21-23 age group. A modest negative correlation was identified between life satisfaction and the level of recreational benefit.

Conclusion

Despite the assumption that engagement in recreational activities leads to greater pleasure and enjoyment, this may not always be the case. Although it is widely acknowledged that engagement in sports and physical activity can alleviate feelings of loneliness and foster a sense of well-being and positivity (Kaya, 2021; Demirci and Çavuşoğlu, 2022), the pursuit of alternative forms of gratification can also contribute to an individual's happiness. For some individuals, participation in sports and recreational activities represents a source of happiness. For others, however, activities such as spending time with family and friends may prove more conducive to positive affect.

Recommendation

Based on the results of the study, the following recommendations have been developed. Training and seminars can be given for managers to use humor effectively in the workplace. In addition, the importance of using humor correctly and the harms of excessive humor to businesses can be conveyed in the trainings. In addition, managers should use humor as a tool to involve employees, strengthen team spirit and relieve stressful situations. In particular, humor can increase employees' flexibility and reduce stress levels in the workplace in stressful or challenging tasks. Managers can strategically adjust the use of humor when necessary by evaluating the effects of humor on productivity and morale.

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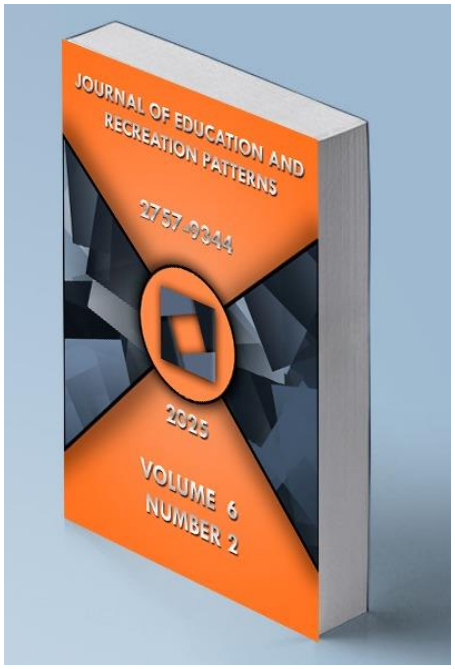

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Relationships Between Weight Status, Physical Activity, Nutritional Behaviors, and Life Satisfaction in Middle School Students

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Relationships Between Weight Status, Physical Activity, Nutritional Behaviors, and Life Satisfaction in Middle School Students

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ABSTRACT

The aim of this study was to examine the relationships among weight status, physical activity, nutritional habits, and life satisfaction in middle school students. The study was conducted with a sample of 216 students (96 male and 120 female) attending public middle schools. Data was collected using a personal information form, the Physical Activity Questionnaire for Older Children (PAQ-C), the Nutritional Behavior Scale, and the Satisfaction with Life Scale for Children. In addition, objective physical activity data were obtained using Polar Ignite® smartwatches, which participants wore continuously for only a 48-hour monitoring period. Statistical analyses included independent samples t-tests, one-way analysis of variance (ANOVA), chi-square tests, and Pearson correlation analyses. The results indicated that 61.1% of the participants were classified as normal weight, while 23.1% were overweight and 11.1% were obese. Male participants exhibited significantly higher Body Mass Index (BMI) values than female participants ($p<0.05$). No significant gender differences were observed in physical activity levels, life satisfaction, or nutritional habits ($p>0.05$). However, 11-year-old students demonstrated significantly higher physical activity levels and healthier nutritional habits than students aged 12 and 13 years. Correlation analyses revealed positive and significant associations between physical activity and life satisfaction, as well as between physical activity and nutritional habits ($p<0.01$). No significant association was found between life satisfaction and nutritional habits ($p>0.05$). In conclusion, promoting sustained physical activity and healthy nutrition during early adolescence may support both physical health and psychosocial well-being among middle school students overall effectively.

Keywords: Nutrional Behaviors, Obesity, Physical Activity.

INTRODUCTION

Childhood obesity has become a major global health concern and has increased dramatically over the years (Kimin et al., 2022). Obesity generally reflects an energy imbalance resulting from excessive energy intake due to unhealthy nutrition habits, combined with physical inactivity and a sedentary lifestyle. The World Health Organization (WHO) defines obesity as an abnormal or excessive accumulation of fat that may impair health (WHO, 2021). According to data from the World Obesity Federation (2024), in 2020 there were 435 million overweight or obese children worldwide, and this number is expected to reach 770 million by 2035.

Childhood obesity is a significant problem that negatively affects both physical and psychosocial development and often persists in adulthood if not addressed early. Research indicates that individuals who are obese during childhood tend to remain obese in adulthood (Galle et al., 2022). Although obesity is a multifactorial condition with genetic, environmental, behavioral, and socioeconomic roots, it is closely associated with dietary behaviors and reduced physical activity (Samakidou et al., 2023). Currently, children engage in physical activity levels far below the recommended guidelines (WHO, 2021). In addition, unhealthy dietary behaviors such as frequent consumption of high-calorie and low-nutrient foods, poor breakfast habits, meal skipping, and excessive portion sizes contribute to an increased risk of obesity (Liberali et al., 2020; Liu et al., 2018).

The body, especially during adolescence, strongly defends its fat stores, and lifestyle modifications alone are often insufficient to treat obesity (Kelly, 2023). The presence of obesity during adolescence increases lifelong mortality risk due to cardiovascular diseases and type 2 diabetes mellitus (Twig et al., 2016). The adverse effects of obesity are not limited to physical health; it is also known to negatively affect children's psychological and social well-being. Obese children may experience difficulties in social interactions with their peers, which can lower their life satisfaction (Baile et al., 2020; Shen & Kogan, 2021). Life satisfaction is defined as an individual's evaluation of their own life based on personal criteria and is considered a significant indicator of children's overall psychosocial well-being (Wadsworth & Pendergast, 2014).

A pronounced decline in life satisfaction has been observed during adolescence (Proctor, Linley, & Maltby, 2009). In this context, numerous studies have focused on identifying the factors underlying decreases in physical activity levels and life satisfaction among adolescent male students and female students. Evidence indicates that factors such as increased screen time (Matin et al., 2017), rising levels of sedentary behavior (Parker et al., 2021), and intensified academic demands (Yoo, Kahng, & Kim, 2017) are associated with reductions in physical activity, which coincide with declines in life satisfaction during adolescence. Current evidence further suggests that physical activity may be meaningfully related to adolescents' subjective well-being through its regulatory role in both positive and negative affect (Gao et al., 2025). Moreover, active participation in leisure-time activities may contribute to higher life satisfaction by providing physical, social, and psychological benefits, reducing sedentary behavior, enhancing social interaction, and ultimately improving overall quality of life (Ekinci, Tercan, & Kaya, 2025).

Concurrently, dietary habits, such as the consumption of healthy foods (like fruits and vegetables), healthy eating behaviors (like eating breakfast regularly), and unhealthy food intake (like sugar-sweetened and carbonated beverages), may be closely linked to subjective health perception, an important aspect of children's health and well-being (Holder, 2019; Veenhoven, 2021). From a developmental perspective, regular and balanced nutrition during childhood and early adolescence is linked to key determinants of life satisfaction, such as

academic performance, emotional stability, and social interactions. This suggests that the association between nutritional behaviors and life satisfaction may be shaped through both biological mechanisms (e.g., energy balance and neurotransmitter functioning) and psychosocial pathways (e.g., self-efficacy, daily routines, and family support). In contrast, findings regarding the relationship between unhealthy food consumption and psychological outcomes are inconsistent. A common belief holds that unhealthy foods may provide temporary mood enhancement (Wahl et al., 2017). Some limited evidence supports this assumption, suggesting that the consumption of carbonated beverages may reduce feelings of unhappiness among children (Chang & Nayga, 2010). Conversely, other studies indicate that excessive consumption of junk food and sugar-rich products may adversely affect children's mental health and lead to lower life satisfaction in the long term (Waters et al., 2019; García-Hermoso et al., 2022).

Healthy lifestyle behaviors are known to form during the early stages of life and influence habits in adulthood. Behaviors acquired during childhood can lead to important health consequences later in life, such as an increased risk of obesity. This is crucial for raising physically and psychologically healthy generations (Kimin et al., 2022; Stok et al., 2018; Scaglioni et al., 2018). Therefore, regular monitoring of overweight and obesity conditions among children and adolescents is necessary (Zhang et al., 2024).

Although childhood obesity is closely linked to physical activity, nutritional behaviors, and psychological well-being, existing research has rarely examined these dimensions simultaneously using both objective and subjective assessment methods in middle school populations. To date, most studies have relied predominantly on self-reported measures of physical activity and lifestyle behaviors, which may be vulnerable to recall bias and subjective interpretation. In this context, the present study adopts a multidimensional framework that integrates smartwatch-based objective measurements of physical activity with self-reported assessments of nutritional behaviors and life satisfaction. By concurrently examining objectively measured body mass index (BMI) and physical activity alongside subjective lifestyle and psychosocial indicators, this study aims to provide novel evidence on how different measurement approaches relate to obesity-associated risk factors among middle school.

METHOD

Research Model

This study employed quantitative research design using the general survey model. The survey model aims to describe a situation that existed in the past or currently exists as it is, and to identify relationships between variables (Karasar, 2012).

Study Group

The study sample consisted of 216 secondary school students attending public schools in Aksaray province. A power analysis was conducted using G*Power 3.1 software to determine the sample size of the study. In the analysis, the effect size was determined as 0.3, the significance level (α) as 0.05 and the test power (1-β) as 0.95, and in this direction, it was determined that it would be sufficient to conduct the study with a minimum of 142 participants. In order to prevent possible data loss, 216 participants were included in the study. The demographic characteristics of the participants in the study are presented in Table 1.

Table 1

Descriptive Statistics of Participants

Variables	Group	n	%
Gender	Male	96	44.4
	Female	120	55.6
Age	11 years	98	45.4
	12 years	68	31.5
	13 years	50	23.1

Table 1 shows that the study sample consisted of 96 male students (44.4%) and 120 female students (55.6%). Regarding age, 98 students (45.4%) were in the 11 years, 68 (31.5%) 12 years and 50 (23.1%) 13 years.

Data Collection Instruments

The data collection instruments used in this study are described below.

Personal Information Form: A form developed by the researchers was used to collect demographic information about the participants (gender, age, economic status).

Physical Activity Questionnaire for Children (PAQ-C): The Physical Activity Questionnaire for Children (PAQ-C), developed by Kowalski et al. (1997) and adapted into Turkish by Erdim et al. (2019), was used to assess students' physical activity levels. The content validity coefficient of the scale was reported as 0.95, and the Cronbach's alpha reliability coefficient was 0.77.

Nutritional Behavior Scale: The Nutritional Behavior Scale developed by Edmundson et al. (1996) and adapted into Turkish by Öztürk and Erdoğan (2010) was used to assess students' dietary habits. The scale consists of 14 items, with scores ranging from -14 to +14, where higher scores indicate healthier nutritional behaviors. The Cronbach's alpha coefficient of the scale was found to be 0.68.

Satisfaction with Life Scale for Children: The Satisfaction with Life Scale, developed by Diener et al. (1985) and adapted into Turkish by Dağlı and Baysal (2016), is a single-dimensional instrument consisting of five items. Cronbach's alpha reliability coefficient of the scale was 0.87.

Determination of Body Mass Index (BMI): Following the completion of the questionnaires, anthropometric measurements were conducted. Prior to weighing, the electronic scale was calibrated, and students were measured in light clothing and without shoes. A portable stadiometer was used for height measurements. Students stood with feet together, and the head was positioned in the Frankfort horizontal plane. The intersection point of the ruler with the vertical plane was recorded. Body Mass Index (BMI) was calculated and classified according to the Centers for Disease Control and Prevention (CDC) reference values as follows: BMI < 5th percentile = underweight; 5th–84th percentile = normal weight; 85th–94th percentile = overweight; and ≥95th percentile = obese (National Center for Health Statistics, 2000).

Daily Step Count Measurement: To determine the participants' daily physical activity levels, Polar Ignite® (Finland) smartwatches were used. Students were instructed to wear the devices continuously for 48 hours.

Procedure for Data Collection

The study was approved by the Aksaray University Human Research Ethics Committee (Date: 21.10.2021; Protocol No: 2021/09-01). Following ethical approval, permissions were obtained from school administrations, and written informed consent was collected from parents. Questionnaire data were gathered from voluntary participants in classroom settings. Subsequently, all participants received training on how to use smartwatches. The devices were distributed, and participants were instructed not to remove them for 48 hours. After the measurement period, the watches were collected, and the recorded data were transferred to electronic format for analysis.

Data Analysis

All collected data were entered into a computer and analyzed using SPSS 22.0 program. Initially, normality assumptions were tested. Skewness and kurtosis values were found to be within the ±1.5 range recommended by Tabachnick and Fidell (2007), indicating that the data were normally distributed. Therefore, parametric tests were employed in subsequent analyses. Participants' demographic characteristics and nutrition/sleep habits were summarized using frequency and percentage distributions. Independent samples t-tests, chi-square and one-way ANOVA were used to examine differences between groups, and Scheffe post-hoc test was applied when significant differences were detected. Pearson correlation analysis was conducted to determine relationships between variables. All statistical analyses were performed at a 95% confidence level, and a significance level of $p<0.05$ was adopted throughout the study.

FINDINGS

This section presents the results of the statistical analyses conducted to examine differences and relationships among the study variables.

Table 2

Distribution of Participants' Mean Daily Step Counts

Number of steps per day	Male		Female		Total	
	Mean	Sd	Mean	Sd	Mean	Sd
Day 1	9104.1	631.51	8611.7	773.73	8319.9	687.64
Day 2	9272.4	813.15	8836.9	935.52	8324.9	993.71
Total	9188.3	722.35	8723,8	854.63	8322.9	840.68

Male n=96, Female n=120, total n=216

As shown in Table 2, the participants' mean daily step count over the two-day monitoring period was 8,322.9 steps/day. The mean step count on the first day was 8,319.9 steps/day, while on the second day it was 8,324.9 steps/day. According to gender, the average total daily step count was 9,188.3 steps/day for male students and 8,723.8 steps/day for female students.

Table 3

Frequency and Percentage Distribution of Students' Physical Activity Levels

Gender	Low PA Level	Normal PA Level	High PA Level
Male	18 (18.8%)	54 (56.2%)	24 (25%)
Female	28 (23.8%)	56 (46.2%)	36 (30%)
Total	46(21.3%)	110 (50.8%)	60 (27.9%)

Male n=96, Female n=120, total n=216

As shown in Table 3, 21.3% (n=46) of the students exhibited low levels of physical activity, 50.8% (n=110) demonstrated moderate levels, and 27.9% (n=60) showed high levels of physical activity. When analyzed by gender, 18.8% (n=18) of male students had low, 56.2% (n=54) had moderate, and 25.0% (n=24) had high levels of physical activity. Among female students, 23.8% (n=28) had low, 46.2% (n=56) had moderate, and 30.0% (n=36) had high levels of physical activity participation.

Table 4

Frequency and Percentage Distribution of Students' Life Satisfaction Levels

Gender	Low	Normal	High
Male	26 (27.1%)	26 (27.1%)	44 (45.8%)
Female	42 (35.0%)	28 (23.3%)	50 (41.7%)
Total	68 (31.5%)	54 (25%)	94(43.5%)

Male n=96, Female n=120, total n=216

According to Table 4, it is observed that 31.5% (n=68) of the students had a low level of life satisfaction, 25% (n=54) had a moderate level, and 43.5% (n=94) had a high level of life satisfaction. In terms of gender, 27.1% (n=26) of male students had low, 27.1% (n=26) had moderate, and 45.8% (n=44) had high levels of life satisfaction. Among female students, 35% (n=42) had low, 23.3% (n=28) had moderate, and 41.7% (n=50) had high levels of life satisfaction.

Table 5

Distribution of Body Mass Index (BMI) Categories by Gender and Results of the Chi-square Test

Body Mass Index (BMI)	Gender n (%)		Total	p
	Male	Female		
Underweight	6 (6.3%)	4 (3.3%)	10 (4.6%)	**0.001***
Normal weight	42 (43.8%)	90 (75%)	132 (61,1%)	
Overweight	30 (31.3%)	20 (16.7%)	50 (23.1%)	
Obese	18 (18.8%)	6 (5%)	24 (11.2%)	

Table 5 presents the results of the chi-square test examining the association between gender and BMI categories. The analysis revealed a statistically significant association between gender and BMI ($p<0.05$).

Table 6

Changes in Physical Activity, Life Satisfaction and Nutritional Behavior by Gender

Variable	Gender	n	Mean	Sd	t	P
Physical Activity	Male	96	3.53	0.75	0.463	0.644
	Female	120	3.49	0.65		
Life Satisfaction	Male	96	17.67	4.93	1.125	0.262
	Female	120	16.83	5.76		
Nutrition Behavior	Male	96	0.53	4.11	1.140	0.255
	Female	120	-0.18	4.92		

As shown in Table 6, no statistically significant differences were detected between male and female students in physical activity, life satisfaction, or nutrition behavior scores ($p>0.05$).

Table 7

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior by Age

Variable	Age	n	Mean	Sd	F	p	Difference
Physical Activity	(1) 11 years	98	3.73	0.64	14.31	**0.000***	1 > 2 > 3
	(2) 12 years	68	3.46	0.64			
	(3) 13 years	50	3.13	0.69			
Life Satisfaction	(1) 11 years	98	16.96	5.20	1.95	0.145	
	(2) 12 years	68	18.21	5.78			
	(3) 13 years	50	16.32	5.19			
Nutrition Behavior	(1) 11 years	98	1.35	4.92	6.62	**0.002***	1 > 2 > 3
	(2) 12 years	68	-0.87	4.01			
	(3) 13 years	50	-0.88	4.08			

**(p<0.05)*

As shown in Table 7, a statistically significant difference was observed among the age groups in terms of physical activity levels (F=14.31, p<0.05). The findings indicate that 11-year-old students demonstrated higher physical activity levels than 12- and 13-year-old students, and that 12-year-old students also exhibited higher levels than 13-year-olds. Regarding life satisfaction, no statistically significant differences were found among the age groups (F=1.95, p>0.05). In terms of nutrition behavior, 11-year-old students had significantly higher nutrition behavior scores than 12- and 13-year-old students (F=6.62, p<0.05).

Table 8

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior Levels by Economic Status

Variable	Group	n	Mean	Sd	F	p	Difference
Physical Activity	(1) Low	27	3.32	0.83	3.700	**0.026***	1<3
	(2) Medium	153	3.48	0.67			
	(3) High	36	3.77	0.64			
Life Satisfaction	(1) Low	27	12.85	6.67	11.086	**0.000***	1<3
	(2) Medium	153	17.72	4.97			
	(3) High	36	18.28	4.77			
Nutritional Behavior	(1) Low	27	1.04	4.16	0.661	0.517	
	(2) Medium	153	-0.05	4.69			
	(3) High	36	0.25	4.43			

**(p<0.05)*

As presented in Table 8, differences were observed in participants' physical activity, life satisfaction, and nutritional behavior scale scores. A statistically significant difference was found among the groups in terms of physical activity levels (F=3.700, p<0.05). Individuals with high economic status exhibited significantly higher levels of physical activity compared to those with low economic status. Regarding life satisfaction, participants with moderate and high economic status demonstrated significantly higher levels of life satisfaction than those with low economic status (F=11.086, p<0.05). However, no statistically significant differences were found among the groups in terms of nutritional behavior scores (F=0.661, p>0.05).

Table 9

Changes in Physical Activity, Life Satisfaction, and Nutritional Behavior Levels According to Body Mass Index

Variable	Group	n	Mean	Sd	F	p	Difference
Physical Activity	(1) Underweight	10	3.96	0.62	2.047	0.108	
	(2) Normal weight	132	3.53	0.71			
	(3) Overweight	50	3.40	0.64			
	(4) Obese	24	3.39	0.68			
Life Satisfaction	(1) Underweight	10	3.80	0.91	1.262	0.288	
	(2) Normal weight	132	3.42	1.04			
	(3) Overweight	50	3.57	1.15			
	(4) Obese	24	3.13	1.14			
Nutritional Behavior	(1) Underweight	10	-0.71	0.16	0.369	0.775	
	(2) Normal weight	132	0.12	0.32			
	(3) Overweight	50	-0.02	0.36			
	(4) Obese	24	0.05	0.32			

Table 9 compares the mean scores of physical activity, life satisfaction, and nutritional behavior according to the participants' body mass index (BMI). The findings revealed no statistically significant difference between BMI groups in terms of physical activity, life satisfaction, and nutritional behavior scores ($p>0.05$).

Table 10

The Relationship Between Physical Activity, Life Satisfaction, and Nutritional Behavior

Variables	1	2	3
1. Physical Activity	1		
2. Life Satisfaction	0.202*	1	
3. Nutritional Behavior	0.183*	0.043	1

**(p<0.05).*

Table 10 presents the correlations among physical activity, life satisfaction, and nutritional behavior scores. The results indicate a positive and significant correlation between physical activity and life satisfaction ($r=0.202$), suggesting that individuals with higher levels of physical activity tend to report greater overall life satisfaction. Similarly, a positive and significant correlation was observed between physical activity and nutritional behavior ($r=0.183$). However, no significant correlation was found between life satisfaction and nutritional behavior ($r=0.043$).

DISCUSSION

This study aimed to provide data that could contribute to the development of preventive strategies promoting healthy lifestyle behaviors during childhood by examining the relationships among key factors that may influence the risk of childhood obesity—namely, body mass index (BMI), physical activity level, life satisfaction, and nutritional behaviors.

The findings of the present study revealed that middle school students took an average of

8,322 steps per day as measured by smart watches. This result suggests that the participants were generally physically active. According to Tudor-Locke et al. (2011), children should achieve at least 6,000 steps per day at moderate to vigorous intensity to meet the recommended physical activity guidelines. In this context, the participants in the present study exceeded the recommended daily step count, indicating satisfactory levels of physical activity. Furthermore, consistent with previous research, male students were found to take more steps than female students. However, it should be noted that in the present study, smartwatches were worn for a 48-hour period.

The results of this study showed that 21.3% of students had low, 50.8% had moderate, and 27.9% had high levels of physical activity. Although male students exhibited higher levels of physical activity, this difference was not statistically significant. These results are consistent with some studies in the literature (Marufoğlu & Kutlutürk, 2021; Al-Zandee & Ünlü, 2019), but contrast with others reporting gender differences in physical activity levels (Hazar et al., 2017). Such discrepancies across studies may be attributed to variations in sample characteristics, environmental factors, or the type and intensity of physical activities examined.

Similarly, 27.1% reported low, 50.8% moderate, and 27.9% high levels of life satisfaction. life satisfaction scores did not differ significantly by gender. Regarding life satisfaction, previous research has produced mixed findings with respect to gender. Chen et al. (2024) found no significant gender difference in life satisfaction among children, although they noted a slight tendency favoring male students. In contrast, several studies have reported that female students scored significantly lower than male students (Goldbeck et al., 2007; Kaye-Tzadok et al., 2017; Newland et al., 2019). Similarly, research focusing on adolescents has shown that females tend to report lower life satisfaction levels (Llosada-Gistau et al., 2015; Tomyn et al., 2015).

Another finding of the present study was that male students exhibited higher healthy nutritional behavior scores than female students; however, this difference was not statistically significant. This finding reflects the inconsistency in the existing literature regarding gender-related differences in nutritional behaviors. For example, Mizia et al. (2021) reported that men's diets were characterized by a significantly higher prevalence of adverse health-related dietary characteristics compared with those of women. Conversely, Kuzay (2024) demonstrated that female students possessed higher levels of nutritional knowledge than male students. In a similar vein, Kartal et al. (2019) found no significant gender differences in nutritional knowledge, while reporting higher mean scores for healthy eating behavior, exercise behavior, and meal regularity among male students. These findings suggest that nutritional knowledge does not necessarily translate into healthier dietary behaviors and that gender-related differences in nutrition-related behaviors may be influenced by cultural, environmental, and psychosocial factors.

Another finding of the study was that the majority of participants were classified as normal weight (61.1%), followed by overweight (23.1%), obese (11.1%), and underweight (4.6%)Gender-based analyses revealed significantly higher BMI values among male students compared with female students. This finding aligns with several previous studies reporting higher BMI levels in male children and adolescents (Alkan et al., 2022; Giralt et al., 2011; Hassapidou et al., 2017; Jia et al., 2017; Preston et al., 2015). Similarly, Chang et al. (2024) observed greater BMI increases among boys, while Chang (2022) reported higher BMI levels in males and suggested that insufficient physical activity may be more strongly associated with BMI in boys than in girls. Conversely, Kautiainen et al. (2005) reported higher BMI values among girls, underscoring the heterogeneity of findings across populations and study contexts. Although boys in the present study exhibited higher levels of physical activity than girls, this did not correspond to lower BMI values; instead, boys demonstrated higher mean BMI scores.

This discrepancy suggests that gender differences in BMI may not be attributable to physical activity alone. Rather, these differences may reflect the combined influence of biological maturation, hormonal regulation, and behavioral factors. In support of this interpretation, Zhang et al. (2022) reported significant associations between BMI and sex hormones, leptin, and irisin in children and adolescents, indicating that sex-specific hormonal processes may contribute to divergent body composition patterns between boys and girls.

The findings of the present study indicated that 11-year-old students had higher physical activity levels compared to 12- and 13-year-old students, and 12-year-olds were more active than 13-year-olds. Consistent with these results, Pate et al. (2022) reported a decline in physical activity with increasing age. In terms of nutritional behavior, 11-year-old students also scored higher than those in older age groups, suggesting that as age increases, children may experience a deterioration in nutrition habits. Prior studies have shown that the frequency of unhealthy food consumption increases, and regular nutrition habits decrease during the transition to adolescence (Mazur & Małkowska-Szkutnik, 2018; Myszkowska-Ryciak et al., 2019; Kolanowski, Ługowska & Trafialek, 2022). Therefore, the lower nutritional behavior scores observed among 12- and 13-year-old students in this study may be associated with the higher prevalence of unhealthy eating and meal-skipping tendencies reported in the literature.

Although 11-year-old students demonstrated more favorable physical activity and nutritional behavior scores, no significant differences in life satisfaction were observed across age groups. Contrary to our findings, Aymerich et al. (2021) reported that life satisfaction levels were significantly higher during childhood compared to pre-adolescence and adolescence, showing a decline with age. Similarly, Newland et al. (2019) emphasized that age is one of the strongest predictors of life satisfaction, with older children reporting lower levels. Life satisfaction, however, is influenced not only by age but also by various contextual factors such as family support, peer relationships, school environment, and psychological resilience. Supporting this, Zaborskis et al. (2022) found that family support and socioeconomic status significantly affected life satisfaction among adolescents aged 11–15. Therefore, the lack of significant differences in life satisfaction across age groups in our study may be attributable to similar levels of social support, family structure, or school environments among participants.

In terms of socioeconomic status, a significant difference was observed in physical activity levels, with participants from higher economic backgrounds demonstrating substantially greater engagement in physical activity than those from lower economic backgrounds. This finding is consistent with previous research indicating that higher socioeconomic status positively influences physical activity among children and adolescents (Ke et al., 2022; Ziegeldorf et al., 2024). Greater physical activity levels among children from more affluent families may be attributed to improved access to recreational facilities, stronger family support, broader socioeconomic resources, and more favorable environmental conditions.

Similarly, life satisfaction was significantly higher among participants from moderate and high economic backgrounds compared to those from low economic backgrounds. The literature consistently supports the view that socioeconomic status affects life satisfaction both directly and indirectly through mechanisms such as stress, parental support, educational opportunities, health, and social capital (Niu et al., 2024; Horanicova, 2022; Davisson, 2025). Accordingly, the positive association between economic status and life satisfaction observed in this study is consistent with well-established findings in previous research.

However, nutritional behavior scores did not differ significantly across economic groups. The literature on this issue remains inconclusive. Some studies have reported that children from higher socioeconomic backgrounds consume less healthy foods (Al Sabbah et al., 2007; Zaborskis et al., 2012; Morgan et al., 2021), while others have reported the opposite (Zaborskis

et al., 2021; Lazzeri et al., 2014; Voráčová et al., 2016). Gautam et al. (2023) found that children and adolescents from low socioeconomic backgrounds were more likely to engage in unhealthy eating behaviors. These mixed findings indicate that nutritional behaviors are shaped by multiple mediating variables such as parental modeling, school environment, and food accessibility. Accordingly, our findings suggest that the influence of economic status on nutritional behavior may vary depending on contextual factors, measurement methods, and the presence of intermediary variables.

When physical activity levels were analyzed according to Body Mass Index (BMI), no significant difference was found. In contrast, Kawalec et al. (2024) reported that insufficient physical activity was more pronounced among overweight and obese youth and highlighted the role of psychosocial factors such as low motivation and decreased physical self-efficacy in hindering active participation. Similarly, no significant differences were observed in life satisfaction or nutritional behavior scores across BMI groups. This finding is consistent with previous research indicating that subjective well-being and life satisfaction are not solely determined by body weight status, but are instead shaped by broader psychosocial, environmental, and cultural factors (Proctor et al., 2009). Likewise, nutritional behaviors have been shown to vary considerably within BMI categories, suggesting that dietary patterns are influenced more by contextual factors such as food environment, socioeconomic status, and nutrition knowledge than by BMI alone (Larson & Story, 2013).

A positive and significant relationship was found between physical activity and life satisfaction, indicating that individuals with higher levels of physical activity tend to report greater overall life satisfaction. This finding is consistent with the literature suggesting that physical activity during adolescence contributes not only to physiological but also to psychosocial well-being (Chmelík et al., 2023; Nie et al., 2025). Moreover, Nie et al. (2025) demonstrated that physical activity indirectly enhances life satisfaction through improvements in body esteem and emotional regulation.

A positive and significant correlation was also observed between physical activity and nutritional behavior, suggesting that more physically active students tend to adopt healthier dietary patterns. This result aligns with previous research indicating that healthy dietary behaviors are significantly associated with higher levels of physical activity (Chaireti et al., 2025; Fernandes et al., 2023). Engagement in physical activity may enhance students' health awareness, fostering a reciprocal reinforcement between dietary habits and movement-related behaviors.

Finally, no significant association was observed between life satisfaction and nutritional behavior in the present study. This finding suggests that nutritional behaviors may not be directly associated with levels of life satisfaction within the studied sample. The absence of a significant relationship may indicate that the link between these variables is shaped by other contextual or mediating factors. In this regard, although Chen et al. (2024) reported that regular breakfast consumption and higher fruit and vegetable intake were associated with greater life satisfaction, they also noted that such associations may differ according to age, cultural context, intrinsic motivation, and other psychosocial determinants.

Conclusion

The present study examined the relationships among body mass index (BMI), physical activity, life satisfaction, and nutritional behaviors in children. Overall, participants demonstrated moderate levels of BMI, physical activity, and life satisfaction. Findings indicated that male students engaged in higher levels of physical activity compared to females, while both physical activity and healthy nutritional behaviors declined with increasing age. Furthermore, students from higher socioeconomic backgrounds exhibited significantly greater

physical activity and life satisfaction scores. Also, positive associations were observed between physical activity, life satisfaction, and dietary behaviors.

Recommendations

Based on the findings of the present study, several recommendations can be proposed. First, given the positive associations observed between physical activity, life satisfaction, and healthy nutritional behaviors, interventions targeting childhood obesity prevention should adopt an integrated approach that simultaneously promotes physical activity, psychosocial well-being, and healthy eating habits. School-based programs, in particular, may play a critical role in fostering these interrelated behaviors at an early age. Second, the observed decline in physical activity and healthy nutritional behaviors with increasing age highlights the importance of sustaining healthy lifestyle practices during the transition from childhood to early adolescence. Age-appropriate and engaging physical activity opportunities should be developed to maintain participation, especially among older children. Third, the differences identified according to socioeconomic status underscore the need for policies and community-based initiatives that reduce socioeconomic disparities in access to physical activity opportunities and resources supporting well-being. Enhancing access to safe recreational spaces, organized sports, and school-supported physical activity programs may contribute to more equitable health outcomes.

Fourth, although male students demonstrated higher levels of physical activity, gender-sensitive strategies should be considered to encourage physical activity participation among girls, addressing potential social, environmental, and motivational barriers.

Finally, future research should employ longitudinal designs to better understand the developmental trajectories and directional relationships among BMI, physical activity, life satisfaction, and nutritional behaviors. The use of extended objective measurements and more comprehensive assessments of dietary behavior may further strengthen the evidence base and support the development of effective preventive strategies

Limitations

This study has several limitations that should be acknowledged. First, the study employed a relatively small sample drawn from a single region, which may limit the generalizability of the results. Second, the cross-sectional design precludes causal inferences regarding the observed relationships. Additionally, the reliance on self-reported measures of physical activity, life satisfaction, and nutritional behaviors may not fully reflect participants' actual behaviors or attitudes. The assessment of daily step counts over only two days may also fail to capture habitual physical activity accurately. Furthermore, the short duration of physical activity measurement (48 hours) represents an important methodological limitation. The assessment of economic status lacked objective criteria and relied partly on subjective evaluation, which may have introduced reporting bias. Finally, as data collected in October, potential seasonal effects on physical activity and related behaviors cannot be ruled out.

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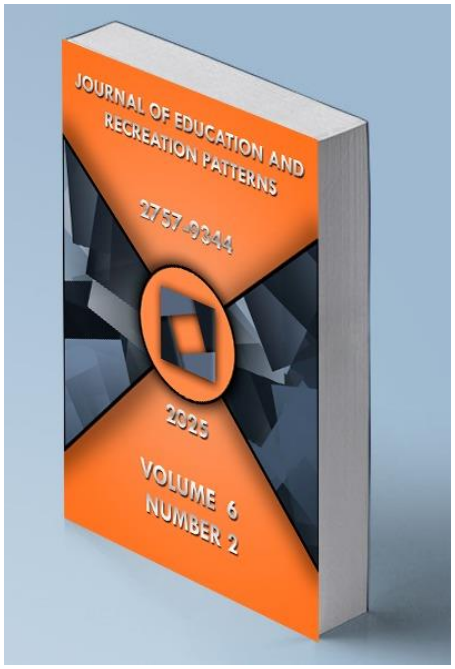

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Unraveling the Digital Distraction in the Context of Theory of Planned Behaviour: The Impact of Social Media Addiction on Academic Procrastination and Study Habits Among Undergraduate Students

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Unraveling the Digital Distraction in the Context of Theory of Planned Behaviour: The Impact of Social Media Addiction on Academic Procrastination and Study Habits Among Undergraduate Students*

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ABSTRACT
This study examines the association between social media addiction, academic procrastination, and study habits among undergraduate students in Türkiye using a cross-sectional correlational design. Data was collected from 549 undergraduates enrolled at universities in Konya through structured self-report questionnaires measuring social media addiction, academic procrastination, and study habits. Guided by the Theory of Planned Behavior, the study focuses on behavioral patterns rather than causal effects. The results show a significant positive association between social media addiction and academic procrastination, and a significant negative association between social media addiction and study habits. Female students reported higher levels of social media addiction, whereas male students reported higher levels of academic procrastination. Multiple regression analyses indicated that social media addiction is positively associated with academic procrastination, while stronger study habits are negatively associated with procrastination. Latent Profile Analysis identified three distinct student profiles, showing that lower levels of social media addiction are associated with more favorable academic behaviors. These findings highlight the importance of addressing study habits and self-regulation in efforts to manage social media use in academic contexts. The study provides behavioral evidence to inform educational practices, while future research should employ longitudinal designs and more diverse samples to strengthen generalizability.

Keywords: Academic Performance Enhancement, Behavioral Intervention, Digital Literacy, Educational Strategies, Leisure.

* The summary of this study was presented as an oral presentation under the title 'Academic Struggle in the Grip of Social Media: Examining the Relationship Between Social Media Addiction and Academic Procrastination in University Students' at the 5th International Recreation and Sport Management Congress held in Antalya, Turkey, 16-19 May 2024.

INTRODUCTION

In the digital era, social media played a central role in daily life, particularly among young people. Platforms such as Facebook, Instagram, and Twitter shape communication, information sharing, and leisure activities. Alongside these functions, concerns have grown regarding their academic implications. Previous studies show that frequent and uncontrolled use may develop into social media addiction, characterized by persistent urges to remain online and difficulty regulating use (Anierobi et al., 2021). Undergraduate students appear especially vulnerable due to their intensive reliance on social media during a critical academic period (Bhandarkar et al., 2021). One major academic concern linked to excessive social media use is academic procrastination. Students with high levels of social media engagement often delay academic tasks, experience reduced concentration, and show weaker time management skills (Dule et al., 2023; Hammad & Awed, 2023). Research also indicates that prolonged social media use is associated with disrupted study routines and lower learning efficiency (Serrano et al., 2022). These patterns align with broader findings showing declines in academic performance and quality of life among students with excessive digital engagement (Al Shaibani, 2020; Bhandarkar et al., 2021).

Despite growing evidence on these associations, existing studies tend to examine academic procrastination or performance as isolated outcomes. Fewer studies focus on study habits as a distinct behavioral dimension. Study habits reflect daily academic practices such as planning, regularity, and sustained engagement, which are essential for effective learning. Research suggests that compulsive social media use may undermine these routines, thereby indirectly increasing procrastination tendencies (Ch'ng & Soo Hoo, 2022). However, this behavioral pathway remains insufficiently examined. The relevance of this issue has increased alongside the deeper integration of digital technologies into educational environments (Geng et al., 2018). As social media becomes more embedded in students' daily routines, its potential to interfere with academic behaviors also grows (Bou-Hamad, 2020). Prior research highlights that excessive social media use is associated with higher academic stress and maladaptive coping patterns, which may further weaken academic engagement (Khalifa, 2021; Pasand et al., 2023). Although factors such as internet addiction and academic stress have been discussed in the literature as related risks (Caratiquit & Caratiquit, 2023; Nwosu et al., 2020), the present study focuses specifically on social media addiction, academic procrastination, and study habits to maintain conceptual clarity.

The specific research problem addressed in this study concerns the limited understanding of how social media addiction relates to academic procrastination through its association with study habits among undergraduate students. While prior studies confirm that compulsive social media use coincides with higher procrastination levels (Anierobi et al., 2021), the role of study habits as a central academic behavior remains underexplored. Addressing this gap, the present study examines the interrelationships among social media addiction, academic procrastination, and study habits in a unified framework. By doing so, it aims to provide empirical evidence that can inform educational strategies focused on strengthening study routines and supporting healthier academic behaviors among university students.

LITERATURE REVIEW

Social Media Addiction

Social media addiction is defined as a compulsive behavior characterized by an excessive preoccupation with social media platforms, leading to significant impairment in various aspects of life, including academic performance. Researchers have described social media addiction as a behavioral addiction involving excessive concern about social media, an uncontrollable urge to use it, and dedicating so much time and effort to it that it impairs other important areas of

life (Andreassen et al., 2017; Kuss & Griffiths, 2017). Studies have indicated that social media addiction can lead to negative outcomes such as poor academic performance, lower productivity, and increased levels of procrastination (Hou et al., 2019; Meier et al., 2016). Several studies have highlighted a significant relationship between social media addiction and academic procrastination, noting that students who are addicted to social media tend to delay their academic tasks more frequently (Caratiquit & Caratiquit, 2023; Taipe et al., 2023). However, there is a gap in research examining the direct impact of social media addiction on study habits specifically, rather than just general academic performance or procrastination. Most studies have focused on general student populations, with limited research targeting undergraduate students specifically, which presents a gap that this study aims to address (Kirschner & Karpinski, 2010; Panek, 2014). Addressing this gap, the current study explores how social media addiction impacts not only the tendency to procrastinate but also the quality and structure of students' study habits, thereby providing a more nuanced understanding of these dynamics.

Academic Procrastination and Study Habits

Academic procrastination is defined as the intentional delay of academic tasks, leading to anxiety, lower academic achievement, and poor study habits (Schraw et al., 2007; Steel, 2007). Procrastination in academic settings has been linked to various factors, including personality traits, time management skills, and external distractions such as social media use (Ferrari et al., 2005; Steel, 2010). The relationship between social media use and academic procrastination has been well-documented, with several studies highlighting that excessive social media use contributes to higher levels of procrastination among students (Caratiquit & Caratiquit, 2023; Ch'ng & Soo Hoo, 2022; Przepiórka et al., 2019; Serrano et al., 2022). Despite extensive research on academic procrastination, there is a notable lack of studies focusing on how social media addiction specifically affects students' study habits. While some studies have explored the broader impacts of procrastination on academic performance, few have examined how addictive behaviors related to social media might alter daily study routines and effectiveness (Kirschner & Karpinski, 2010; Panek, 2014). This study seeks to fill this gap by investigating how social media addiction impacts not only the tendency to procrastinate but also the quality and structure of students' study habits, providing a more comprehensive understanding of the interplay between these variables.

Theoretical Background and Hypotheses

The theoretical framework for this study is grounded in the theory of planned behavior (Ajzen, 1991), which suggests that individual behavior is driven by intentions, attitudes, subjective norms, and perceived behavioral control. Applying this theory to the context of social media addiction and academic behaviors, it is posited that students' addictive behaviors towards social media are likely to influence their academic intentions and actions, including procrastination and study habits (Andreassen et al., 2016; Kuss & Griffiths, 2017). Based on the existing literature and theoretical framework, the following hypotheses are proposed: If students exhibit higher levels of social media addiction, then they are more likely to engage in academic procrastination (H1). This hypothesis is supported by the consistent findings that excessive social media use is correlated with higher levels of procrastination (Ch'ng & Soo Hoo, 2022; Hammad & Awed, 2023; Przepiórka et al., 2019; Serrano et al., 2022). If students with social media addiction engage in academic procrastination, then their study habits will be negatively impacted (H2). This hypothesis is based on the assumption that procrastination disrupts regular study routines and reduces overall study effectiveness (Dule et al., 2023; Mou et al., 2024; Serrano et al., 2022). If social media addiction directly affects study habits, then students will exhibit poorer study habits compared to those with lower levels of addiction (H3). This hypothesis seeks to explore the direct link between addictive behaviors and study habits, filling the research gap identified in the literature (Annan-Brew & Nartey, 2021; Azizi et al.,

2019; Onun et al., 2023; Zhuang et al., 2023). In summary, while there is substantial evidence linking social media addiction to academic procrastination, the specific impact on study habits remains underexplored. This study aims to address this gap by examining the direct effects of social media addiction on both academic procrastination and study habits among undergraduate students, providing a more comprehensive understanding of the interplay between these variables.

METHOD

Participants and Data Collection

The population of this study consists of young adults aged 18-24 who are undergraduate students in Turkey, with a sample comprising 549 undergraduate students (399 female, 150 male) from universities in Konya, Turkey. Participants were recruited using a convenience sampling method. To ensure the sample size was adequate, we employed the Sample Size Calculator program, which indicated a minimum of 384 participants was necessary for a 95% confidence interval with a 5% margin of error (Raosoft, 2004). By obtaining data from 549 participants, we exceeded this requirement, enhancing the reliability of our findings. Data were collected through a structured questionnaire with 25 statements designed to assess social media addiction, academic procrastination, and study habits. The data collection process was conducted by two trained research assistants who distributed and collected the questionnaires over a four-week period.

Measures

In this study, two primary measurement tools were employed to assess the constructs of interest: the Bergen Social Media Addiction Scale (BSMAS) and the Academic Procrastination Scale (APS). The BSMAS was utilized to measure the degree of social media addiction among participants, providing insights into their online behavior and its potential impact on their daily lives. The APS was used to evaluate the extent of academic procrastination, capturing participants' tendencies to delay academic tasks and their study habits. Detailed characteristics of the BSMAS and APS, including their psychometric properties and validation processes, are provided in the subsequent subheadings.

Bergen Social Media Addiction Scale

The BSMAS is a unidimensional instrument comprising six items, originally developed by Andreassen et al. (2016). Its Turkish version was validated and tested for reliability by Demirci (2019). Responses are given on a five-point Likert scale, ranging from 1 (very rarely) to 5 (very often), resulting in a total score range of 6 to 30. The BSMAS was adapted from the Facebook Addiction Scale (FAS), also created by Andreassen et al. (2012). The FAS included six subscales and 18 items. The CFA demonstrated that the FAS had good construct validity, with model fit indices showing RMSEA= 0.04 and CFI= 0.99. The internal consistency of the FAS was 0.82. The BSMAS was later refined by Andreassen et al. (2016) to a single dimension with six items. The internal consistency for the BSMAS was reported as 0.88. Each item on the BSMAS aligns with six core addiction criteria: salience, mood modification, tolerance, withdrawal, conflict, and relapse. In Demirci's (2019) study validating the Turkish version of the BSMAS, CFA indicated a good model fit ($x2/df = 11.98$; RMSEA= 0.04; CFI= 0.99; TLI= 0.98), with an internal consistency coefficient of 0.83.

Academic Procrastination Scale

The APS is a comprehensive instrument developed by Çakıcı (2003) to measure procrastination behaviors specifically in academic contexts. The scale consists of 19 items divided into two sub-dimensions: procrastination (12 items) and regular study habits (7 items). Responses are provided on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly

agree). The psychometric properties of the APS were rigorously evaluated through exploratory and confirmatory factor analyses. The initial exploratory factor analysis revealed a two-factor structure, which was later confirmed through confirmatory factor analysis, demonstrating a good model fit. The internal consistency of the APS was high, with a Cronbach's alpha coefficient reported at 0.89. The scale's reliability was further supported by composite reliability scores and its validity was confirmed through heterotrait-monotrait ratio analysis. However, for the purposes of our study, the sub-dimensions were considered as separate variables and included in the analyses.

Data Analysis

Data analysis followed the study hypotheses and research aims. Frequency analysis described the sample structure and supported group comparisons. Skewness and kurtosis values checked data normality and justified the use of parametric tests. Correlation analysis examined the basic associations among social media addiction, academic procrastination, and study habits. This step provided preliminary support for H1 and H2. Independent groups t-tests compared mean differences in procrastination and study habits across key groups. These tests helped identify whether academic behaviors differed by social media addiction level. Multiple regression analysis tested the predictive relationships proposed in the hypotheses. Social media addiction was entered as a predictor of academic procrastination to test H1. Academic procrastination and social media addiction were then used as predictors of study habits to test H2 and H3. This approach allowed the assessment of both indirect and direct effects on study habits. Latent Profile Analysis identified distinct social media addiction profiles among students. This method explored whether different usage patterns related to different levels of procrastination and study habits. This analysis strengthened the interpretation of H3 by revealing behavioral differences across profiles. All analyses were conducted using IBM SPSS Statistics and Mplus software.

FINDINGS

Normality and Internal Consistency Results

The normality of the variables—Social Media Addiction, Academic Procrastination, and Study Habits—was assessed using skewness and kurtosis values (Table 1). Skewness values near zero indicate symmetrical values near zero, while kurtosis values suggest a normal distribution. For Social Media Addiction, the skewness was -0.0643 and kurtosis was -0.177. For Academic Procrastination, the skewness was 0.0185 and kurtosis was -0.497. For Study Habits, the skewness was -0.115 and kurtosis was 0.0654. According to Kline (2023), skewness values within the range of ±1 and kurtosis values within ±3 are acceptable for normality in small to medium samples. Therefore, all three variables appear to be normally distributed as their skewness and kurtosis values fall within the acceptable thresholds.

In addition to distributional properties, the internal consistency of the study variables was examined using Cronbach's alpha coefficients (Table 1). The Social Media Addiction scale showed acceptable reliability ($\alpha = 0.772$). Academic Procrastination demonstrated high internal consistency ($\alpha = 0.852$). Study Habits also showed acceptable reliability ($\alpha = 0.763$). These values exceed the commonly accepted threshold of 0.70, indicating that all scales reliably measured their intended constructs within the current sample. Together with the normality results, these findings support the suitability of the data for subsequent parametric analyses.

Table 1

Skewness-Kurtosis Results

Statistic	Social Media Addiction	Academic Procrastination	Study Habits
Mean	2.90	2.98	3.03
Standard deviation	0.832	0.775	0.748
Skewness	-0.0643	0.0185	-0.115
Std.error of skewness	0.104	0.104	0.104
Kurtosis	-0.177	-0.497	0.0654
Std. error of kurtosis	0.208	0.208	0.208
Cronbach's alpha	0.772	0.852	0.763

Correlation Matrix

The correlation analysis (Table 2) provides initial support for the study hypotheses. H1 proposed that higher levels of social media addiction would be associated with higher academic procrastination. The results support H1. Social media addiction showed a moderate positive correlation with academic procrastination, indicating that students with higher addiction levels tend to delay academic tasks more frequently. H2 proposed that academic procrastination would be associated with poorer study habits. This hypothesis is also supported. Academic procrastination showed a moderate negative correlation with study habits, suggesting that increased task delay corresponds with weaker and less regular study routines. H3 proposed a direct association between social media addiction and study habits. The results support H3. Social media addiction showed a moderate negative correlation with study habits, indicating that higher addiction levels relate to poorer study behaviors. Gender showed weak but significant correlations with social media addiction and academic procrastination, suggesting behavioral differences by gender. No significant correlations were found between purposes of social media use and the main study variables, indicating that usage intensity, rather than usage purpose, is more relevant for academic outcomes.

Table 2

Correlation Results

Variable		(1)	(2)	(3)	(4)	(5)
(1) Social Media Addiction	Pearson's r	—				
	p-value	—				
(2) Academic Procrastination	Pearson's r	0.434***	—			
	p-value	< .001	—			
(3) Study Habits	Pearson's r	-0.268***	-0.479***	—		
	p-value	< .001	< .001	—		
(4) Gender	Pearson's r	-0.127**	0.102*	-0.071	—	
	p-value	0.003	0.016	0.095	—	
(5) Purposes of social media use	Pearson's r	0.065	0.035	-0.041	0.012	—
	p-value	0.125	0.419	0.343	0.784	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Independent Samples T-Test Results

Independent samples t-test results (Table 3) further clarify group differences. Female students reported significantly higher levels of social media addiction than male students. This finding is consistent with H1 and H3, as higher addiction levels were linked to both procrastination and weaker study habits. Male students reported significantly higher levels of academic procrastination than female students, which aligns with H1. No significant gender difference was found in study habits. This result suggests that gender influences addiction and procrastination levels but does not directly differentiate daily study routines.

Table 3

Independent Samples T-Test Results

Variable	Group	*N*	*M*	*t*	*df*	*p*	Effect Size
Social Media Addiction	Female	399	2.96				
	Male	150	2.73	2.98	547	0.003	0.286
Academic Procrastination	Female	399	2.93				
	Male	150	3.10	-2.41	547	0.016	-0.231
Study Habits	Female	399	3.06				
	Male	150	2.94	1.67	547	0.095	0.160

Note. H_a $\mu_{female} \neq \mu_{male}$

Multiple Regression Results

The multiple regression analysis (Table 4) directly tested H1, H2, and H3. Social media addiction emerged as a significant positive predictor of academic procrastination, providing strong support for H1. Study habits emerged as a significant negative predictor of academic procrastination, supporting H2. Students with stronger study habits showed lower levels of procrastination. Together, social media addiction and study habits explained 33% of the variance in academic procrastination. This result highlights the combined influence of digital behavior and daily academic routines on procrastination outcomes.

Table 4

Multiple Regression Results

Variable	β	*SE*	*t*	*p*	Lower	Upper
Intercept	3.315	0.1716	19.32	< .001		
Social Media Addiction	0.306	0.0339	9.04	< .001	0.257	0.400
Study Habits	-0.405	0.0377	-10.75	< .001	-0.462	-0.319

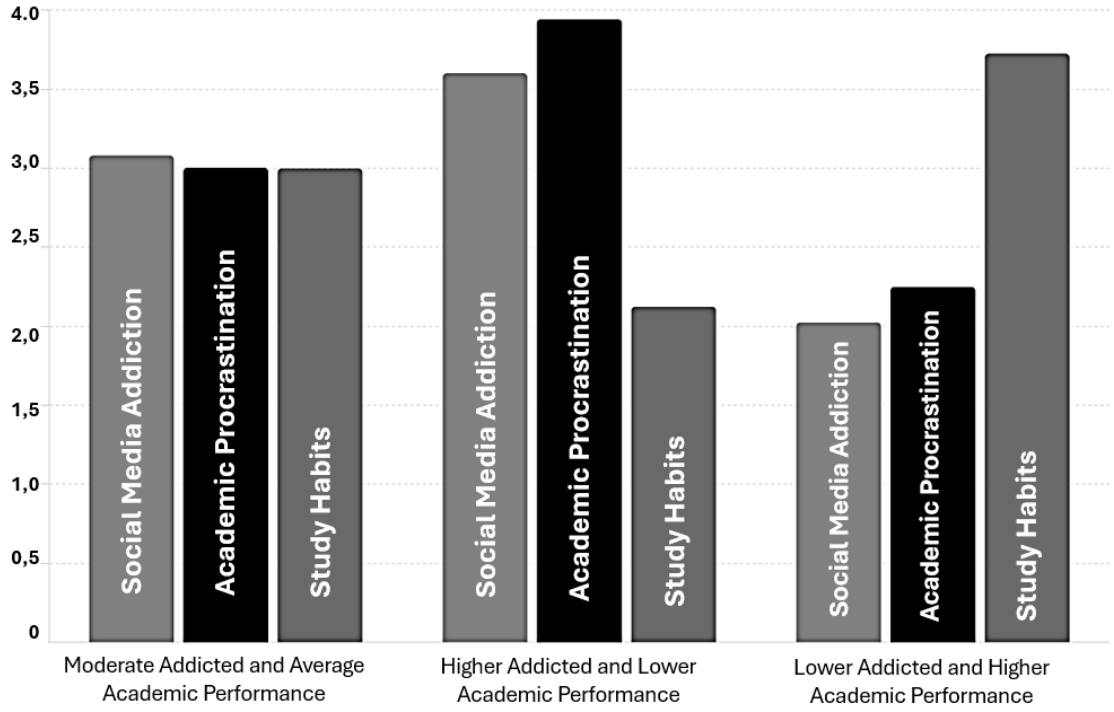
Note. Dependent Variable was Academic Procrastination, $R^2 = 0.330$.

Latent Profile Results

Latent Profile Analysis (Figure 1) identified three distinct student profiles based on social media addiction, academic procrastination, and study habits. Students in the "Lower Addicted and Higher Performance" profile showed better study habits and lower procrastination, supporting H3. Students in the "Higher Addicted and Lower Performance" profile showed poor study habits and high procrastination, supporting H1 and H2. These profiles demonstrate that social media addiction differentiates academic behavior patterns. Lower addiction levels align with structured study habits and reduced procrastination. Higher addiction levels align with academic delay and weaker study routines.

Figure 1

Mean Values Of Social Media Addiction, Academic Procrastination, and Study Habits For Each Profile



DISCUSSION

This study examined the links among social media addiction, academic procrastination, and study habits in undergraduate students. The findings clarify how these variables relate within a single model. Prior studies often examined each factor alone. This study integrates them and explains their joint effects on academic behavior. H1 proposed that higher social media addiction relates to higher academic procrastination. The results support H1. Students with higher addiction levels showed stronger procrastination tendencies. This finding aligns with earlier work that links frequent platform use to task delay and reduced self-control (Çiftçi & Özavcı, 2023; Surjandy & Kangliesky, 2024). Social media use appears to interrupt task initiation and sustain avoidance of academic duties. H2 proposed that academic procrastination negatively affects study habits. The findings support H2. Students who delayed academic tasks reported weaker study routines and lower study consistency. Procrastination disrupted planning, time allocation, and sustained effort. This result confirms prior evidence that delay behavior undermines effective study practices (Dule et al., 2023; Mou et al., 2024). H3 proposed a direct effect of social media addiction on study habits. The results also support H3. Even when procrastination was considered, higher addiction levels related to poorer study habits. This finding highlights a direct behavioral pathway. Social media addiction appears to weaken study discipline beyond its effect through procrastination. This result addresses the main research gap and extends earlier findings that treated study habits as a secondary outcome (Azizi et al., 2019; Zhuang et al., 2023).

Several alternative explanations should be considered. Cultural norms may shape social media use patterns and academic expectations. These factors may influence procrastination behavior in ways not captured by the model. Methodological factors also matter. Self-report measures may inflate associations due to shared method bias. Cross-sectional data limit causal

inference. Reverse effects remain possible. Poor study habits may also increase reliance on social media as a coping strategy. Despite these limits, the study offers clear implications. Interventions should address both procrastination and daily study routines. Reducing platform use alone may not be sufficient. Programs that strengthen planning skills and study structure may reduce the academic impact of social media addiction. This integrated perspective supports more targeted and effective academic support strategies.

Limitations

This study has several limitations that affect the interpretation of the findings. First, convenience sampling restricts generalization. The sample reflects undergraduate students from universities in Konya, Turkey. Local academic norms, digital access, and cultural attitudes toward social media may shape use patterns and procrastination behavior. As a result, the strength of the observed relationships may differ in other regions or education systems. Second, the study relied on self-report measures. Participants may have underestimated social media use or procrastination due to social desirability. This bias may have weakened or inflated associations among variables. The results therefore reflect perceived behaviors rather than objectively measured actions. Third, the cross-sectional design limits causal interpretation. The findings support the proposed directions in H1, H2, and H3. However, reverse relationships remain possible. Poor study habits or high procrastination may also increase social media use as an avoidance strategy. Longitudinal designs are needed to clarify temporal order. Fourth, the study did not include key confounding variables. Personality traits, academic stress, and mental health factors may influence both social media addiction and academic behavior. Their absence may partially explain the observed effects and limits the explanatory scope of the model. Fifth, the gender imbalance in the sample may shape the results. The higher number of women may have influenced mean addiction scores and group comparisons. Gender-related findings should therefore be interpreted with caution. Finally, although validated scales were used, they may not capture all behavioral dimensions. Subtle patterns of study behavior or platform-specific use may remain unobserved. These limitations suggest caution in interpreting the findings and point to clear directions for future research.

Future Research

Future research should address several key areas to build upon the findings of this study. First, employing longitudinal designs would help establish causal relationships between social media addiction, academic procrastination, and study habits, providing insights into how these dynamics evolve over time. Second, expanding the demographic diversity of the sample, including students from different regions, countries, and educational institutions, would enhance the generalizability of the results and allow for cross-cultural comparisons. Third, future studies should consider including additional variables such as personality traits, mental health status, and environmental factors, which could serve as potential confounders or moderators in the relationship between social media use and academic behaviors. Fourth, employing mixed-method approaches, incorporating both quantitative and qualitative data, could provide a deeper understanding of the underlying mechanisms and contextual factors influencing these relationships. Additionally, research should aim to develop and validate more comprehensive measurement tools that capture the multifaceted nature of social media addiction, academic procrastination, and study habits. Finally, intervention-based studies are recommended to test the efficacy of various strategies designed to mitigate the adverse effects of social media addiction on students' academic performance and well-being. Such interventions could include digital literacy programs, time management workshops, and mental health support services, providing practical solutions for educators and policymakers.

Conclusion

This study offers a clear contribution by showing that study habits play a central role in the link between social media addiction and academic procrastination. Rather than treating procrastination as a stand-alone outcome, the findings reveal that weakened daily study routines form a key pathway through which social media addiction harms academic behavior. This focus on study habits extends prior research and clarifies the behavioral mechanism behind academic delay. The main take-home message is that social media addiction affects how students organize, plan, and sustain their study activities. Poor study habits emerge not only as a consequence of procrastination but also as a direct outcome of addictive social media use. This insight shifts attention from screen time alone to the structure of everyday academic practices. From a practical perspective, the findings suggest that effective interventions should target study habits alongside digital use. Educators and student support services may achieve stronger outcomes by combining time management training, structured study planning, and digital self-regulation strategies. By highlighting study habits as a core leverage point, this study provides a focused direction for future research and offers actionable guidance for improving academic functioning in digitally intensive learning environments.

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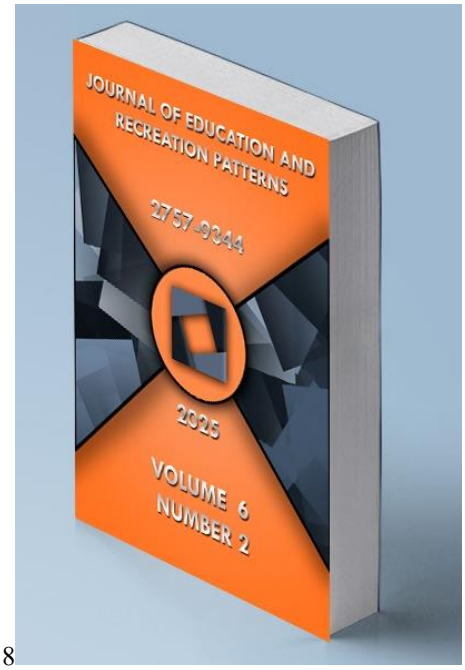

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Examining the Relationship Between Life Skills Supporting Learning and Leadership Behavior Levels in Recreation Department Education

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ABSTRACT

The aim of the study was to examine the relationship between recreation department students' learning-supporting life skills and leadership behavior levels. A correlational screening model was used as a research method. The research population consisted of 250 recreation department students studying at the Faculty of Sport Sciences at Fırat University in the 2024-2025 academic year. The study sample consisted of 164 students. A personal information form, a recreational leadership behavior scale, and a learning-supporting life skills scale were used as data collection tools. SPSS 24 analysis program was used to analyze the data. Normal distribution was determined. Percentage, frequency, and arithmetic mean values were calculated. T-test, ANOVA, Pearson correlation, and linear regression analysis were used to determine effect size. All analyses were conducted at a 95% confidence interval. As a result, it was determined that the participants demonstrated positive tendencies in terms of both leadership and life skills. Leadership behaviors and life skills were similar across age groups, while no relationship was observed between these variables and gender. Leadership training was found to have no significant impact on leadership behaviors and life skills, but individuals who regularly read leadership-related documents (books, articles, etc.) adopted a less oppressive and controlling leadership style. Furthermore, it was concluded that as students' life skills improved, their recreational leadership behaviors also strengthened, and therefore, every improvement in life skills contributed to a significant improvement in leadership behavior.

Keywords: Leadership Behavior, Learning, Life Skills, Recreation.

INTRODUCTION

Recreation is derived from the Latin word ‘recreatio,’ meaning ‘recreation,’ and is defined as the utilisation of free time. As humans are the only beings that inherently feel the need to recreate themselves, the concept of recreation is unique to human life (Erdemli, 2008). In the time remaining after daily obligations, individuals wish to engage in meaningful activities according to their own tastes and preferences. Such activities are generally referred to as recreation. Since recreation takes shape according to individual preferences, it has been defined in various ways by different researchers (Karaküçük, 2014). Recent studies also emphasise that recreation contributes significantly to individual development and well-being (Koçak et al., 2025). As participation recreational activities in leisure time increased, the life satisfaction perception increased, and the perception of automatic thought decreased (Çolak et al., 2023).

Since the dawn of time, humankind has felt the need to organise itself as a social entity in order to meet its basic needs and live in communities (Topaloğlu & Koç, 2017). People who come together for political, religious, military or economic purposes require leaders to maintain order within these groups and achieve their goals (Saylı & Baytok, 2014). Leadership is a phenomenon as old as human history and remains an important subject of research today. Throughout history, leaders have played different roles in societies, such as prophets, kings, thinkers, commanders, artists, and teachers (Erel, 2008). The words ‘leader’, ‘to lead’ and ‘leadership’ derive from the Anglo-Saxon root ‘lead’, meaning ‘path’ or “direction”. Anglo-Saxon sailors also used this word to mean ‘ship's course’ (Yıldız, 2013). The Turkish Language Association defines the French-derived word ‘leader’ as ‘leader, chief’; and “leadership” as ‘leadership, the leader's duty’ (Ekinci, 2022).

The term ‘leader’ is used to denote an individual who shows the way, provides leadership, can anticipate the needs and expectations of their followers, and is creative. ‘Leadership’ is defined as the art of motivating employees and coordinating them to enable an organisation to achieve its goals (Tunçer, 2012). Leadership is the ability to influence individuals' attitudes, thoughts, and behaviours. A leader is someone who guides employees, motivates them, and directs them towards goals in order to achieve the organisation's objectives (Koçel, 2014). Recent research also highlights that leadership tendencies are associated with personality traits and behavioural patterns (Genç et al., 2024).

Recreational leadership is a concept that developed in the 1920s with the growing interest in recreational activities. It emphasises the importance of leaders who support individuals' mental, physical and spiritual development and help them make productive use of their free time (Arıkan, 2002). This type of leadership aims to provide group members with the pleasure of participation, ensure happiness, and guide and direct them towards activities (Kozak & Yüncü, 2009). Recreational leadership is critical to the success and continuity of activities. Recreational leaders are responsible for ensuring member satisfaction, directing activities, and influencing them (Karaküçük et al., 2017). In recreational leadership, it is important for the leader to manage group dynamics, build commitment, set norms, manage communication and conflict, and provide motivation (Kozak & Yüncü, 2009).

The concept of recreation is in high demand, particularly in countries with high levels of education, alongside healthy living trends (Tütüncü, 2008). This interest has encouraged the establishment of recreation departments in developed countries (Tütüncü, 2008). Recreation departments were first established in the United States in the mid-1920s, and the NRPA developed training programs to cultivate professional leaders (Kızanlıklı, 2014). In the 1940s, curricula for this field were created at North American universities, and students were trained in public recreation, therapeutic recreation, and outdoor activities (Godbey et al., 2005). In Turkey, awareness of healthy living, efforts to improve the quality of life for individuals with

disabilities, and the need for a qualified workforce increased interest in recreation, leading to the establishment of departments in this field (Tütüncü, 2008). These departments, which initially began within the SBT and BESYO, later spread to Tourism Faculties (Tütüncü, 2012). Recreation department courses were first offered at Middle East Technical University, Marmara University, and Gazi University (Tütüncü, 2008; Zorba, 2008).

Life skills, which are widely used in education, health and social fields, are defined in different ways in the human sciences. Danish et al. (2004) define life skills as skills that enable individuals to succeed in different contexts such as school, home and the street. Parry and Nomikou (2014), on the other hand, emphasise that life skills are acquired through experience and learning, explaining them as a set of skills used to solve problems encountered in daily life. The World Health Organisation (WHO, 1999) defines life skills as skills that enable individuals to cope with daily life problems, develop their ability to adapt, and help them exhibit positive behaviours. Life skills are learnable and developable and are classified as physical (e.g., standing upright), behavioural (e.g., effective communication), cognitive (e.g., effective decision-making), interpersonal, and intrapersonal skills (Cronin & Allen, 2017). In this context, life skills are grouped in different ways depending on the field or program. For example, Gazda & Brooks (1985) addressed life skills within the scope of personal development in seven categories, classifying them as problem solving, communication, determination, self-confidence, critical thinking, and centralised thinking (Özmete, 2011).

Papacharisis et al. (2005) categorised life skills under the headings of remaining calm under pressure, problem solving, goal setting, communication, coping with success and failure, teamwork, and receiving feedback. In a project funded by the World Bank and conducted by the International Youth Foundation (IYF, 2014), 57 different life skills were examined, and 10 core standards were identified from among them. The core life skills defined by the Foundation are as follows: self-confidence, respect for others and oneself, interpersonal skills (empathy, compassion), emotional management, personal responsibility (trust, honesty, work ethic), positive attitude and motivation, conflict management, teamwork, communication (listening, verbal and written), cooperation, creative thinking, critical thinking, problem solving and decision making. The World Health Organisation (WHO, 1999) and UNICEF (1999) have also classified life skills as follows: decision-making, problem-solving, creative thinking, critical thinking, effective communication, interpersonal skills, self-awareness, empathy, coping with emotions and coping with stress.

The primary objective of this study is to examine the relationship between life skills that support learning and leadership behaviour levels, taking into account individual differences among recreation department students, such as age, gender, prior leadership training, and reading of leadership-related documents (books, articles, etc.). The number of existing studies on this subject is quite limited and has mostly focused on the relationship between leadership and variables such as social skills, communication, or emotional intelligence. However, there are no studies that directly address life skills and leadership behaviours together, especially in the context of recreation department students. In this respect, the study aims to fill this gap in literature, both theoretically by revealing the interaction between leadership development and life skills, and practically by contributing to educational programmes aimed at developing the leadership capacities of university youth.

METHOD

Research Model

In the study, the correlational survey model, one of the quantitative research methods, was used to determine the relationship between the life skills that support learning and the

leadership behaviour levels of recreation department students. The correlational survey model aims to determine the existence or degree of co-variation between two or more variables (Karasar, 2005).

Universe and Sample

The population of the study consisted of 250 recreation department students enrolled at the Faculty of Sports Sciences at Fırat University during the 2024-2025 academic year. The sample of the study was also determined by the convenience sampling method among students studying at the Faculty of Sports Sciences at Fırat University (n=(n=(N.N−1)+(tsd,α2.p.q)/ ((α2.(N−1)+(tsd,α2.p.q))) and it was determined that the minimum number of subjects sufficient for maximum power was at least 152 (d=0.05, α=0.05, p=0.5). (Ural and Kılıç, 2006: 48). A total of 164 students participated in the study.

Data Collection Tool

In the study, the Personal Information Form prepared by the researchers, the Recreational Leadership Behaviour Scale, and the Life Skills Supporting Learning Scale were used as data collection tools.

Personal Information Form: The personal information form created by the researchers to determine the participants' sociodemographic information consisted of four questions (age, gender, previous leadership training, and reading of leadership-related documents (books, articles, etc.)).

Recreational Leadership Behaviour Scale: The study utilised the Recreational Leadership Behaviour Scale developed by Durhan et al. (2022). The scale consists of 15 items in total, is a 5-point Likert scale, and comprises two sub-dimensions. The sub-dimensions are differentiated as democratic leadership and autocratic leadership. The lowest possible score on the scale is 15, and the highest possible score is 75. When examining the original form of the scale, confirmatory factor analysis provides evidence of construct validity (RMSEA .072, SRMR .67, NFI .90, CFI .93, NNFI .92, x2/df 3.06). Furthermore, considering the original form of the scale, the internal consistency coefficient for the democratic leadership sub-dimension was determined to be .78, while the internal consistency coefficient for the autocratic leadership sub-dimension was .64. The internal consistency coefficient for the entire scale was .60. The internal consistency coefficients obtained from the data set were determined as .80 for democratic leadership, .62 for autocratic leadership, and .59 for the entire scale. While the internal consistency coefficient of the scale was α=.60, it was determined as α=.80 for the democratic factor and α=.62 for the autocratic factor.

Life Skills Supporting Learning Scale: In the study, the 'Learning Supportive Life Skills Scale for Higher Education Students' developed by Köksal and Yakar (2022) was used. Validity and reliability analyses were conducted during the scale development process. The scale, which is a 5-point Likert type and single-factor structure, consists of 23 items. According to exploratory factor analysis, the single-dimensional structure explains 43.94% of the total variance. In confirmatory factor analysis, item-factor loadings ranged from .50 to .67. Upper-lower group comparisons were found to be significant, and the Cronbach's alpha value was .94.

Data Analysis

SPSS 24 analysis software was used to analyse the data collected in the study. The skewness and kurtosis analysis results showed that the data was normally distributed. Percentages, frequencies and overall mean values were determined based on the data obtained. The independent sample t-test was used to analyse variables with two groups in the study. The ANOVA test was used for variables with more than two groups. Pearson correlation analysis was used to determine the relationship between the scales, and linear regression analysis was

used to determine the effect between them. The analysis of the study data was performed at a 95% confidence interval.

Research Ethics

Throughout all stages of the research, the 'Guidelines on Scientific Research and Publication Ethics for Higher Education Institutions' were followed, and permission was obtained from the Fırat University Social and Humanities Research Ethics Committee on 22 April 2025, numbered 33835

FINDINGS

This section presents the statistical findings regarding the participants' demographic characteristics, recreational leadership behaviors, and life skills supporting learning.

Table 1

Results of the Normality Test for Scales

Scale	Factor	Skewness	Kurtosis
Recreational Leadership Behavior Scale	Scale Total Score	-,158	-,303
	Democratic	-,341	,474
	Autocratic	-,145	-,478
Life Skills Scale Supporting Learning	Scale Total Score	-,160	,401

According to the normality test (skewness and kurtosis) conducted on the recreational leadership behaviour scale and its sub-factors, as well as the life skills scale that supports learning, it was determined that the data fell within the range of +1.5 to -1.5 and exhibited a parametric distribution (Tabachnick and Fidell, 2013). Therefore, since the data exhibit a normal distribution, they are both usable and the analysis results are considered statistically reliable.

Table 2

Demographic Variables

Variable	Group	n	%
Age	18–20 Years Old	42	25,6
	21–25 Years Old	98	59,8
	26–30 Years Old	12	7,3
	31 And above	12	7,3
Gender	Woman	67	40,9
	Man	97	59,1
Previous Leadership Training Experience	Yes	72	43,9
	No	92	56,1
Reading Status of Documents Related to Leadership (books, articles, etc.)	Yes	70	42,7
	No	94	57,3

As shown in Table 2, a total of 164 individuals participated in the study. Looking at the age distribution of the participants, 42 individuals (25.6%) were in the 18-20 age group, 98 individuals (59.8%) were in the 21-25 age group, 12 individuals (7.3%) were in the 26-30 age group, and 12 individuals (7.3%) were in the 31 and above age group. In terms of gender, 67

participants were female (40.9%) and 97 were male (59.1%). Regarding previous leadership training, 72 participants (43.9%) stated that they had received training, while 92 (56.1%) stated that they had not. Regarding reading leadership-related documents (books, articles, etc.), 70 participants (42.7%) stated that they had read such sources, while 94 participants (57.3%) stated that they had not.

Table 3

General Average Scores for Scales and Sub-Factors

Scale	Factor	n	Min.	Max.	$\overline{X}$	Std.
Recreational Leadership Behavior Scale	Scale Total Score	164	44,00	67,00	56,01	4,97
	Democratic	164	19,00	40,00	33,12	4,29
	Autocratic	164	14,00	33,00	22,89	4,07
Life Skills Scale Supporting Learning	Scale Total Score	164	59,00	115,00	93,18	12,02

According to Table 3, the mean total score ($\bar{x}$=56.01) on the recreational leadership behaviour scale is found to be at a moderate level. Among the sub-factors of this scale, the average score for democratic leadership behaviour ($\bar{x}$=33.12) is higher than that for autocratic leadership behaviour ($\bar{x}$=22.89), indicating that participants exhibit more democratic leadership characteristics. The total score average of the Life Skills Supporting Learning Scale ($\bar{x}$=93.18) is slightly above average, indicating that individuals possess life skills supporting learning to a large extent. These results reveal that participants show positive tendencies in terms of both leadership and life skills.

Table 4

Results of the ANOVA Test According to Age Variable

Scale	Factor	Age	n	Mean	Sd.	F	p
Recreational Leadership Behavior Scale	Scale Total Score	18–20 Years Old	42	55,38	4,83	1,242	,297
		21–25 Years Old	98	56,17	4,82		
		26–30 Years Old	12	54,83	6,56		
		31 and above	12	58,16	4,70		
		Total	164	56,01	4,97		
	Democratic	18–20 Years Old	42	32,33	4,09	1,810	,148
		21–25 Years Old	98	33,23	4,02		
		26–30 Years Old	12	32,58	5,29		
		31 and above	12	35,50	5,56		
		Total	164	33,12	4,29		
	Autocratic	18–20 Years Old	42	23,04	3,86	,134	,940
		21–25 Years Old	98	22,93	4,04		
		26–30 Years Old	12	22,25	5,29		
		31 and above	12	22,66	4,24		
		Total	164	22,89	4,07		
Life Skills Scale Supporting Learning	Scale Total Score	18–20 Years Old	42	94,21	13,36	1,421	,239
		21–25 Years Old	98	92,52	10,66		
		26–30 Years Old	12	89,50	14,82		
		31 And above	12	98,66	14,04		
		Total	164	93,18	12,02		

According to the ANOVA test results presented in Table 4, there is no statistically significant difference between the groups in the total score and sub-factors (Democratic and Authoritarian) of the Recreational Leadership Behaviour Scale and the total score of the Learning Supportive Life Skills Scale, depending on the age variable ($p > .05$). This result indicates that individuals in different age groups have similar values in terms of recreational leadership behaviour and life skills.

Table 5

Results of the t-Test According to Gender Variable

Scale	Factor	Gender	n	Mean	Sd.	t	p
Recreational Leadership Behavior Scale	Scale Total Score	Woman	67	55,56	4,43	-,998	,320
		Man	97	56,32	5,30		
	Democratic	Woman	67	33,00	4,27	-,302	,763
		Man	97	33,20	4,32		
	Autocratic	Woman	67	22,56	3,47	-,858	,392
		Man	97	23,12	4,44		
Life Skills Scale Supporting Learning	Scale Total Score	Woman	67	93,91	11,57	,651	,516
		Man	97	92,68	12,35		

According to the t-test results presented in Table 5, there was no statistically significant difference between female and male participants in the total score of the Recreational Leadership Behaviour Scale and its sub-dimensions (Democratic and Authoritarian) and the total score of the Life Skills Supporting Learning Scale based on the gender variable ($p > .05$). This finding indicates that gender does not have a decisive effect on the levels of leadership behaviour and life skills measured by these scales.

Table 6

Results of the t-Test According to the Variable of Previous Leadership Training

Scale	Factor	Receiving Education	n	Mean	Sd.	t	p
Recreational Leadership Behavior Scale	Scale Total Score	Yes	72	56,68	5,17	1,500	,136
		No	92	55,50	4,77		
	Democratic	Yes	72	33,31	4,18	,523	,602
		No	92	32,96	4,39		
	Autocratic	Yes	72	23,36	4,15	1,288	,200
		No	92	22,53	4,00		
Life Skills Scale Supporting Learning	Scale Total Score	Yes	72	93,72	10,89	,518	,605
		No	92	92,76	12,87		

When examining the t-test results in Table 6, it is observed that there is no statistically significant difference between the groups that received leadership training and those that did not in terms of the total score and sub-factors of the Recreational Leadership Behaviour Scale and the total scores of the Learning Supportive Life Skills Scale ($p > .05$). This result indicates that having received leadership training does not have a significant effect on the levels of leadership behaviour and life skills measured by these scales.

Table 7

Results of the T-Test Based on The Reading Status Variable for Documents Related to Leadership (books, articles, etc.)

Scale	Factor	Leadership-Related Document	n	Mean	Sd.	t	p
Recreational Leadership Behavior Scale	Scale Total Score	Yes	70	55,42	5,23	-1,295	,197
		No	94	56,45	4,74		
	Democratic	Yes	70	33,67	4,39	1,409	,161
		No	94	32,71	4,19		
	Autocratic	Yes	70	21,75	4,46	-3,171	,002
		No	94	23,74	3,56		
Life Skills Scale Supporting Learning	Scale Total Score	Yes	70	93,30	12,72	,106	,916
		No	70	55,42	5,23		

According to the t-test results in Table 7, there is no significant difference between the groups in the total score of the recreational leadership behaviour scale, the democratic sub-factor, and the total score of the life skills supporting learning scale based on the variable of reading leadership-related documents (books, articles, etc.) ($p > .05$). However, a significant difference was found in the autocratic sub-factor ($p < .05$); this indicates that those who read leadership-related documents have significantly lower autocratic leadership behaviour scores than those who do not read such documents. This result suggests that individuals who regularly read leadership-related documents (books, articles, etc.) are less likely to adopt authoritarian, i.e., more controlling and domineering, leadership behaviours. In other words, acquiring leadership-related knowledge may contribute to individuals moving away from authoritarian leadership attitudes and possibly towards more democratic, participatory leadership approaches. However, this reading habit does not create a significant difference in the total recreational leadership behaviour score or in life skills that support learning.

Table 8

Pearson Correlation Results by Scale

Scale		Recreational Leadership Behavior Scale
Life Skills Scale Supporting Learning	**r**	,421**
	p	,000

n=164 **=p<,001

According to the results of the Pearson correlation analysis conducted based on the scales, a moderate positive correlation (r=.421** p<.000) was observed between the levels of life skills supporting learning and the levels of recreational leadership behaviour among the students participating in the study. This finding indicates that as students' life skills improve, their recreational leadership behaviour also increases, revealing that learning-supportive life skills play an important role in strengthening leadership behaviour.

Table 9

Results of Linear Regression Analysis by Scale

Dependent Variable: Recreational Leadership Behavior Scale					
	B	**Std. Error**	**β**	**t**	**p**
Life Skills Scale Supporting Learning	39,787 ,174	2,769 ,029	,421	14,369 5,910	,000 ,000
	R= ,421	**R²**=,177			
	F=34,927	**p**<,01			

According to the results of the linear regression analysis conducted based on the scales, it was observed that the levels of life skills supporting learning among the students participating in the study had a statistically significant effect on their levels of recreational leadership behaviour (R=.421, R^2=.177). This indicates that each increase in life skills leads to a marked improvement in leadership behaviour and that these skills account for approximately 18% of the development of students' leadership competencies. Therefore, developing life skills that support learning plays a critical role in enhancing students' leadership capacities.

DISCUSSION

The aim of our study is to determine the relationship between recreation department students' life skills that support learning and their levels of leadership behaviour. When examining the overall mean scores for the scales and their sub-factors (Table 3), it is seen that the mean total score for the recreational leadership behaviour scale ($\bar{x}$=56.01) is at a moderate level. It is understood that the average of the sub-factor of democratic leadership behaviour ($\bar{x}$=33.12) is higher than that of autocratic leadership behaviour ($\bar{x}$=22.89), and that the participants exhibit more democratic leadership characteristics. The total mean score of the Life Skills Supporting Learning Scale ($\bar{x}$=93.18) is slightly above average, indicating that individuals possess a high degree of life skills supporting learning. These results reveal that participants demonstrated positive tendencies in terms of both leadership and life skills. According to the study conducted by Mutlu et al. (2020), students' leadership behaviour levels were found to be high when considering the scores obtained from the scale. In other words, it reveals that the participants showed positive trends in terms of leadership behaviour. The findings of the examined study support our work. Avcı and Kamer (2018) emphasised in their study that the participants' life skills levels were low. It cannot be said that the findings of the studies examined yielded the same results as our study.

In our study, when the ANOVA test results according to the age variable (Table 4) are examined, there is no statistically significant difference between the groups in the total score of the recreational leadership behaviour scale and its sub-factors (Democratic and Authoritarian) and the total score of the life skills supporting learning scale ($p > .05$). This result indicates that individuals in different age groups have similar values in terms of recreational leadership behaviours and life skills. In their study, Cakmak et al. (2022) found no significant difference between the age variable and life skills. İrhan (2023) found no significant difference between students' recreational leadership behaviours and age ($p>0.05$). The findings of the studied research support our study.

In our study, when the t-test results according to the gender variable (Table 5) were examined, no statistically significant difference was found between female and male

participants in the total score of the recreational leadership behaviour scale and its sub-dimensions (Democratic and Authoritarian) and the total score of the life skills supporting learning scale ($p > .05$). This finding indicates that gender does not have a decisive effect on the levels of leadership behaviour and life skills measured by these scales. In their study, Cakmak et al. (2022) found that male students had higher life skills, stress coping, and empathy-self-awareness than female students, showing a significant gender-related difference. The findings of the studies reviewed cannot be said to be consistent with our study. In his study, İrhan (2023) found no significant difference between students' recreational leadership behaviours and gender ($p>0.05$). The findings of the study reviewed support our study.

In our study, when examining the t-test results (Table 6) according to the variable of having previously received leadership training, no statistically significant difference was found between the groups that received training and those that did not in terms of the total score and sub-factors of the recreational leadership behaviour scale and the total scores of the life skills that support learning scale ($p > .05$). This result indicates that having received leadership training does not have a significant effect on the levels of leadership behaviour and life skills measured by these scales. In their study, Ordu et al. (2024) found that students with leadership experience may have more developed recreational leadership skills. Taşkıran (2018) found that students who received recreation and leadership training had higher levels of authority-oriented leadership than those who did not receive such training. The findings of the studies reviewed cannot be said to be consistent with our study.

In our study, when the t-test results (Table 7) were examined according to the variable of reading leadership-related documents (books, articles, etc.), no significant difference was found between the groups in the total score of the recreational leadership behaviour scale, the democratic sub-factor, and the total score of the life skills supporting learning scale ($p > .05$). However, a significant difference was found in the autocratic sub-factor ($p < .05$); this indicates that those who read leadership-related documents have significantly lower autocratic leadership behaviour scores than those who do not read such documents. This result suggests that individuals who regularly read leadership-related documents (books, articles, etc.) are less likely to adopt authoritarian, i.e., more controlling and domineering, leadership behaviours. In other words, acquiring leadership-related knowledge may contribute to individuals moving away from authoritarian leadership attitudes and possibly towards more democratic, participatory leadership approaches. However, this reading habit does not create a significant difference in the total recreational leadership behaviour score or in life skills that support learning.

In our study, when examining the results of the Pearson correlation analysis conducted according to scales (Table 8), it was observed that there was a moderately positive relationship ($r=.421^{**}$ $p<.000$) between the levels of life skills supporting learning and the levels of recreational leadership behaviour among the students participating in the study. This finding indicates that as students' life skills improve, their recreational leadership behaviour also increases, revealing that learning-supportive life skills play an important role in strengthening leadership behaviour.

In our study, when examining the results of the linear regression analysis regarding the scales (Table 9), it was observed that the levels of life skills supporting learning among the students participating in the study had a statistically significant effect on their levels of recreational leadership behaviour ($R=.421$, $R^2=.177$). This indicates that each increase in life skills leads to a marked improvement in leadership behaviour and that these skills account for approximately 18% of the development of students' leadership competencies. Furthermore, these results are supported by recent research. Specifically, when leisure satisfaction is high, the positive effect of peer relationships on happiness is amplified (Yalçın et al., 2025). Ceran

(2023) demonstrated through a meta-analysis that emotional and personal competencies considered core components of life skills—have a significant and positive relationship with transformational leadership behaviours. This contemporary evidence reinforces that improvements in life skills meaningfully contribute to stronger, more adaptive, and more effective leadership performance. Therefore, developing life skills that support learning plays a critical role in enhancing students' leadership capacities.

Conclusion

In conclusion, this study examined the relationship between learning-supportive life skills and recreational leadership behaviors among recreation department students, and it was found that students generally demonstrated positive tendencies in both areas. Age and gender variables were not found to have a significant effect on leadership behaviors or life skills, and receiving leadership training did not create a notable difference. On the other hand, participants who regularly read leadership-related documents exhibited less authoritarian and autocratic leadership behaviors. Furthermore, it appears that increases in life skills may positively influence recreational leadership behaviors and that these skills may contribute to leadership development. Therefore, it can be suggested that enhancing learning-supportive life skills may play an important role in improving students' leadership competencies.

Recommendation

Practical activities can be carried out to encourage students to adopt a more democratic and participatory leadership style, moving away from authoritarian leadership. Making books, articles and other academic documents more accessible to students may contribute to a reduction in authoritarian tendencies. In addition to theoretical lessons, students' leadership skills can be reinforced through fieldwork, workshops and team activities. Opportunities for sharing experiences in leadership development processes can be provided for different age and gender groups. Monitoring and feedback systems can be established to evaluate the long-term gains of individuals who have undergone leadership training. Training programmes can be designed holistically to integrate life skills with leadership behaviours in a mutually supportive manner. Students can be encouraged to regularly attend seminars and conferences related to leadership. Counselling and mentoring programmes may be implemented to support the development of life skills (mentoring involves an experienced guide providing guidance and support to a student in their personal, academic and leadership development).

Limitations

The population of the study consisted of 250 students studying in the Recreation Department of Fırat University's Faculty of Sports Sciences in the 2024-2025 academic year. The sample of the study consisted of 164 students who participated in the study, and the research is limited to this population and sample.

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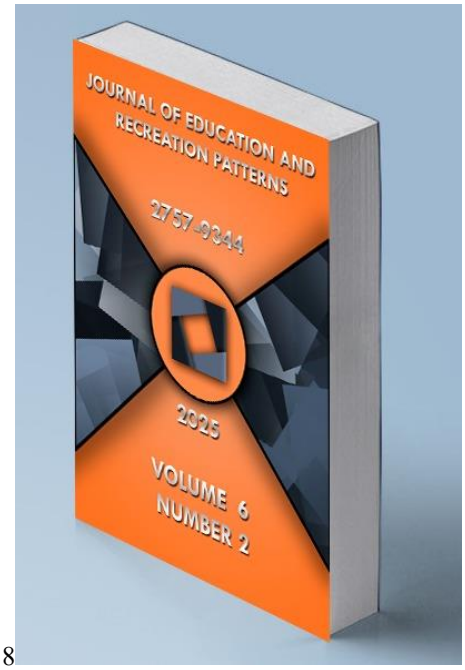

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Investigation of the Attitudes of Teachers Working in Special Education Schools Towards Games, Sports and Physical Activities Lessons

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ABSTRACT
The attitudes of teachers working in special education schools towards games, sports, and physical activities are crucial for the participation of students with special needs in these lessons and for promoting their physical activity levels. Participation in physical activity positively affects the physical, social, psychological, and spiritual development of students with special needs. This study aims to evaluate the attitudes of physical education and special education teachers towards games, sports, and physical activities lessons in terms of various variables.
The study involved 50 physical education teachers and 192 special education teachers working in special education schools. Data were collected using the "Attitude Scale Towards Games and Physical Activities Lesson," and ethical approval was obtained before the research. Descriptive statistics, normality tests, ANOVA, and independent samples t-tests were used for data analysis.
Results indicated that gender, age, total professional experience, and school level did not significantly affect teachers' attitudes ($p > .05$). However, physical education teachers had significantly higher attitude scores compared to special education teachers, and the service period in the current school also revealed a significant difference in attitudes ($p < .05$).
These findings suggest that attitudes vary by teaching branch and current school tenure but are independent of other factors. The more positive attitudes of physical education teachers are likely linked to their training background. Conversely, the decrease in attitude scores with longer tenure at the same school may reflect reduced motivation. In-service training programs are recommended to raise awareness among special education teachers and support active student participation.

Keywords: Disabled Students, Games-Sports and Physical Activities, Physical Education, Special Education, Teacher Attitude.

INTRODUCTION

The main purpose of the modern education system is to provide all individuals with the services they need in the field of education, as well as to teach them to produce solutions to the problems they may encounter at all stages of their lives and to prepare them for life. Special education practices within this large and comprehensive system are to provide environments and educational services for students with special needs (SEN) who cannot benefit from normal education practices due to their disabilities (Opstoel et al., 2020; Gündoğan, 2002; Segrave & Holt, 2003). Education in special education schools, which are in place to provide appropriate conditions for students with special needs, is classified as tier Primary, Middle, and High School, separate education programs are offered for each tier (Han et al., 2024; Mengi & Öpengin, 2021; Can & Kuru, 2018). The aim of these schools is to educate the SEN in the best way possible in accordance with contemporary educational principles and to ensure that these individuals develop in all aspects in order to achieve the goals of education (Koçyiğit et al., 2007; Schreuer et al., 2014). For these reasons, education programs are structured with special lessons that provide services to cover all areas of development. Games, sports and physical activities (GSPA) lessons are among the most important special lessons that contribute to many developmental areas. The Games, Sports and Physical Activities lesson is included in the curriculum of levels Primary, Middle and the Sports and Physical Activities lesson is included in the curriculum of level High School (Alemdağ et al., 2014; Güven & Yıldız, 2014).

GSPA lessons are an important factor in terms of the developmental areas of SEN with their fun and mobility-enhancing qualities such as running, jumping and leaping, as well as their individual and group activities (Tarantino et al., 2022; Burns et al., 2017). Within the scope of the lessons, basic movement skills are taught to the SEN, thus paving the way for them to use their bodies more efficiently at a later age. At the same time, these movements are a preliminary preparation for the complex games and sports that SEN may encounter in their later lives (Smith & Sparkes, 2019). GSPA lessons curricula include all educational processes that can contribute to the participation of SEN in physical activities, playing games and developing their motor skills for their developmental areas during these practices (Boyraz & Serin, 2016; Han, 2025). Thanks to the educational games and activities they include, GSPA lessons are of great importance in ensuring that SEN become more physically active, love and internalize sports, make sports a regular habit, and ultimately lay the foundation for a healthier life (Taşmektepligil et al., 2006; İlhan et al., 2013).

In the first and second levels of special education schools, namely primary and secondary schools, these lessons are taught by special education teachers, and in the third level, high school, these lessons are taught by physical education teachers (Demirci & Demirci, 2014; Temel & Kangalgil, 2021). Although teachers working in special education schools and conducting GSPA lessons believe in the importance of these lessons and consider these lessons very necessary, they face problems related to the applicability of the curriculum such as not having sufficient knowledge and skills in the field, having difficulty in what to teach in the lessons, not having enough materials and facilities in schools, insufficient class hours, etc. (Nemec et al., 2019; Şentürk et al., 2015). For this reason, GSPA lessons, which are extremely important for individuals in need of special education, come to the forefront with the attitudes of teachers. It can be stated that the contribution of teachers should be taken seriously and, in this respect, the attitudes and behaviors of the teachers conducting the lesson towards GSPA lessons are important (Kaya & Yıldız, 2023; Önal et al., 2023; Han et al., 2024).

The main purpose of this study is to examine the attitudes of teachers working in special education schools towards GSPA lessons and to reveal the factors affecting the applicability of this lesson. GSPA lessons make significant contributions to the development of motor skills of students with special needs, to increase their participation in physical activities and to support

their social adaptation. However, the effectiveness of this lesson largely depends on the knowledge, skills and attitudes of teachers. Therefore, determining the opinions of teachers conducting GSPA lessons will constitute an important data source in terms of planning, implementing and developing the lesson. In this study, social cognitive theory was used as a basis to understand the attitudes of teachers working in special education schools towards GSPA lessons (Bandura, 1986). The limited number of studies in this field in the literature, especially the inadequacy of studies that examine teachers' opinions in depth, make this study an important step towards eliminating the lack of information in the field. It is expected that the findings to be obtained will guide practitioners and educational administrators and contribute to the more qualified education of individuals with special needs.

METHOD

Research Model

This research was designed as a quantitative study based on the survey model. Using the descriptive survey method, the attitudes of physical education and special education teachers working in special education schools towards the GSPA lessons attended by their students were examined.

Universe and Sample

A total of 242 teachers, 50 physical education teachers and 192 special education teachers, working in special education schools in 10 provinces from different regions of Turkey, participated in the study voluntarily. Teachers working in Primary, Middle, and High School level special education schools in Adıyaman, Ordu, Samsun, Eskişehir, Denizli, Sakarya, Malatya, Erzurum, Muş and Van provinces were included in the study. Convenience sampling method was used to determine the study group. While collecting the data for the study, care was taken to ensure that the data was homogeneous by reaching teachers in at least one province from all regions of Türkiye.

Table 1

Demographic Characteristics of the Teachers Included in the Study

Variable	Category	N	%
Age	25-30	136	56.2
	31-35	62	25.6
	36-40	26	10.7
	41-over	18	7.4
Gender	Male	122	50.04
	Female	120	49.6
Branch	Physical Education	50	20.7
	Special Education	192	79.3
Total tenure of teachers in the profession	1-5 years	152	62.8
	6 years - above	90	37.2
The length of service of teachers in their current schools	1-3 years	150	62
	4 years - above	92	38
Level of the school where the duty is performed	Level Primary and Middle	161	66.5
	Level High School	81	33.5

Data Collection Tool

In the study, the "Attitude Scale Towards Play and Physical Activity Lesson" (ASTPPAC) developed by Hazar and Demir (2018) was used as a data collection tool. This scale consists of a total of 17 items and 3 sub-dimensions. It also has a 5-point Likert-type structure and a Cronbach's Alpha internal consistency coefficient of 0.78. The scale was developed as a measurement tool that measures the attitudes of prospective classroom teachers towards the game and physical activities course in a valid and reliable manner. The scale was shared with teachers via WhatsApp, web and Google Forms, and a consent form was also obtained from the participants for voluntary participation. Before the research, ethical permission report dated 06.03.2025 and numbered 186253 was obtained from Muş Alparslan University, Scientific Research and Ethics Committee. All teachers participated in the study voluntarily and the necessary confidentiality rules were followed during the data collection.

Data Analysis

SPSS 25.0 program was used to analyze the data and firstly, the general distribution of the data was examined by using descriptive statistics. Skewness and Kurtosis tests were used to check whether the data were normally distributed so parametric tests were used since the data showed normal distribution. ANOVA test was used for multiple group comparisons and independent samples t-test was for pairwise comparisons.

Table 2

Normality Test Results Based on Skewness and Kurtosis

Variable	Skewness	Std. Error	Kurtosis	Std. Error
Teachers' GSPA scale scores	–0.005	0.156	0.052	0.312

In Table 2, it is seen that the Skewness and Kurtosis values of the data are between -1 and +1, and the skewness and kurtosis values between -1 and +1 indicate that the data show normal distribution (Tabachnick & Fidell, 2013). According to these results, it was accepted that the data showed normal distribution. ANOVA test was used for multiple group comparisons and independent samples t-test was for pairwise comparisons. The error level of the statistics was accepted as $p<0.05$.

FINDINGS

This section presents the results of statistical analyses conducted to examine the differences and relationships among the study variables. Tables 3 through 8 summarize the findings based on variables across groups, gender, field of study, total length of service in the profession, length of service at the current school, and level of the current school.

Table 3

Comparison of ASTPPAC Scale Scores according to Teachers' Age Variable

	Sum of squares	SD	Mean of squares	F	p
Between groups	92.490	3	30.830		
Within groups	10055.680	238	42.251	0.730	0.535
Total	10148.169	241			

There was no statistically significant difference between age groups in terms of scale scores ($p>.05$). Based on this result, it can be interpreted that teachers' age is not a determining

factor in their attitudes towards the GSPA lessons attended by students with special needs.

Table 4

Comparison of ASTPPAC Scale Scores according To Teachers' Gender Variable

Gender	N	Average	SD.	t	p	d
Male	122	58.71	6.53	0.016	0.987	0.002
Female	120	58.70	6.47			

There was no statistically significant difference between the gender variable and the scale scores of the teachers (p>.05). This result shows that teachers' attitudes towards GSPA lessons attended by students with special needs are at similar levels regardless of their gender. No statistically significant difference was found between male and female teachers' attitude scores toward GSPA lessons. A Cohen's d value of 0.00 indicates that gender has no effect on attitudes, and the difference is statistically and practically insignificant (d = 0.002).

Table 5

Comparison of ASTPPAC scale scores according to the branch variable of teachers

Branch	N	M	SD.	t	p	d
Physical Education Teacher	50	62.72	4.98	5.165	0.000*	0.82*
Special Education Teacher	192	57.66	6.44			

*=p<0,05

It was seen that the scale scores of physical education teachers were significantly higher than those of special education teachers and as a result of the t-test, a statistically significant difference was found in terms of the branches of the teachers (p<.05). This is thought to be due to the fact that physical education teachers have a more positive attitude towards the participation of students with special needs in GSPA lessons due to the branch they are working in. Physical education teachers' attitudes toward GSPA lessons were found to be significantly higher than those of special education teachers. Cohen's d was 0.82, indicating a large effect size. This result suggests that subject matter has a strong influence on teacher attitudes and that physical education subject matter knowledge may influence this positive attitude (d = 0.82).

Table 6

Comparison of ASTPPAC Scale Scores in terms of Teachers' Total Tenure in their Profession

Total tenure of teachers in their profession	n	M	SD	t	p	d
1-5 years	152	58.43	6.91	-.848	0.397	0.11
5 years and above	90	59.16	5.69			

There was no statistically significant difference between teachers' total tenure in their professions and their attitudes towards the participation of students with special needs in GSPA lessons (p>.05). It is thought that teachers' total tenure in their professions does not have an effect on their attitudes towards the GSPA lessons attended by their students. No significant difference was found in attitudes toward GSPA courses between teachers with 1–5 years of experience and those with more than 6 years of experience. Cohen's d was 0.11, indicating that this difference was a small effect and of little practical significance. This may suggest that teachers' attitudes depend not only on experience but also on other factors, such as professional development and motivation (d = 0.11).

Table 7

Comparison of ASTPPAC Scale Scores in terms of Teachers' Length of Service in Their Current Schools

The length of service of teachers in their current schools	n	M	SD	t	p	d
Up to 3 years	150	59.46	6.91	2.348	**0.020***	0.31*
4 years and above	92	57.46	5.69			

*=p<0,05

There was a statistically significant difference between the length of service of the teachers in their current schools and their attitudes towards the participation of students with special needs in GSPA lessons (p<.05). It is understood from the table that this significant difference is in favor of the teachers with 3 or less years of service in the current school. It can be concluded that teachers with less years of service in the current school have better attitudes towards the participation of students with special needs in GSPA lessons and that this positive attitude gradually decreases with the increase in the length of service in the same school. Teachers who have worked at the same school for three years or less have significantly higher attitude scores than those who have worked at the same school for four years or more. Cohen's d was 0.31, indicating a small-to-medium effect size. This result suggests that teachers working at the same school for extended periods may lead to a loss of motivation or a habituation effect on their attitudes (d = 0.31).

Table 8

Comparison of ASTPPAC Scale Scores according to the Level of the Schools Where Teachers Work

Level	N	M	SD	t	p	d
Level Primary and Middle	161	59.14	6.15	1.457	0. 146	0.20
Level High School	81	57.85	7.08			

In the table, the independent samples t-test analysis of the attitudes of the teachers towards the participation of their students with special needs in the GSPA lessons and the levels at which they work is given and no significant difference was found as a result of the test (p> .05). It can be said that the level at which teachers work does not have any effect on their attitudes towards the participation of students with special needs in GSPA lessons. No significant difference was found between primary/middle school and high school teachers in terms of attitudes toward GSPA courses. A Cohen's d value of 0.20 indicates a small effect size. This suggests that grade level is not a determining factor in teacher attitudes, and that other variables (field of study, institutional culture, student profile, etc.) may be more influential (d = 0.20).

DISCUSSION

In this study, it was aimed to examine the attitudes of physical education teachers and special education teachers working in special education schools towards games, sports and physical activities (GSPA) lessons in terms of various variables. The results of the research showed that there was no significant difference in the attitudes of the teachers according to the variables of gender, age, total length of service in the profession and the level of the school, but a significant difference was found according to the variables of branch and length of service in the current school. In this part of the study, the findings and results obtained were evaluated and discussed with the related studies in the literature. In addition, the study was based on social cognitive theory to understand the attitudes of teachers working in special education schools

towards GSPA lessons (Bandura, 1986).

In the study, no significant difference was found between teachers' gender and their attitudes towards GSPA lessons. Research on the subject states that gender is not a fundamental factor that directly affects teachers' attitudes towards sports and physical activities lessons, and instead professional competence and experience are more important (Han & Yılmaz, 2023, Yılmaz et al., 2023). However, some studies (Yenmiş & Gül, 2021) stated that male teachers are more confident in sports and physical activities, while female teachers focus more on students' social and emotional development (Bertills et al., 2018; Demirel et al., 2022 Demiralp et al., 2025).

No significant difference was found between teachers' ages and their attitudes towards GSPA lessons. In a study conducted by Demirci and Demirci (2014) on the subject, it was stated that the age factor of teachers did not directly affect their attitudes towards their students' participation in physical activities. While Tarantino et al. (2022) argued that teachers' attitudes towards their students' participation in physical activities decreased as they got older, Temel and Kangalgil (2021) stated that experienced teachers manage their lessons more effectively and provide students' participation in physical activities better. It can be concluded that age is not a determining factor on attitude, but teachers' professional motivation and individual attitudes have a more determining effect than age.

One of the variables in which a significant difference was found was the branch variable. The attitude scores of physical education teachers towards GSPA lessons were found to be significantly higher than those of special education teachers. The results obtained from the studies conducted by Smith and Sparkes (2019), Han and Yılmaz (2023) overlap with our research findings. It is thought that the main reason why physical education teachers exhibit more positive attitudes towards GSPA lessons attended by SEN is that they receive more pedagogical and practical training in the field of physical education (Nemec et al., 2019). Among the reasons for the lower level of special education teachers' attitudes towards the participation of SEN in GSPA lessons; difficulties encountered during physical activity practices (Şentürk et al., 2015; Hadi et al., 2023;), lack of infrastructure and materials in schools (Alemdağ et al., 2014), professional wear and tear as a result of working with SEN for a long time (Pocock & Miyahara, 2018; Tercan & Ekinci, 2025).

There was no significant difference between the total length of service of the teachers in their profession and their attitudes towards the GSPA lessons attended by SEN. This finding is similar to the result obtained from the study conducted by Taran and Kangalgil (2024). However, in a study conducted by Smith and Green (2004) on teachers' attitudes towards GSPA, they stated that teachers who have been working in their profession for many years can manage these lessons more effectively and therefore have more positive attitudes. The fact that professional experience was not a determinant of attitudes towards GSPA lessons in our current study suggests that the individual motivation and professional development opportunities of the participants may be a more effective factor than the duration of professional experience (Han, 2025; Opstoel et al., 2020).

Another variable in which a significant difference was found was the total length of service of the teachers in their current school. In the study, it was observed that the attitude scores of teachers with 3 years or less of service in the current school were better than the scores of teachers with 4 years or more of service. In the literature, it has been reported that the motivation of teachers working in the same school for a long time decreases over time and their interest in physical activities in which students participate decreases (Dağdelen & Kösterelioğlu, 2015). The main reason for this situation is thought to be the monotonization of lesson content and the routinization of physical activity lessons as a result of teachers working in the same school for a long time (Wang et al., 2015; Han et al., 2024). For this reason, it can

be argued that teachers should not work in the same school for more than 3 years and necessary regulations should be made on the subject (Altun, 2016; Kara et al., 2024).

No significant difference was found between teachers' attitudes towards the GSPA lessons attended by students with special needs and the levels of the schools where the teachers work. In this respect, the results obtained from the study conducted by Tindall et al. (2015) are in parallel with the results of the current study. However, some studies in the literature (İlhan et al., 2013; Alemdağ et al., 2014) stated that teachers' approaches to GSPA lessons can change depending on the age of the students and therefore the level of education. In particular, it is stated that teachers working at the high school level, which is the third level, have more problems in including their SEN in physical activities in GSPA lessons (Lamata et al., 2024). For this reason, it is thought that the curriculum should be prepared in accordance with the age and education level of the SEN in order for teachers working at different levels to teach the GSPA lessons more effectively and efficiently.

Conclusion

This study examined the attitudes of physical education and special education teachers working in special education schools towards GSPA lessons in terms of various variables. While no significant difference was found between the attitudes of teachers towards GSPA lessons in terms of gender, age, level of the school they work at and total service period in the profession, it was concluded that the branch of the teachers and the service period in their current school had a significant effect on their attitudes towards GSPA lessons. While physical education teachers have a more positive attitude towards GSPA lessons due to the nature of their fields, the relatively low attitudes of special education teachers can be related to the fact that GSPA lessons contain more physical education practices and that special education teachers do not receive sufficient training in this field. In addition, it has been concluded that teachers working in the same school for a long time may cause a loss in their motivation.

Recommendations

In this context, it is recommended that in-service trainings be organized for special education teachers and that they be better equipped in physical activities, and that appropriate rotations be made to increase the decreasing motivation of teachers who have been working in the same school for a long time. In-service trainings for special education teachers should be provided on how to teach GSPA lessons more effectively. During the entire education process, special education teachers and teachers trained in the field of physical education for the disabled should be in active interaction and share their knowledge in practice.

Ultimately, understanding and improving teachers' attitudes towards GSPA lessons is of critical importance in increasing SEN's participation in physical activities and in ensuring that they benefit from these lessons at the highest level. Future research can contribute to the development of education-training policies by focusing on the difficulties teachers encounter during the practices in the lessons, student perspectives and innovative teaching approaches.

Limitations

This study was limited to physical education teachers and special education teachers working in special education schools at primary, secondary and high school levels in 10 provinces from different regions of Türkiye, namely Adıyaman, Ordu, Samsun, Eskişehir, Denizli, Sakarya, Malatya, Erzurum, Muş and Van.

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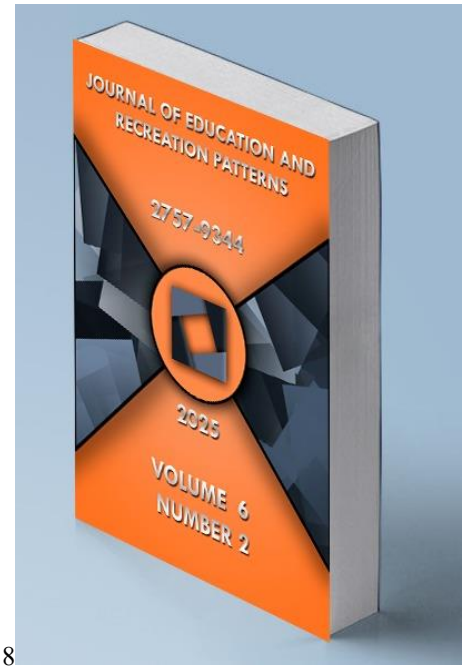

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Can You Photograph Happiness? A Photovoice Study about the Effect of Hippotherapy on the Psychological Well-Being of Children with Cerebral Palsy from Parents' Perspective

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Can You Photograph Happiness? A Photovoice Study about the Effect of Hippotherapy on the Psychological Well-Being of Children with Cerebral Palsy from Parents' Perspective

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ABSTRACT
This study investigates the impact of hippotherapy on the psychological well-being of children diagnosed with cerebral palsy using the photovoice method. The sample consisted of 11 parents (7 women, 4 men) of children aged 3–9 years receiving hippotherapy. Individual and group interviews were conducted between April and June, and the photographs taken by parents were analyzed using the SHOWED approach and thematic analysis. The analysis revealed five physical effects (functional motor skills, physical development, independent sitting, gait, and balance) and six well-being–related themes, including perceived self-efficacy; self-confidence and sense of achievement; motivation; communication and socialization; perceptual expansion—defined as the child's growing awareness of environmental stimuli and increased exploratory behaviors; and emotional attachment. The findings indicate that psychological well-being improves in parallel with physical development achieved through hippotherapy. This study provides important implications for practitioners, families, and service providers. Theoretically, the study expands understanding of well-being by demonstrating how parents interpret psychological change through observable physical progress. A practical policy recommendation emerging from the results is the integration of parent-generated visual documentation (photovoice outputs) into rehabilitation protocols to enhance communication between families and clinicians and to support individualized therapy planning.

Keywords: Cerebral palsy, Hippotherapy, Photovoice, Therapeutic recreation, Well-being.

INTRODUCTION

The therapeutic value of riding horses dates back centuries, with the first reports from ancient Greece. Since the days of ancient Greece, the benefits of horse riding have been increasingly recognized and documented. Subsequently, hippotherapy has been widely implemented as a rehabilitation method in numerous countries (Granados & Agís, 2011). It has been employed by therapists in Europe since the 1960s as a means to enhance strength, balance, posture, and overall function. However, it was not until the 1970s that therapists in the United States began integrating hippotherapy with traditional treatment approaches (Benjamin, 2000). The development of therapeutic horseback riding for individuals with disabilities was sparked by the 1952 Olympic Grand Prix Dressage victory of Liz Hartel, who claimed that riding helped cure polio (DePauw, 1986). Later in the 1960s, therapeutic riding centers began to develop throughout Europe, Canada, and the United States. Therapists in Germany, Switzerland, and Austria popularized the term hippotherapy when they started to use horses as a treatment tool (Casady & Nichols-Larsen, 2004). Hippotherapy is a therapy method that uses the movement impulses of a walking horse to facilitate movement responses in the user astride the horse. During the therapy, the patient does nothing to actively affect the movement of the horse; on the contrary, the patient is moved by the horse and responds to the horse's movement (Debuse, Chandler, & Gibb, 2005). The rationale for hippotherapy is that the horse gait provides a clear, spontaneous, rhythmical, and repetitive pattern of movement to the rider similar to the mechanics of human gait (McGee & Reese, 2009; Bertoti, 1988).

In clinical terms, the walking horse provides a three-dimensional movement to the rider's pelvis across the sagittal, frontal, and transverse planes, closely mirroring the kinematic patterns of human gait (Bertoti, 1988; McGee & Reese, 2009). This repetitive, rhythmical movement requires continuous postural adjustments by the rider, thereby increasing pelvic mobility and activating deep trunk and postural musculature (Janura et al., 2009). The enriched proprioceptive and vestibular input generated during these adjustments enhances sensory integration and supports neuromotor organization (Debuse, Chandler, & Gibb, 2005). Repeated exposure to this structured sensory–motor experience is believed to stimulate neuroplastic changes within the central nervous system, contributing to improvements in balance, postural control, and functional motor skills observed in children with cerebral palsy (Lechner et al., 2007). Thus, hippotherapy is not merely a meaningful experiential activity but a physiologically grounded intervention that directly engages motor and sensory pathways relevant to daily functioning.

In addition to hippotherapy, horse riding has been shown to improve gross motor coordination (MacKinnon et al., 1995), midline posture control (Bertoti, 1988) head control, and coordination when used for therapeutic and recreational purposes (Wingate, 1982; Biery & Kaufmann, 1989). For example, in hippotherapy, children experience and begin to anticipate movement with each step of the walking horse through the repetitive, rhythmical movement of the horse. They learn to shift the center of gravity and produce compensatory movements that keep them on the moving horse. This experience is believed to lead to the modification and reorganization of the central nervous system (Casady & Nichols-Larsen, 2004). The primary goal of hippotherapy as an individualized treatment is to improve the balance, posture, function, and mobility of the individual (All & Loving, 1999; Zadnikar & Kastrin, 2011).

Special needs groups in which hippotherapy is widely used include patients with autism, arthritis, head trauma, stroke, spinal cord injury, behavioral disorders, and cerebral palsy. Hippotherapy is a form of treatment utilized to address common physiological issues in individuals with special needs. Its primary objective is to enhance strength, muscle tone, flexibility, relaxation, balance, and functional performance in daily activities, which is achieved through the interaction with deep agonistic muscles during the therapy sessions (Cho, 2017;

Kim & Lee, 2015).

Rhythmic movements of the horse activate the individual's nervous system and positively affect self-confidence, attention, spatial perception, and speech development (Casady & Nichols-Larsen, 2004). Falke (2009) states that hippotherapy training is a "co-therapist" that contributes positively to the personality development, self-confidence, and group communication skills of individuals with special needs (Biery & Kauffman, 1989; Copeland-Fitzpatrick & Tebay, 1998). This training is also known to improve neurological functions and sensory processes through the development of sensory connectivity, communication, and neuro-connection (Lechner et al., 2007; Janura et al., 2009). Hippotherapy offers both physiological and psychological benefits, including increased self-confidence, self-esteem, motivation, attention span, spatial awareness, concentration, and verbal skills (McGibbon et al., 1998).

Children with cerebral palsy have spasticity, musculoskeletal problems, mobility disturbances, and decreased pelvic movements, which lead to awkward movement and sitting posture (Lee et al., 2014). One of the key problems in children with cerebral palsy is deficient postural control. Hence, maintaining the postural control necessary for the performance of activities of daily living often forms a major challenge (Van Der Heide et al., 2004). The goal of therapy for children with cerebral palsy is generally to improve the range of motion, develop more advanced motor skills, and improve both reactive and postural control and balance (Berninger & Gans, 1986). The movement of the horse generally provides children with cerebral palsy with various inputs that can be used to facilitate better contraction, joint stability, weight transfer, and postural balance responses (Miller, 2007).

Psychological well-being in this study can be understood within the framework of Self-Determination Theory (SDT), which proposes that optimal functioning depends on the satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Deci & Ryan, 2000). The improvements observed in motor skills, balance, and independent movement through hippotherapy can be interpreted as supporting the child's sense of competence, while emotional engagement with the horse, therapists, and the environment contributes to relatedness. These mechanisms help explain why hippotherapy may enhance motivation, self-efficacy, and social interaction, providing a theoretical basis for understanding the well-being outcomes identified by parents.

This study focused on the thoughts and feelings of parents of children with cerebral palsy toward the well-being of children receiving hippotherapy. Although the physical and psychological effects of hippotherapy on individuals with cerebral palsy have been widely researched, studies on hippotherapy outcomes perceived by parents are limited. Tercan et al., 2025 parents of children with autism who did not engage in leisure activities have been found to report significantly lower quality of life, along with higher levels of stress and sadness. Irwin et al. (2019) emphasized in their meta-analysis that the psychological well-being of parents was indirectly improved by interventions directed at children with cerebral palsy. In addition to these interventions, the improvements in behaviors of children with cerebral palsy demonstrated the important secondary outcomes of well-being (Brown et al., 2015; Irwin et al., 2019; Whittingham et al., 2016). On the other hand, although some research documented statistically significant improvements in function and positive effects of hippotherapy for children with cerebral palsy, the hippotherapy research showed difficulties in capturing physical, social, and emotional changes. Hippotherapy, as an increasingly recognized and popular method, is supported by a robust body of evidence and research.

However, the existing literature has predominantly focused on parents' caregiver burden, stress levels, and the psychological challenges associated with long-term caregiving. This deficit- and pathology-oriented perspective provides valuable insight into parental strain, yet it

offers limited understanding of how parents witness and interpret positive developmental changes in their children. By contrast, the present study adopts a strengths-based and positive psychology–oriented approach by exploring the improvements, emotional growth, and well-being outcomes that parents observe through their children's participation in hippotherapy. Highlighting this shift from a stress-focused framework to a development-centered perspective underscores the originality and contribution of the current research (Irwin et al., 2019; Whittingham et al., 2016).

In this context, it is considered a significant gap in the literature that previous studies lack focus on the perspective of parents regarding the well-being of their children in relation to hippotherapy. The photovoice method is particularly well suited to addressing this gap because it allows parents to express their observations through both visual and narrative forms, capturing nuances that may not emerge in traditional interviews. By enabling participants to document meaningful moments in their daily lives, photovoice provides deeper insight into how parents interpret changes in their children's physical and psychological well-being. In light of this, the present study, addressing this gap in literature, is considered a valuable contribution with the potential to enhance the depth of existing scholarly work. The findings also offer practical implications for developing strategies that specifically target parents, who play a pivotal role in successfully implementing hippotherapy for children's development. Another highly significant outcome of the current study is the utilization of photovoice as a means to understand more profound contexts and gain insights.

METHOD

Photovoice (Wang & Burris, 1997) is an innovative and diverse research methodology that uses photography to understand and document people's experiences (Walton et al., 2012). The use of visual imagery has the capacity to effectively convey complex experiences, ideas, and emotions, thereby enhancing communication (Carlsson, 2001; Simmonds et al., 2015). It is also worth highlighting that visual imagery has been recognized as an inclusive and empowering research approach, amplifying the perspectives of marginalized communities (Macdonald et al., 2022). Hence, the originality of the Photovoice method becomes particularly pertinent in this study, as it enables the exploration of parental perspectives on children with special needs, thereby establishing the suitability of the method used.

In this study, the physical effects of hippotherapy sessions on individuals diagnosed with cerebral palsy were not only documented and analyzed but also captured in conjunction with their stories, thereby exploring their role in promoting well-being and overcoming obstacles. This research discusses parents' experiences and thoughts on "well-being" of their children. One notable advantage of using the photovoice method in this study is its capacity to offer a valuable opportunity to comprehend significant and unique experiences within meaningful contexts.

Table 1

Demographic Characteristics of Participants

Participants	Gender	Age	Child's Age	Education Level	Profession
P1	Male	30	4	Secondary School	Worker
P2	Female	34	4	Secondary School	Housewife

P3	Female	41	7	Secondary School	Housewife
P4	Male	51	9	Primary School	Worker
P5	Female	50	9	Primary School	Housewife
P6	Male	45	7	High School	Technician
P7	Male	40	3	Master's degree	Private sector employee
P8	Female	37	3,5	Master's degree	Private sector employee
P9	Female	40	4	Bachelor's degree	Housewife
P10	Female	33	6	High School	Housewife
P11	Female	44	4	Primary School	Housewife

The research was conducted with the parents of children with cerebral palsy. The researchers followed reliable ways to reach the families of these children and include them in the study. The required permissions were obtained from the relevant institution. One of the researchers informed the families and arranged meetings to explain the ethical process of the interview to be conducted and establish rapport with the families before the research. These meetings helped to build a safe environment for better expression and a more friendly atmosphere while interviewing parents. Participants who fulfilled the stipulated requirements of actively engaging in the study for a minimum duration of 12 weeks were deemed eligible for inclusion. The 12-week minimum duration was chosen because neuromuscular adaptation, motor learning, and observable functional improvements in children with cerebral palsy typically require at least 8–12 weeks of continuous therapeutic intervention (Damiano & DeJong, 2009; Sterba, 2007; Moreau et al., 2016). Thus, this threshold ensured that parents had adequate exposure to observe meaningful physical and psychological changes in their children. To identify participants, purposive sampling, a widely used sampling method in qualitative research, was used. The determination of the sample size was based on the saturation point, which is used as a basis in many qualitative studies (Anderson et al., 2014). In this study, saturation was reached after the ninth participant, when no new codes or meaningful insights emerged. The final two interviews confirmed the existing categories without generating additional themes. Eleven people (7 women and 4 men), who were the parents of children with cerebral palsy being rehabilitated in the Hippotherapy Center in Türkiye, volunteered to participate in the study. The demographic diversity of the participants, with education levels ranging from primary school to a master's degree, contributed to the richness and credibility of the data by allowing a wide spectrum of parental perspectives across different socio-economic backgrounds.

Procedure

The data of this study consisted of the photographs taken by 11 parents of children with cerebral palsy and the stories accompanying these photographs. The parents used their personal mobile phones to take photographs. The data was collected through phone calls, social media messages, videos, and audio recordings between April and June. The interviews were conducted by the fifth author of this article, and each lasted about 30 minutes. They were audio-recorded and transcribed. The participants were informed by the researcher about the study and the ethical issues regarding photographs. Although no formal Photovoice training session was conducted, participants received verbal guidance prior to data collection regarding the ethical use of photographs. This briefing included instructions on privacy, the visibility of children's faces, avoiding identifiable or inappropriate poses, and ensuring respectful representation in all images. These clarifications ensured that parents documented their children's experiences responsibly while adhering to ethical standards.

The researchers exhibited great sensitivity to building and maintaining trust during the research process. Nine participants were interviewed through home visits, organized based on the availability and invitation of the parents. For the remaining two participants, the researcher arranged meetings at outdoor locations of their preference. In addition to these in-person meetings, some parts of the data collection process also involved Zoom interviews. The study thus utilized a hybrid data collection approach combining face-to-face and online interviews. Although both formats yielded rich narrative data, participants interviewed during home visits tended to share more detailed emotional reflections, likely due to the comfort and familiarity of their home environment. In contrast, Zoom interviews remained effective for eliciting descriptive information but occasionally offered less spontaneous emotional depth due to the mediated nature of the setting. Open-ended interview questions were used, supplemented by the occasional use of follow-ups to elucidate inquiries or facilitate comprehensive responses. The interview session included questions such as "has hippotherapy proven to be beneficial?" and "have you noticed improvements in your child's overall well-being?". Before conducting the research, ethics committee approval was obtained from the Social Science and Humanities Scientific Research and Publication Ethics Committee of the university to which the second author of this article is affiliated. Each participant provided informed consent by signing a voluntary consent form, affirming their agreement to participate. Participation in the study was strictly voluntary, and participants were explicitly informed of their right to withdraw from the study at any time, without providing a rationale for their decision. Ethical considerations about the photography projects, including taking, storing, and delivering photographs, were thoroughly addressed, and implemented throughout the entirety of the research process. The participants were provided with contact information from the researchers. The 6-stage approach to the photovoice method, as proposed by Povee et al. (2014), was used. The transfer of photographs and emotions was confirmed through the focus group and individual interviews. During the participatory visual analysis, parents were invited to interpret the meanings they attributed to each photograph. They confirmed or refined the researcher's initial codes and occasionally contributed additional nuances that helped shape the thematic structure. No objections emerged regarding the coding, but parents' clarifications strengthened the interpretive depth and trustworthiness of the analysis. Focus group interviews were conducted in Zoom with seven participants which lasted 42 minutes. During the session, the photographs and accompanying stories were shared via screen sharing. Each photograph was assigned mnemonic names for contexts. The utilization of the photovoice method, known to promote reflection and foster dialogue (Spencer et al., 2021), facilitated a streamlined process during the meeting. Group discussions about photographs were largely guided by the SHOWED method (Wang & Burris, 1997), a set of questions designed to elicit information about photographs. The SHOWED method includes questions such as "what do you see here?", "what is really happening here?", "how does this relate to our lives?", "why does this problem and concern exist?", "what can we do about it?". The questions in the SHOWED method were displayed in focus group interviews and referenced to begin discussions. These discussions also elicited themes across participants. The group interviews were conducted one week after the researchers received the photos and stories. During the interviews, the participants were presented with the selected images.

Data Analysis

To analyze the photographic data, the participants and a researcher together took part in a Participatory Visual Analysis (Wang & Burris, 1997). This analysis consisted of three main components. 1. Selecting photographs that most accurately capture the community's needs and assets 2. Contextualizing and telling stories about the meaning behind the photographs 3. Identifying and codifying emerging issues, themes, and theories (Roberts et al., 2022). All group discussions and individual interviews were transcribed, and a manual content analysis was used. Group discussions were used to illustrate individual interview categories and larger

themes. At this stage, content analysis was used to identify patterns and themes across responses. Categories were formulated based on recurring themes identified during the analysis of transcripts, and a coding manual was subsequently created. Following coding, responses were analyzed for common themes. To validate the emerging themes, a member check process was undertaken involving the voluntary participation of four individuals. The themes that emerged at the end of the interview and the transfer of photographs were compiled and presented to the focus group for verification.

Next, the codes were grouped to represent potential themes. Various measures were taken to increase the rigor and trustworthiness of the research. To ensure the accuracy of these themes, all written documents and stories related to the photographs were examined by the entire research team. All data (interview texts and pictures) and the comments resulting from the analysis were reviewed by at least two members of the research team to ensure rigor. The analysis uncovered the themes through triangulation that integrated diverse datasets and involved a team of researchers. Furthermore, data collection continued until saturation occurred. Reliability was ensured through an iterative process of data collection and analysis (Frambach et al., 2013).

FINDINGS

Of the 11 participants, 7 were female, 4 were male. The mean age was 40.4 (SD= 6.7), while the mean age of children with cerebral palsy was 5.5 (SD= 2.2). Eight of the parents had a high school or lower level of education. Table 1 presents the demographic characteristics of the participants. During the interviews, the participants expressed the positive impact of hippotherapy on their children's well-being, primarily attributing it to notable improvements in their physical development. Five physical effect themes were determined through thematic analysis based on the photographs and stories shared by the parents. These themes included 1) physical motor; 2) physical development; 3) independent sitting; 4) gait, and 5) balance. Based on the five physical effects observed, the study identified six themes: 1) Perceived self-efficacy; 2) Self-confidence and sense of achievement; 3) Motivation; 4) Communication and socialization; 5) Perceptual expansion; and 6) Emotional attachment. The participants particularly acknowledged the psychological improvement and the complementary treatment based on the physical improvements attained through hippotherapy. They reported visual evidence and stories that depicted the positive impacts of hippotherapy on self-confidence and overall well-being, supporting its influence on physical development.

Physical Effects

With the physical effects of hippotherapy, the focus was on functional motor skills, physical development, independent sitting, gait, and balance. These physical effects should not be considered independently of psychological well-being. In other words, the physical development of children receiving hippotherapy may also have a positive effect on their well-being. Below, each physical effect is explained, and the photographs and stories shared by the parents are presented.

Functional motor skills

Motor skills development was one of the critical areas of focus about the physical effects of hippotherapy. The parents of children with cerebral palsy who participated in the study highlighted this physical effect in their photographs and stories. Figure 1a refers to the development of functional motor skills. The parent sharing the image disclosed that the staircase posed a significant obstacle for the child but acknowledged an improvement in the child's functional motor skills following this therapy. The story of this image is as follows.

> This is the staircase to enter and exit our house. Before hippotherapy, these stairs were a major challenge for my child. It was a long climb on the staircase. After hippotherapy, it became easier to go up and down the stairs. Now my child can climb the stairs without any support. There is a huge difference in the development before and after hippotherapy. (Participant 3; woman (41 years); Figure 1a).

Beyond its physical effects, the staircase also carried symbolic meaning for the family. What was once perceived as an intimidating barrier—"a mountain to be climbed"—gradually became a representation of the child's growing autonomy and the family's sense of liberation. This shift in meaning illustrates how participants reinterpret ordinary environments through their evolving abilities and lived experiences.

Physical development

Some of the participants affirmed the positive contribution of hippotherapy to their children's physical development. Participant 10 reported that her child had developmental delay of the foot, accompanied by contractions, and noted that the therapy mitigated the delay and improved the foot posture. Figure 1b presents the photography and its story below.

> My child had developmental delay and contractions in their left foot before the hippotherapy. After the therapy, these issues have declined. We had even thought about Botox as an option before the therapy. Our doctor said we didn't need to do it. Now, there is no contraction or side-stepping. (Participant 10; woman (33 years); Figure 1b).

Figure 1

Pictures of Functional Motor Skills and Physical Development

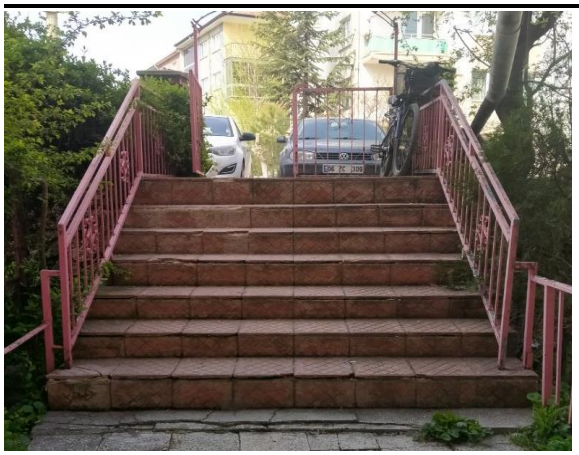


Figure 1a. Functional motor skills

Figure 1b. Physical development

Independent sitting

The participants also emphasized the effect of hippotherapy on their children's physical development in relation to achieving independent sitting. As depicted in Figure 1b, the child's independent performance of physical movement was seen as a development. Below is the participant's depiction of the image.

Figure 2

Pictures of Independent Sitting and Gait

Figure 2a. Independent sitting

Figure 2b. Gait

> While our child had trouble sitting independently before hippotherapy, now she can sit and do things without our assistance. Now I leave her alone, and she's sitting, eating her breakfast, peeling her eggs. (Participant 11; woman (44 years); Figure 2a).

Gait

Gait was another prominent aspect that participants highlighted when discussing the physical effects of hippotherapy. They reported an increased willingness and improvement in gait following the therapy. Figure 2b depicts a child making an attempt to walk with the assistance of a baby-walker. The development that this image represents is expressed as follows.

> My child couldn't hold on to things and walk before. He would shake when he tried to hold on to his walker or first-step buggy while walking. He would panic and be agitated. After hippotherapy, he started taking assisted steps. Now he wants to push and hold on to things and walk by himself. (Participant 10; woman (33 years); Figure 2b).

Balance

The last theme that the participants highlighted about the physical effects of hippotherapy was balance. The parents emphasized the positive contribution of therapy to the balance of children with cerebral palsy by using the photograph of a scooter, which was a tool used to realize a child's dream. The state of balance is represented in Figure 3, and below is the story shared by the participant regarding this photo.

> Scooters have been my child's dream for years, but we've always forbidden it. We have always held it off because my child had no balance, and they could fall and get hurt. We initially said no, but after hippotherapy, we thought of giving them a scooter when we thought about how we could make them happy because their balance and upright posture are now better. (Participant 6; man; (45 years); Figure 3).

This example illustrates more than improved balance; it reflects a shift in the family's risk perception and parenting approach. What was once considered unsafe and strictly prohibited became a symbol of joy, confidence, and renewed trust in the child's abilities. In this sense, rehabilitation extended beyond therapeutic gains and entered the realm of recreation, demonstrating how hippotherapy reshaped both the child's physical capacity and the parents' interpretations of what is possible.

Figure 3

Scooter Picture Representing the Child's Development of Balance

Well-being Effects

Perceived self-efficacy

Some participants pointed that hippotherapy contributed to the perceived self-efficacy. In this regard, one of the parents stated that her child overcame their shyness and helped them gain self-efficacy. As evident from the excerpt below, some parents articulated the influence of therapeutic interventions on their children's capacity to effectively manage fundamental tasks.

> My child was very timid. They would hide when we went to a place. They used to do things with me. Now they can go anywhere on their own. Before the hippotherapy, they had difficulty using their hands. When I tried to get them to hold an object, they would drop it immediately. One day, I noticed at breakfast that they were holding bread in their right hand and tea in their left hand. Now they can also put on and take off their glasses. (Participant 5; woman (50 years); Figure 4a).

Self-confidence and self-esteem

The second theme was self-confidence and self-esteem. This theme related to a sense of achievement experienced by children with cerebral palsy in successfully completing some tasks. Specifically, parents reported that their children could now independently perform basic activities such as climbing stairs, maintaining balance, and standing upright, which were previously facilitated by parental assistance. More than half of the participants perceived a strong association between physical competence and psychological well-being, which they identified as a manifestation of self-confidence. This aspect was considered a distinct and noteworthy outcome of therapy that extended beyond mere physical development. Receiving therapy had a positive impact on their children's sense of achievement. Below is presented one of the participants' opinions on the positive impact of therapy on self-confidence and self-esteem.

> We have two memories of this photo, good and bad. It tells us about the before and after of hippotherapy. The first time my child tried to go down these stairs, they ended up falling down the stairs. We used to do stair-climbing exercises in hippotherapy. At first, they couldn't climb the stairs at all, but now they can do it easily. Their balance and upright posture have improved. Now they say to us, "you don't need to hold me

anymore. I can climb the stairs on my own". They can go up and down the stairs without support. (Participant 3; woman (41 years); Figure 4b).

Figure 4

Pictures of the Development of Motivation and Socialization

Figure 4a. Perceived self-efficacy

Figure 4b. Self-confidence and self-esteem

Motivation

The therapy was reported to have resulted in increased intrinsic and extrinsic motivation among children with cerebral palsy for the accomplishment of mundane tasks. Motivation serves as a catalyst for individuals to act. It has been suggested that motivation, as a critical factor in fostering self-confidence and self-efficacy, can emerge internally through the interaction between the child and the horse and through external factors, including trainers, families, and peers involved in the training. Several parents reported that hippotherapy stimulated a sense of achievement in their children. For the motivational aspects of therapy, more than half of the participants expressed satisfaction with their children's determination to succeed, particularly when they overcame their fears. The excerpt that supported this theme is as follows.

> When we picked up our child, they would scream, get scared and cry. Now they are happy when we put them on their feet. They now try to do it on their own. They sit down and try to have their breakfast. When it snows, they try to get snow off the ground. When we put on their shoes, they would step inwardly. Now they're trying not to do so. (Participant 2; woman (34 years); Figure 5a).

Communication and socialization

Nearly all participants reported that hippotherapy had a positive impact on their children's ability to communicate with family, friends, peers, and therapists. The findings highlighted that the improvement of the children's communication skills also played a significant role in fostering their socialization. The developments resulting from therapy were noted to effectively eliminate asocial behavior that particularly emerged due to limitations in the child's physical movement. According to the parents, the child's physical development resulted in increased self-confidence, which in turn positively influenced the child's communication skills and overall socialization. The picture and excerpt below explain the socialization theme.

> My child could not run freely in this garden during the first school days. When they tried to run, they lost balance and fell over. My child is a little timid. After hippotherapy, they started running because they could comfortably stand on balance. The fact that they began to run and walk more easily enabled them to get closer to their friends, and thus

they became more social. This garden is now a place of freedom where they can run comfortably and play with their friends. (Participant 3; woman (41 years); Figure 5b).

Figure 5

Pictures of the Development of Motivation and Socialization

Figure 5a. Motivation

Figure 5b. Socialization

Perceptual expansion

Our findings suggested that parents of children with cerebral palsy appreciated hippotherapy for its role in promoting perceptual expansion. The development of the child's interests and greater awareness of environmental stimuli were characterized as perceptual expansion. Parents also perceived hippotherapy as facilitating their child's exploration of their extremities and objects. Furthermore, therapy was perceived as a positive reinforcement of previously unexplored complementary behaviors. As indicated in the excerpt below, perceptual expansions were observed, including interest in exploring the toys, exploring movements, and complementing the act of listening with looking and watching.

> My child had no interest in toys before the hippotherapy. If we gave them a plastic bag, they would like the rustling of it and play with it. During the hippotherapy, the touch and movements of patting the horse led them to explore their hands. They used to say that their hands were tickling and tingling. Putting their hands to the side, they achieved balance. They could not sit without support before the therapy. Now they are trying to maintain their balance and engage in activities with their toys. They reach and try to pick up the toys and return to their earlier position. Before the therapy, we couldn't get them to sit down and getting them to return to their position was no option. My child, who couldn't even sit down before, is now interested in exploring where they sit. Previously, they would have preferred to just listen, not do anything by looking. Now they pay attention and have begun to do things by looking and watching. Hippotherapy has accelerated our treatment process. (Participant 9; woman; (40 years); Figure 6a).

Figure 6

Pictures of Perceptual Expansion and Emotional Attachment

Figure 6a. Perceptual expansion

Figure 6b. Emotional attachment

Emotional attachment

The last theme was emotional attachment. A number of parents disclosed that hippotherapy contributed to the connection between children's development of emotions and animal love. Some participants reported a correlation between the child's increased level of relationship with the horse and emotional attachment. For example, one participant shared a photo and positive experiences highlighting her child's enhanced sense of touch and interaction, which, as a result of hippotherapy, fostered a love for other animals while facilitating an emotional attachment.

> My child was interested in animals before the hippotherapy, but during the therapy, they felt much more attached to animals because they had the chance to interact directly with animals. Cats, dogs, horses. They bonded with them through close contact. My child is incredibly happy. They love having people around them that talk to them. They can't quite speak yet, but when they see the horses, they get madly happy. And because they had a chance to touch the animals during the therapy, they got more interested, and I think it is good for them. (Participant 8; woman (37 years); Figure 6b).

DISCUSSION AND CONCLUSION

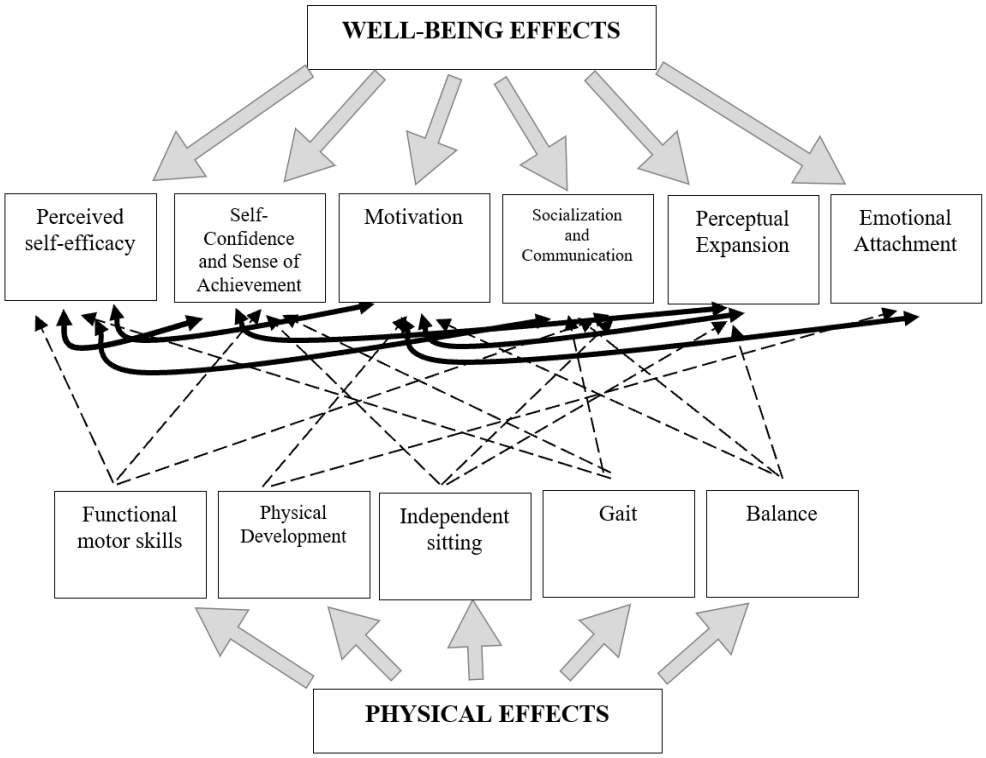
This study aimed to examine the effect of hippotherapy on the well-being of children with cerebral palsy through the photovoice method from the parents' perspective. The findings of this study can contribute to the research on the hippotherapy experiences of parents who have a child with cerebral palsy. To the best of our knowledge, this study represents the first qualitative research utilizing the photovoice method to examine the influence of hippotherapy on well-being from the perspective of parents raising children with cerebral palsy. Hence, our study effectively addressed a gap in the current literature and can be a significant contribution to the existing body of knowledge. Numerous studies have been conducted on the physical development and psychological impacts of hippotherapy. This study demonstrated a parental point of view, who are the target audience, and can be regarded as a methodological contribution as it uses the photovoice method as a qualitative approach. The findings of this study supported the existing research that employed different methodologies to investigate the effects of

hippotherapy. We demonstrated that parents appreciated hippotherapy for the well-being of children with cerebral palsy.

Our study resulted in the identification of five factors expressed by the parents regarding the effect of hippotherapy on physical development, which included: physical motor skills, physical development, independent sitting, gait, and balance. Our findings echoed the results of numerous studies on hippotherapy (e.g., Biery & Kauffman, 1989; Casady et al., 2004; Debuse et al., 2005; Granados & Agís, 2011; Lee et al., 2014; McGibbon et al., 1998). For example, Biery and Kauffman (1989) stated improved balance after a six-month hippotherapy. Lee et al. (2014) also reported a similar finding of improved balance as a result of hippotherapy. According to Zadnikar and Kastrin's (2011) meta-analysis, hippotherapy held promise for enhancing balance and postural control in individuals with cerebral palsy. Casady and Nichols-Larsen (2004) observed a positive effect of hippotherapy on the functional movements of a sample group of eleven children with cerebral palsy, with a mean age of 3.9 (SD = 1.4). Winchester et al. (2002) indicated that hippotherapy might lead to improvement in gross motor function in developmentally delayed children and that these improvements remained once hippotherapy ceased. The findings regarding the impact of hippotherapy on well-being in relation to its physical effects revealed six key themes: perceived self-efficacy, self-confidence, and sense of achievement; motivation; communication and socialization; perceptual expansion; and emotional attachment. These emerging themes cannot be evaluated in isolation from the factors that contributed to the children's physical development during therapy. As Debuse et al. (2005) advocated, the effects of hippotherapy should be evaluated in a holistic manner. Nearly all the parents interviewed stated that their children with cerebral palsy psychologically developed as a reflection of their physical development. Supporting this interpretation, previous research has shown that satisfaction derived from leisure activities strengthens the positive relationship between social interaction and psychological well-being (Yalçın et al., 2025).

Figure 7

Findings on the Relationships between Physical and Well-Being Effects



While this study primarily examined the impact of hippotherapy on well-being, it was essential to acknowledge the relationship between hippotherapy and the physical effects. Based on the German and British physiotherapists' views, Debuse et al. (2005) highlighted the psychological benefits of hippotherapy alongside the physical developmental benefits. In addition to the physical benefits of this treatment, research has shown psychological, social, and educational benefits (Granados & Agís, 2011). Therefore, the five effects of hippotherapy on children in relation to well-being should be considered from the parents' perspective. The assumption that the child with cerebral palsy demonstrated psychological and physical development simultaneously appeared to validate the impact of hippotherapy on the relationship between physical development and well-being. This finding was consistent with previous studies (e.g., Debuse et al., 2005; MacKinnon et al., 1995; Woźniak & Weber-Nowakowska, 2019). While many emerging themes about the well-being or psychological impact of hippotherapy supported the existing research (Lechner et al., 2007), factors such as perceptual expansion and emotional attachment could be regarded as valuable contributions to the relevant literature.

Figure 7 presents the physical effects and the perceived well-being effects resulting from hippotherapy as reported by the parents with photographic evidence. The figure illustrates the relationships between the outcomes of physical development and well-being. When evaluating the perceived self-efficacy based on the functional motor skills and well-being effects, it was found that children between the ages of 6-9 improved their ability to carry out daily activities as their functional motor skills developed. As a result of the children's realization of their capabilities to independently perform these daily activities, they became less reliant on their families and developed a sense of self-assurance in their abilities. As a consequence of improved functional motor skills, the children experienced a sense of competence and achievement in daily activities, increasing motivation to engage in further activities. As they realized their ability to perform these activities, they developed self-confidence and a sense of achievement. Functional motor development was of more importance for children in primary school. The child initially chose to isolate themselves due to concerns about disrupting games and potentially causing harm to their peers, as their motor development was comparatively lower than that of their peers. As a result of skill development, individuals built their self-confidence, increased their desire to engage more with peers, and enhanced their socialization and communication skills. In terms of physical development, the child became aware of the changes in their body. The implementation of therapies led to a reduction in bodily contractions, consequently promoting the child's physical development. The child was more motivated to continue the therapy by noticing the rapid development in their body. This motivation enhanced their active participation in therapies and promoted their overall developmental progress. Hence, the child exhibited not only a motivated engagement in therapies but also an understanding that their physical development was attributable to these interventions. Furthermore, they demonstrated emotional attachment towards those in their social sphere. This emotional attachment can be toward those around them as well as therapists. The child's ability to sit independently without external support contributed significantly to their self-confidence and sense of accomplishment. Prior to the sessions, the child's focus during sitting was primarily on maintaining balance. However, because of the therapy, the child gradually experienced an increased level of comfort while sitting. The ability to sit independently allowed the child to gain a better understanding of their surroundings. This heightened state of awareness and exploration of the environment fostered perceptual expansion. Prior to independent sitting, the child struggled to maintain balance and may experience instances of falling while attempting to sit. The child's difficulty in sitting effortlessly resulted in social isolation, as they tended to avoid interaction with peers and seek more solitude. The attainment of independent sitting through the therapy sessions positively influenced the child's self-confidence and sense of achievement. Furthermore, the increased desire to spend time with peers facilitated the

development of socialization and communication skills. Walking ability as a significant component of daily activities enhanced the child's overall level of physical activity. As a result, children of primary school age became capable of independently commuting to school. The ability to act independently and autonomously, without assistance from the family, enhanced self-efficacy, self-confidence, and a sense of achievement. Consequently, the child's enhanced ability to engage comfortably in peer activities contributed to the improvement of their socialization and communication skills.

Balance was an essential factor for children with cerebral palsy as it impacts various aspects of their lives. The development of balance facilitated gait and independent sitting and created a sense of achievement, thus enhancing motivation and fostering active participation in therapies. With the advancement of balance, the child who previously experienced social isolation due to challenges in maintaining balance during peer interactions developed socialization and communication skills. Achieving a sense of balance liberated the child from the constant need to focus on balance, which fostered a greater ability to explore and engage with the surroundings. This sense of curiosity and the drive for exploration also contributed to perceptual expansion.

The relationship between the effects of well-being indicated that children experienced enhanced self-efficacy, self-confidence, and a sense of achievement through engaging in activities and achieving developmental milestones. The acquisition of perceived self-efficacy and the ability to confidently engage in daily activities as a result of therapy sessions increased the child's commitment to the therapies and served as a motivating factor. Children developed a sense of self-efficacy and became more inclined to spend time with their peers. Developing self-efficacy facilitated socialization and communication. As self-confidence and a sense of achievement developed, the children became more motivated to explore their environment. Consequently, this process led to a perceptual expansion, broadening the children’s perception and understanding of their surroundings. Perceptual expansion and a sense of curiosity motivated the children, which led to an emotional commitment to the therapy.

Moreover, the theme of perceptual expansion observed in this study reflects not only behavioral change but also underlying neurological and cognitive development. Parents described their children transitioning from primarily “listening” or passively observing to actively “watching, reaching, and engaging” with their environment. This developmental shift aligns with Piaget’s sensorimotor stage, in which children move from simple reflexive actions toward intentional interaction, exploration, and problem-solving. In this sense, P9’s observations—such as exploring objects with hands and reaching for toys—represent early forms of goal-directed behavior and increased environmental awareness. This theme stands out as one of the study’s most original contributions, demonstrating how hippotherapy may support not only motor and emotional gains but also early cognitive processes related to exploration and agency.

Furthermore, our findings demonstrated that parents endorsed the well-being perspective by emphasizing the impact of hippotherapy on the children's physical development. While participants of previous studies have reported both physical and psychological effects, our study revealed that parents prioritized physical development in line with their expectations and subsequently assessed the well-being effects as a reflection thereof. This result aligned with the anticipated outcome considering the expectations of the families. Families prioritized their children's freedom of movement.

The significance of our findings lies in their contribution to the development of self-confidence, a sense of achievement, motivation, communication, and socialization. These additional outcomes, beyond the primary expectations from the therapy, are crucial for children's psychological development. These expected physical developments resulted in

relatively less expected results of well-being effects, which made families happy (Irwin et al., 2019). The results of our research using photovoice as a qualitative method can be used to complete a physical or quantitative analysis of hippotherapy.

Theoretical Implications

This study with its subject, methodology, and holistic perspective is a theoretical contribution to comprehending the experiences of individuals with cerebral palsy. It offers valuable insights into the families' perspectives and experiences bridging a gap in the current literature on hippotherapy and cerebral palsy. Moreover, the sub-dimensions that emerged within our study support the existing theoretical knowledge, while the two previously unexplored aspects (perceptual expansion and emotional attachment) that our research introduced can contribute to existing literature. The target audience of this study, including parents, health care professionals, clinicians, and service providers working with children with cerebral palsy, can engage with the scientifically presented results, which incorporate real-life examples regarding complementary and alternative medicine and hippotherapy. Within the context of comparable experiences and outcomes, these stakeholders can gain insights and discover answers to their well-being expectations. The demonstrated effects in the literature can indirectly serve as a source of motivation and well-being for parents who are confronted with similar situations and share a common narrative. Furthermore, the findings of our study can guide future researchers in developing a new understanding, perspective, and approach toward the research processes, thereby making an additional contribution to the field.

Practical Implications

This study offers several practical implications for families and clinicians working with children with cerebral palsy. The findings highlight that parents play a central role in supporting the therapeutic progress of their children. Clinicians may therefore integrate these insights into their referral and guidance processes by informing families about the physical and psychological benefits associated with consistent participation in hippotherapy. The results may also guide parents in addressing emotional needs both at the time of diagnosis and throughout the treatment journey. Beyond medical interventions, the study underscores the importance of considering complementary therapies as meaningful avenues for supporting well-being. The findings may assist policymakers and service providers in designing programs that alleviate the emotional and financial burden of therapy while also validating the experiences of families. Understanding the multidimensional outcomes valued by parents can help clinicians tailor services more closely to family needs. In addition, Photovoice emerged as a promising supportive tool within the therapeutic process. The act of photographing their children’s progress appeared to strengthen parents’ sense of involvement, reinforce their belief in the effectiveness of hippotherapy, and enhance motivation to continue the treatment process. Encouraging parents to incorporate photography into routine follow-up may provide emotional and motivational benefits while giving therapists richer, parent-generated insights into the child’s everyday progress.

Limitations and Future Studies

As with every study, our study has its own limitations. Firstly, the participants of this study consisted of a limited number of parents. The sample of the study was a group of people in Eskişehir that received service within the scope of the European Union project (Hippotherapy Project: Centre in Türkiye). Conducting quantitative studies with larger sample sizes can lead to more comprehensive and generalizable findings. Various factors, including culture, education, and religion, have the potential to influence the evaluation of hippotherapy services received by families of children with cerebral palsy. Future studies can employ photovoice or other qualitative research approaches involving parents from diverse cultural, educational, and

religious backgrounds, which can contribute further to the field. Another limitation of the study was that the physical and well-being development of the children was solely based on the photos and stories shared by the parents. That is, the study lacked expert validation or assessment of the psychological or mental development of the children involved. The findings in the current research were based on parents' reports about the perceived social, psychological, and health state of their children. Future studies can benefit from comparing families' and specialists' reports. Adopting such an approach would contribute to exploring both the perceived outcomes and expert-validated results of therapy. Another limitation of this study concerns the potential presence of positive bias in parental reports. As frequently observed in qualitative research involving caregivers, social desirability or a sense of gratitude toward therapeutic services may have led parents to emphasize positive changes more strongly than negative or neutral experiences. Additionally, because the Photovoice method requires participants to choose which moments to photograph, the resulting data is shaped by personal interpretations and subjective preferences. It is therefore important to consider this when interpreting the findings. Furthermore, we acknowledged that this study primarily focused on the well-being status of children with cerebral palsy from the parental perspective, and future studies can complement our findings by examining well-being from the perspectives of both experts and individuals with cerebral palsy. The results of this study illustrated the observed developments, which could provide a path to a better understanding of the therapy process. Lastly, while this study primarily focused on the well-being effects of hippotherapy, it did not address the challenges faced by families in coping with difficulties. Future studies can investigate families' coping strategies employed in dealing with psychological difficulties.

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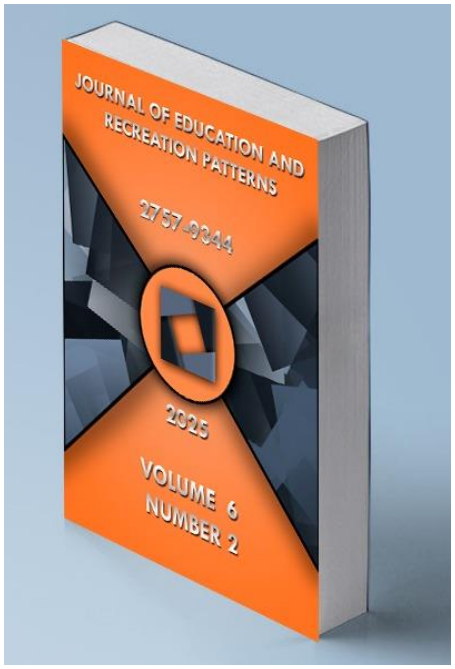

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Effects of Cross-Country Skiing and Volleyball Training Characteristics on Some Respiratory Parameters in Female Athletes

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Effects of Cross-Country Skiing and Volleyball Training Characteristics on Some Respiratory Parameters in Female Athletes*

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ABSTRACT
This study aimed to examine the effects of sport-specific training on selected respiratory parameters in female cross-country skiers and volleyball players. A total of 36 women voluntarily participated in the study, including 12 cross-country skiers (age: 19.17 ± 1.11 years), 12 volleyball players (age: 20.42 ± 2.19 years), and 12 sedentary controls (age: 20.42 ± 2.27 years). Pulmonary function values were measured using a spirometer under standardized conditions. Statistical analyses were conducted using SPSS v30. Since the data showed a normal distribution, a one-way ANOVA was applied to compare mean respiratory parameters among groups, followed by Tukey's post-hoc test for pairwise comparisons.
The results indicated that forced expiratory volume in one second (FEV_1), the FEV_1/forced vital capacity ratio (FEV_1/FVC), peak expiratory flow rate (PEF), forced expiratory flow between 25-75% of vital capacity (FEF_{25-75}%), and maximal voluntary ventilation (MVV) were significantly higher in cross-country skiers than in sedentary participants ($p < 0.05$). Moreover, cross-country skiers demonstrated significantly higher FEV_1/FVC and FEF_{25-75}% values compared to volleyball players ($p < 0.05$). Volleyball players exhibited significantly higher PEF and MVV values than sedentary participants ($p < 0.05$), while no significant differences were found in the remaining parameters ($p > 0.05$).
In conclusion, female cross-country skiers displayed superior respiratory function compared with volleyball players and sedentary women. These findings suggest that the physiological demands and training characteristics of cross-country skiing may contribute more effectively to the enhancement of respiratory capacity.

Keywords: Cross-Country Skiing, Exercise Physiology, Respiratory Function, Sedentary Women, Volleyball.

* This study was presented as an oral presentation at the 22nd International Sports Science Congress, hosted by Gazi University in Ankara between November 21-24, 2024.

INTRODUCTION

Designing training programs that enhance the physical, physiological, and motor performance of female athletes represents a key focus in contemporary sports science research. The specific training characteristics required by different sport disciplines can induce distinct respiratory system adaptations, thereby influencing athletic performance and health (McArdle et al., 2010). Adaptations within the respiratory system are critical determinants of both exercise performance and overall well-being (Wilmore & Costill, 2004). Parameters such as maximal oxygen uptake (VO_2max), ventilatory thresholds, and pulmonary function indices are commonly used to assess athletes' physiological responses to varying training loads (Saltin & Åstrand, 1967). Understanding how physiological and hormonal differences influence respiratory adaptations in female athletes is essential not only for optimizing performance but also for safeguarding health and promoting long-term participation in sport. Although lung function is influenced by factors such as body composition, stature, sex, age, ethnicity, and genetics, evidence suggests that physically active individuals generally exhibit superior respiratory function compared with sedentary peers (Fox et al., 1993; Atan et al., 2012). Regular and long-term exercise induces numerous systemic adaptations and contributes to the development of respiratory function (Patlar et al., 2000).

The extent to which training influences pulmonary function appears to depend largely on the structural characteristics and intensity of the training stimulus. Respiratory muscle strength, in particular, plays an important role in the efficiency of breathing and overall ventilatory capacity. Given the contribution of respiratory and core musculature to ventilatory mechanics, their development level is a crucial determinant of athletic performance (Shin et al., 2017). A well-developed lung capacity is vital for meeting oxygen demands during exercise and ensuring effective oxygen transport to working tissues, as it represents a primary component of cardiorespiratory fitness (Caspersen et al., 1985). Metabolic adaptations are known to vary with exercise type, duration, and intensity, and different training modalities may elicit distinct changes in respiratory frequency and volume (Losnegard & Hallén, 2014). Because each sport imposes unique physiological demands, the nature of the training stimulus determines the extent and specificity of respiratory adaptations. While cardiovascular function is a well-established determinant of endurance performance, enhanced pulmonary capacity directly supports endurance by facilitating more efficient oxygen uptake and utilization.

Cross-country skiing is a sport characterized by high respiratory system activation and requires a complex interplay of balance, strength, speed, agility, and particularly endurance capacity. Given the demanding nature of its training structure, cross-country skiing imposes substantial stress on both the cardiovascular and respiratory systems while simultaneously engaging nearly all major muscle groups, thereby promoting technical and physiological adaptations (Sandbakk & Holmberg, 2014). In contrast, volleyball training-although less dependent on continuous endurance-plays a crucial role in improving respiratory efficiency and lung capacity through intermittent high-intensity actions and frequent upper-body involvement (Bilici & Genç, 2020). Cross-country skiing and volleyball therefore differ markedly in their energy system utilization, muscular activation patterns, and physical demands. Whereas cross-country skiing primarily emphasizes aerobic endurance and sustained oxygen delivery, volleyball performance relies more on anaerobic power output, rapid recovery, and explosive movements within team-based dynamics (Brooks et al., 2005). These physiological distinctions may lead to sport-specific adaptations in respiratory parameters.

Although the beneficial effects of regular exercise on pulmonary function have been well documented, comparative research exploring how distinct training modalities influence respiratory adaptations in female athletes remains limited. Accordingly, evaluating and contrasting the respiratory responses of athletes engaged in sports with divergent physiological

and technical characteristics-such as cross-country skiing and volleyball-provides valuable insight for optimizing training design and safeguarding respiratory health. Therefore, the present study aimed to investigate the effects of sport-specific training in cross-country skiing and volleyball on selected respiratory parameters in female athletes.

METHOD

Participants

This Thirty-six women voluntarily participated in this study (Table 1). The sample included 12 cross-country skiers, 12 volleyball players, and 12 sedentary women who met the inclusion criteria of being nonsmokers, free from chronic disease, and having experienced no acute health issues within the preceding three weeks. The athlete groups consisted of individuals with a minimum of three years of systematic training experience, engaging in regular practice at least five days per week for more than one hour per session.

All participants were informed in detail about the study's objectives, procedures, and potential risks, and each provided written informed consent in accordance with the Declaration of Helsinki. Participants were instructed to avoid strenuous physical activity, caffeine consumption, or any behavior that might influence respiratory measurements within 24 hours before testing.

Study Design

This study employed a cross-sectional, comparative design aimed at examining differences in selected respiratory parameters among female cross-country skiers, volleyball players, and sedentary controls. All measurements were conducted under standardized laboratory conditions. Participants were fully informed about the study objectives, procedures, and potential risks, and each provided written informed consent prior to participation. To ensure participant familiarity with the spirometry procedures and to minimize measurement variability, athletes performed a practice trial before formal testing. The research protocol was reviewed and approved by the Muş Alparslan University Scientific Research and Publication Ethics Committee (Date and No: 27.12.2024 - 175292). All procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Data Collection Tools

Anthropometric Assessments: Body height, body weight, and body mass index (BMI) were recorded for all participants. Height was measured to the nearest 0.1 cm using a stadiometer while participants stood barefoot and upright. Body weight was determined using a Tanita BC-730 Body Composition Analyzer (Tokyo, Japan) with participants wearing lightweight clothing (t-shirts and sweatpants). Body mass index was calculated using the standard formula (BMI = weight [kg] / height² [m²]).

Respiratory Measurements: Pulmonary function was assessed using a Pony FX spirometer (Cosmed, Rome, Italy) to determine functional lung volume and capacity parameters in accordance with established guidelines (Atan et al., 2012; Durmic et al., 2015). Participants were instructed to abstain from smoking, alcohol or caffeine intake, medication use, and strenuous exercise for 24 hours before testing.

All measurements were performed in a seated position, with the nose occluded by a nasal clip and the mouth sealed around the spirometer mouthpiece. After several normal breathing cycles, participants were asked to inhale maximally and then exhale forcefully and completely. Each test was repeated twice, and the highest value was recorded for analysis. The following parameters were examined: Forced Vital Capacity (FVC), Forced Expiratory Volume in One Second (FEV_1), FEV_1/FVC ratio, Peak Expiratory Flow (PEF), Forced Expiratory Flow at 25-

75% of vital capacity (FEF_{25-75}%), Vital Capacity (VC), and Maximal Voluntary Ventilation (MVV).

Data Analysis

All data were organized and visualized using Microsoft Excel, while statistical analyses were performed with IBM SPSS Statistics version 30.0 (Armonk, NY, USA). The Shapiro–Wilk test was used to verify the normality of the data distribution. Since the data were normally distributed, a one-way analysis of variance (ANOVA) was applied to compare respiratory parameters among groups. Tukey's post hoc test was employed for pairwise comparisons where significant differences were detected. Additionally, Pearson correlation analysis was used to examine associations between selected variables. Statistical significance was set at $p < 0.05$.

FINDINGS

The analysis focused on evaluating differences in respiratory function parameters among female cross-country skiers, volleyball players, and sedentary participants. Descriptive statistics were calculated for all variables, and one-way ANOVA was conducted to determine intergroup differences. The overall findings revealed that sport-specific training had a marked influence on several pulmonary function parameters. Athletes, particularly those engaged in cross-country skiing, exhibited superior respiratory performance compared with sedentary women, indicating clear sport-related physiological adaptations in ventilatory capacity and expiratory function.

Table 1

Descriptive Characteristics of the Study Participants (Mean ± SD).

Groups	N	Age (years)	Body Weight (kg)	Height (cm)	BMI (kg/m2)
Cross-Country	12	19.17±1.11	54.08±3.94	164.75±3.93	19.85±0.96
Volleyball	12	20.42±2.19	55.58±6.50	163.75±5.85	20.71±1.76
Sedanter	12	20.42±2.27	52.67±8.06	162.67±5.09	19.89±2.77

BMI = Body Mass Index

Table 2

Comparison of Respiratory Parameters Among Female Cross-Country Skiers, Volleyball Players, and Sedentary Participants

Parameters	Groups	N	Average.	SD.	F	p	Tukey
FVC(L)	A- Cross-Country	12	3.77	0.24	1.65	.207	
	B-Volleyball	12	3.78	0.11			
	C-Sedanter	12	3.39	0.13			
FEV1(L)	A- Cross-Country	12	3.47	0.18	4.76	.015*	A>C
	B-Volleyball	12	3.21	0.11			
	C-Sedanter	12	2.87	0.11			
FEV1/FVC% (%)	A- Cross-Country	12	92.8	1.38	8.55	.001*	A>B A>C
	B-Volleyball	12	85.3	1.22			
	C-Sedanter	12	85	1.86			
PEF (L/s)	A- Cross-Country	12	6.12	0.4	12.45	.000*	A>C B>C
	B-Volleyball	12	5.67	0.3			

	C-Sedanter	12	3.93	0.27			
FEF25-75% (L/s)	A- Cross-Country	12	4.37	0.21	10.39	.000*	A>B A>C
	B-Volleyball	12	3.63	0.23			
	C-Sedanter	12	3.11	0.15			
VC (L)	A- Cross-Country	12	3.6	0.24	1.12	.337	
	B-Volleyball	12	3.47	0.12			
	C-Sedanter	12	3.25	0.11			
MVV (L/min)	A- Cross-Country	12	97.1	7	4.23	.023*	A>C B>C
	B-Volleyball	12	97.86	5.79			
	C-Sedanterler	12	77.48	3.49			

FVC - Forced Vital Capacity; FEV_1 - Forced Expiratory Volume in One Second; FEV_1/FVC - Ratio of Forced Expiratory Volume to Forced Vital Capacity; PEF - Peak Expiratory Flow; $FEF_{25-75}\%$ - Forced Expiratory Flow between 25-75% of Vital Capacity; VC - Vital Capacity; MVV - Maximal Voluntary Ventilation.
Note: $p < 0.05$ indicates statistical significance (Tukey post hoc test).

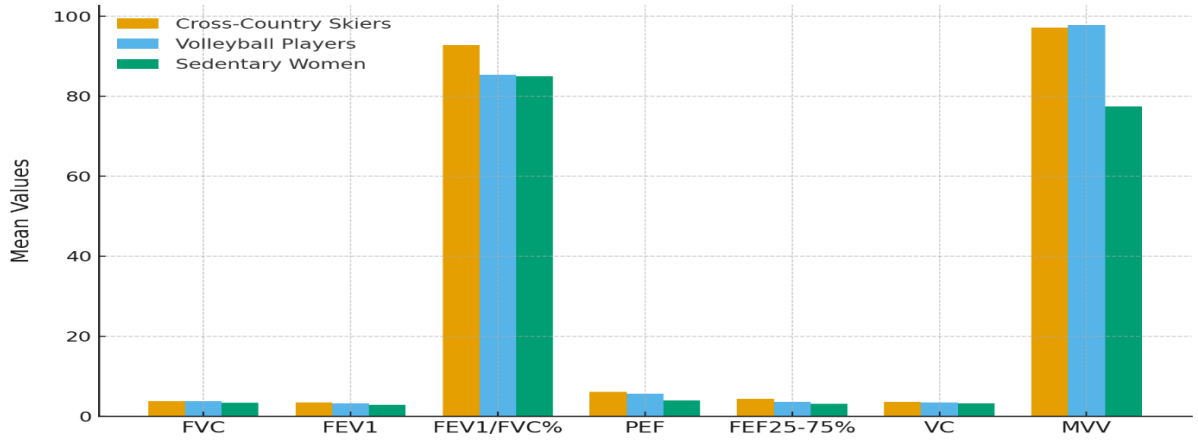
Table 2 presents the results of the one-way ANOVA comparing the respiratory parameters of female cross-country skiers, volleyball players, and sedentary participants. Overall, the findings indicate that regular sport-specific training produces significant improvements in several pulmonary function indicators compared to a sedentary lifestyle. Among the measured parameters, FEV_1, FEV_1/FVC, PEF, $FEF_{25-75}\%$, and MVV showed statistically significant differences between groups ($p < 0.05$), highlighting the superior ventilatory performance of the athlete groups.

The cross-country skiers demonstrated the highest mean values across nearly all parameters, reflecting the aerobic and endurance-oriented nature of their training, which stimulates both the cardiovascular and respiratory systems. Their FEV_1/FVC and $FEF_{25-75}\%$ ratios were significantly greater than those of volleyball players, suggesting better airway function and expiratory flow capacity. The volleyball players, who engage in high-intensity intermittent efforts, also displayed significantly higher PEF and MVV values compared with sedentary participants, indicating sport-specific adaptations in respiratory muscle strength and ventilatory efficiency.

No significant intergroup differences were found for FVC and VC, suggesting that total lung volume may be more influenced by anatomical and genetic factors than by training modality. Nonetheless, the consistent superiority of active groups over sedentary controls demonstrates that both aerobic (cross-country skiing) and anaerobic (volleyball) exercise contribute positively to pulmonary performance, albeit through distinct physiological pathways.

Figure 1

Comparison of Respiratory Parameters among Female Cross-Country Skiers, Volleyball Players, and Sedentary Participants (mean values).



Bar chart represents the mean values of each respiratory parameter (FVC, FEV_1, FEV_1/FVC%, PEF, FEF_{25-75}%, VC, MVV) for the three groups. Cross-country skiers generally exhibited higher values across most parameters, reflecting superior ventilatory and expiratory performance compared with volleyball players and sedentary women.

Table 3

Pearson Correlation Coefficients between Anthropometric Characteristics and Respiratory Function Parameters among Participants.

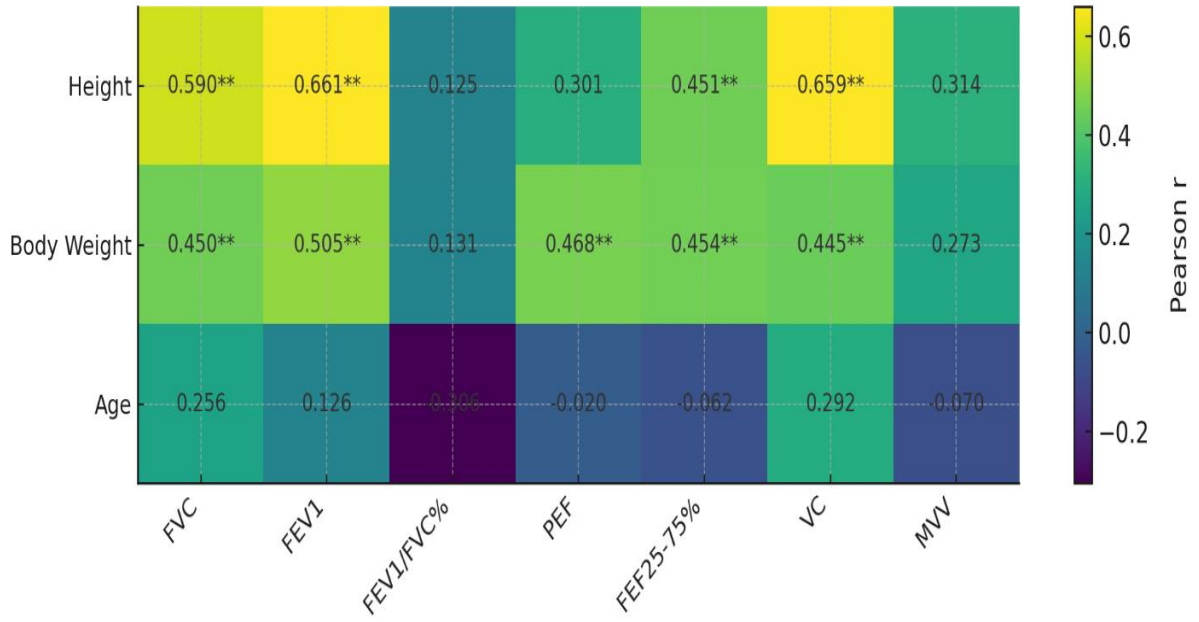
		FVC(L)	FEV1(L)	FEV1/FVC%	PEF (L/s)	FEF25-75% (L/s)	VC (L)	MVV (L/min)
Height	r	.590**	.661**	0.125	0.301	.451**	.659**	0.314
	p	0.000	0.000	0.469	0.075	0.006	0.000	0.062
Body Weight	r	.450**	.505**	0.131	.468**	.454**	.445**	0.273
	p	0.006	0.002	0.446	0.004	0.005	0.006	0.108
Age	r	0.256	0.126	-0.306	-0.02	-0.062	0.292	-0.07
	p	0.131	0.464	0.07	0.906	0.719	0.084	0.684

FVC (Forced Vital Capasity), FEV1(Forced Expiratory Volume in 1 second), FEV1(Forced Expiratory Volume in 1 second) /FVC (Forced Vital Capasity), PEF (Peak Expiratory Flow), FEF25-75% (Forced Expiratory Flow at 25-75%), VC (Vital Capacity) and MVV (Maximal Voluntary Ventilation)

Significant positive correlations were found between height and several respiratory parameters, including FVC, FEV_1, FEF_{25-75}%, and VC ($p < 0.01$). Body weight was also positively associated with FVC, FEV_1, PEF, and FEF_{25-75}% ($p < 0.01$). No significant correlations were observed between age and any respiratory variables. These findings indicate that taller and heavier individuals generally exhibit greater lung volumes and ventilatory capacities.

Figure 2

Correlation Heatmap between Anthropometric Characteristics (height, body weight, and age) and Respiratory Function Parameters.



The figure illustrates Pearson's correlation coefficients (r) between anthropometric and respiratory variables. Darker colors indicate stronger positive relationships. Significant

correlations are marked with ** ($p < 0.01$) and * ($p < 0.05$). Height and body weight showed strong positive associations with several respiratory parameters, whereas age exhibited no significant correlation.

DISCUSSION

This section dives deep into the interpretation and significance of the findings presented in the 'Results'. It seeks to situate the research outcomes within the broader scholarly conversations, thereby offering insights into their implications, potential applications, and future directions. In the present study, the effects of sport-specific training on respiratory function were examined by comparing female cross-country skiers, volleyball players, and sedentary participants. The results revealed that the cross-country skiing group demonstrated enhanced ventilatory performance, with significantly higher FEV_1, FEV_1/FVC, PEF, $FEF_{25-75}\%$, and MVV values than sedentary women. These findings indicate that sustained endurance-oriented training induces substantial improvements in respiratory efficiency and expiratory flow dynamics. Moreover, the higher FEV_1/FVC and $FEF_{25-75}\%$ ratios observed in cross-country skiers compared with volleyball players suggest sport-specific adaptations that favor endurance capacity. In contrast, volleyball players showed moderately elevated PEF and MVV values relative to sedentary individuals, reflecting functional improvements linked to the intermittent, high-intensity demands of volleyball-specific exercise.

These findings are supported by previous research emphasizing the beneficial effects of endurance training on pulmonary function. Prakash et al. (2007) reported that long-term aerobic exercise enhances FEV_1 and vital capacity by strengthening respiratory musculature and improving alveolar efficiency, while Mazic et al. (2015) observed higher ventilatory capacity and oxygen transport efficiency in endurance-trained athletes compared with non-athletes. Together, these results reinforce the notion that regular, high-volume aerobic exercise elicits profound respiratory adaptations through continuous ventilatory stimulation. Further supporting this evidence, Sable et al. (2012) and Ahmadi et al. (2013) reported that consistent physical activity improves key lung function parameters. The superior FEV_1/FVC and $FEF_{25-75}\%$ values in cross-country skiers can be explained by the continuous respiratory and cardiovascular load imposed by endurance-based training, which strengthens respiratory musculature and enhances ventilatory capacity. In line with this, Bilici and Türker (2019) highlighted that endurance exercise strengthens respiratory muscles and increases ventilation efficiency, while Koubaa et al. (2015) found that long-term, low-intensity exercise improves FEV_1 and $FEF_{50}\%$, reflecting better airway conductance. Collectively, these findings underline the decisive role of endurance training in promoting pulmonary function among female athletes.

The higher PEF and MVV values observed in volleyball players compared with sedentary participants can be attributed to the explosive and intermittent nature of volleyball, which intermittently engages respiratory muscles under high ventilatory stress. Similar outcomes were reported by Mehrotra et al. (1998), who found that athletes had superior FVC, FEV_1, and PEF values compared with sedentary controls, and by Shashi et al. (2013), who demonstrated that high-intensity swimming training enhances MVV and PEF. These findings suggest that high-intensity, intermittent activities contribute to improvements in the dynamic components of respiratory function.The variation between endurance- and strength-oriented sports emphasizes the principle of training specifically in physiological adaptation. Vaithiyanadane et al. (2012) observed significantly greater lung function in swimmers than in sedentary individuals, whereas Bilici and Genç (2020) found that regular physical activity among university students led to improvements in FVC, VC, FEV_1, and PEF. These consistent findings confirm that distinct exercise modalities elicit unique respiratory adaptations depending on the dominant energy system and muscular involvement.

In summary, endurance-based sports such as cross-country skiing-characterized by sustained aerobic loading-play a key role in improving overall respiratory capacity, whereas power- and intermittently focused sports such as volleyball primarily enhance dynamic ventilatory performance. This differentiation reflects the diversity of physiological adaptations elicited by various training stimulus. As noted by Bilici and Genç (2020), individuals who participate in regular physical activity exhibit superior respiratory function compared with their sedentary counterparts, highlighting the broad positive influence of sport participation on pulmonary health. Understanding how exercise type, duration, and intensity shape these adaptations can aid in the design of evidence-based, sport-specific training models that optimize respiratory efficiency and athlete well-being.

Conclusion

In conclusion, this study demonstrated that regular engagement in sport-specific training produces measurable improvements in respiratory function among female athletes. Cross-country skiers, who predominantly perform endurance-based exercise, exhibited superior ventilatory and expiratory performance compared with volleyball players and sedentary participants. These outcomes confirm that long-term aerobic training exerts a stronger influence on pulmonary capacity and respiratory muscle efficiency than intermittent, power-oriented training forms. At the same time, the elevated PEF and MVV values in volleyball players indicate that high-intensity intermittent activity also enhances dynamic respiratory performance.

Overall, the results underscore that the type, duration, and intensity of exercise determine the nature of respiratory adaptations. Designing training programs that align with the physiological demands of each sport is essential for maximizing athletic performance and maintaining respiratory health. Future research should expand on these findings by including larger, more diverse athlete populations to further clarify the mechanisms underlying sport-specific respiratory adaptations and to refine evidence-based exercise prescriptions for both competitive and recreational settings.

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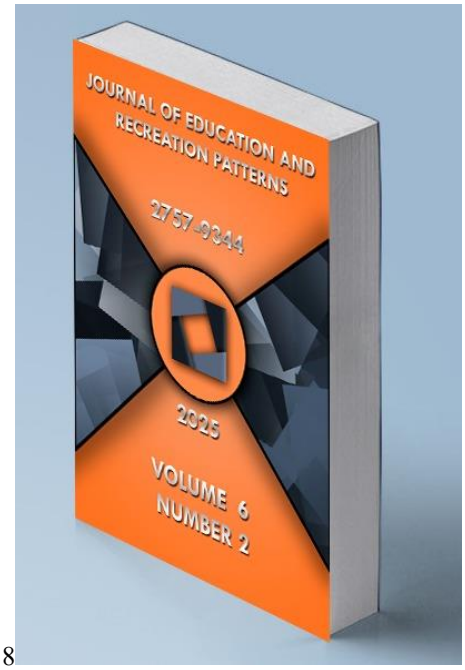

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Investigation of the Relationship Between Static Postural Sway Parameters and Explosive Power in Recreational Athletes via Digital Posturography

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Investigation of the Relationship Between Static Postural Sway Parameters and Explosive Power in Recreational Athletes via Digital Posturography

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ABSTRACT
This study aimed to determine whether bipedal static balance performance, assessed under eyes-open and eyes-closed conditions, contributes to countermovement jump (CMJ) performance when sex-related differences and postural stability parameters are statistically controlled. Sixty-four physically active adults (32 females and 32 males; aged 18–45 years) who regularly engaged in resistance-based exercise participated in the study. Static balance was evaluated in a standardized bipedal stance using the TecnoBody D-Wall system by quantifying center-of-pressure (CoP) ellipse area under eyes-open and eyes-closed conditions. CMJ performance was assessed using the same system, with jump height, flight time, total mechanical work, maximum force, and maximum absolute power recorded. Statistical analyses were performed using IBM SPSS Statistics. Data normality was assessed with the Shapiro–Wilk test. Sex-based differences in anthropometric variables were analyzed using independent samples t-tests or Mann–Whitney U tests, as appropriate. To examine the effect of sex on CMJ performance while controlling for static balance parameters, analysis of covariance (ANCOVA) models were applied, with eyes-open and eyes-closed CoP ellipse areas entered as covariates. ANCOVA results revealed significant main effects of sex on several CMJ outcomes, including flight time, total work, maximum force, and maximum absolute power ($p < 0.05$), with large effect sizes. Eyes-open static balance did not significantly influence any CMJ parameter. In contrast, the eyes-closed CoP ellipse area demonstrated a borderline significant effect on total mechanical work ($p = 0.050$), suggesting a limited contribution of proprioceptive-dominant postural control to mechanical work production independent of sex. These findings indicate that bipedal static balance, as quantified by CoP ellipse area, does not substantially explain variability in vertical jump performance beyond sex-related effects. This conclusion is specific to static balance conditions and should not be generalized to dynamic balance or functional stability tasks. Overall, static postural control and explosive jump performance appear to represent largely independent motor capacities, underscoring the importance of task-specific assessment and training strategies in athletic populations.

Keywords: Countermovement Jump, Digital Posturography Technologies, Static Balance.

INTRODUCTION

Athletic performance is a multidimensional construct arising from the interaction of neuromuscular power, coordination, and postural control. Among these components, jumping ability is widely regarded as a key indicator of lower-extremity power and has been consistently linked to sport-specific performance outcomes such as sprint speed, acceleration, and running performance across different competitive distances (Fatouros et al., 2000; Luebbers et al., 2003; Robinson et al., 2004; Chaouachi et al., 2014; Farkas et al., 2024). Vertical jump performance, particularly during the countermovement jump (CMJ), reflects an athlete's capacity to rapidly generate force and efficiently utilize the stretch–shortening cycle (SSC), making it a commonly used marker of explosive performance in both research and applied sport settings (Luebbers et al., 2003; Chaouachi et al., 2014).

Balance, defined as the ability to maintain the body's center of mass within the base of support, constitutes another essential determinant of athletic performance. Effective postural control allows athletes to stabilize the body during static positions and regulate movement during dynamic actions, particularly in sports involving repetitive jumping, rapid deceleration, and changes of direction (Chaouachi et al., 2014; Alhashimi et al., 2024; Suzuki et al., 2024). Balance performance relies on the integration of visual, vestibular, and somatosensory inputs and is commonly categorized as static or dynamic, each reflecting distinct aspects of sensorimotor control and neuromuscular regulation (Hrysomallis, 2011).

From a biomechanical perspective, a potential mechanistic link between balance and vertical jump performance may be explained through force transmission efficiency during the SSC. The CMJ begins with an eccentric loading phase, during which the ankle, knee, and hip joints must remain sufficiently stabilized to allow effective storage and subsequent release of elastic energy. Insufficient joint stabilization may result in force dissipation through non-vertical planes, leading to so-called "lateral force leaks" and a reduction in net vertical impulse (Chaouachi et al., 2014; Christensen & Nordstrom, 2008). In this context, postural stability can be considered a prerequisite for directing generated force along the intended movement axis and optimizing jump performance.

In addition to mechanical stability, proprioceptive input represents a shared neuromuscular mechanism underlying both balance and explosive power production. Sensory feedback from muscle spindles, Golgi tendon organs, and joint mechanoreceptors provides continuous information regarding muscle length, tension, joint position, and movement velocity. This afferent input plays a crucial role in regulating muscle stiffness, intermuscular coordination, and timing of motor unit recruitment during both postural control and jumping tasks (Šimek Šalaj et al., 2007; Struzik et al., 2017). A well-functioning proprioceptive system minimizes postural sway during stance and contributes to optimized neuromuscular activation patterns during the rapid eccentric–concentric transition of the SSC (Christensen & Nordstrom, 2008; Struzik et al., 2017). Consequently, it has been proposed that superior balance ability may support explosive performance by enhancing neuromuscular efficiency and force application.

Importantly, these neuromuscular mechanisms may operate differently in male and female due to sexual dimorphism in musculoskeletal and neural control characteristics. Female generally exhibit greater joint range of motion and ligamentous laxity, which may favor postural adaptability but reduce joint stiffness and peak force transmission capacity during explosive movements. In contrast, male typically possess a stiffer muscle–tendon unit and greater absolute force-generating capacity, which may enhance vertical jump performance but potentially compromise fine postural control under static conditions (Chaouachi et al., 2014; Hrysomallis, 2011). These sex-specific neuromuscular strategies suggest that the relationship between

balance and jumping performance may differ between males and females, and that analyses pooling both sexes may obscure meaningful physiological patterns.

Despite these theoretical considerations, empirical findings regarding the relationship between balance and jumping performance remain inconsistent. While some studies have reported positive associations—particularly when balance is assessed under challenging sensory conditions or via dynamic and unilateral tasks—others have demonstrated weak or non-significant relationships between static balance parameters and vertical jump performance (Chaouachi et al., 2014; Goktepe et al., 2016; Cooper et al., 2020; Suzuki et al., 2024). These discrepancies may stem from methodological differences, including the type of balance assessment employed (static vs. dynamic), task difficulty, athlete population, sensory manipulation (eyes open vs. closed), and failure to account for sex-related neuromuscular differences.

Importantly, many studies reporting stronger balance–performance relationships have employed dynamic or functional balance tests, such as the Star Excursion Balance Test or sport-specific instability assessments, which challenge the limits of postural control (Goktepe et al., 2016). In contrast, bipedal static stance tests primarily reflect baseline postural sway and neural noise, potentially limiting their sensitivity in well-trained populations (Hrysomallis, 2011). Nevertheless, instrumented static balance measures, such as equilibrium ellipse area derived from digital posturography, offer objective and highly reliable quantification of postural control and may provide insight into baseline sensorimotor stability under controlled conditions.

Accordingly, the present study aimed to examine whether baseline static postural stability, quantified via equilibrium ellipse area under eyes-open and eyes-closed conditions, is associated with detailed vertical jump performance parameters obtained from an instrumented assessment system, while explicitly accounting for sex-related differences. The originality of this study lies in its integration of sensory-specific static balance conditions, comprehensive CMJ performance metrics, and sex-based analytical considerations to clarify conflicting findings in the literature.

Based on theoretical and empirical considerations, the following hypotheses were formulated:
(H1) Static balance performance under eyes-closed conditions would demonstrate a stronger association with vertical jump parameters compared to eyes-open conditions, due to increased reliance on somatosensory and vestibular input.

(H2) The relationship between static balance performance and vertical jump outcomes would differ between females and males due to sex-specific neuromuscular control strategies.

(H3) Individuals exhibiting superior static balance performance would demonstrate better vertical jump performance outcomes.

METHOD

Ethics

Çankırı Karatekin University Ethics Committee, Institutional Review Board, granted the study's ethical approval under protocol number 2024-09-18 (743df7c398de482b). The study adhered to the principles of the Declaration of Helsinki. All participants provided informed consent, with written consent obtained from each individual.

Participants

Participants were eligible for inclusion if they were between 18 and 45 years of age, engaged in regular resistance-based exercise for approximately 90 minutes on at least three days per week for a minimum of the past six months, and voluntarily consented to participate in the

study. This definition was intended to identify regularly exercising individuals rather than elite or sport-specific athletes. All participants were required to be free from any condition that could directly affect balance control or explosive lower-extremity performance.

Exclusion criteria included the presence of any current or recent musculoskeletal injury affecting the lower extremities or spine, diagnosed orthopedic disorders, structural foot deformities such as pes cavus or pes planus, a history of lower-extremity or spinal surgery within the previous six months, and any known neurological, vestibular, or systemic condition that could impair postural control or neuromuscular function. Participants reporting chronic pain, balance disorders, or the use of medications known to influence neuromuscular performance were also excluded from the study.

The sporting background or primary exercise discipline of the participants was not restricted, and individuals may have engaged in different types of physical activities (e.g., resistance training, recreational sports, or general fitness exercise). Therefore, the sample represents a heterogeneous group of physically active adults rather than a homogeneous athletic population from a single sport discipline.

Participant characteristics and sex-based comparisons are presented in Table 1. No statistically significant difference was observed between females and males in terms of age ($p = .520$). In contrast, significant sex-related differences were identified for anthropometric variables. Male participants exhibited significantly greater height, body weight, and body mass index (BMI) compared with female participants (all $p < .001$). These findings indicate clear sex-related differences in body composition and anthropometric profiles, while age distribution was comparable between groups.

Table 1

Participant Characteristics and Sex Comparisons

Variable	Females (n = 32) Mean ± SD	Males (n = 32) Mean ± SD	p
Age (years) [u]	29.9 ± 6.3	31.8 ± 6.7	.520
Height (cm) [t]	162.8 ± 4.4	178.6 ± 4.3	< .001***
Weight (kg) [u]	56.8 ± 4.5	80.1 ± 10.0	< .001***
BMI (kg/m²) [u]	21.6 ± 1.7	25.2 ± 2.5	< .001***

u; Mann–Whitney U test, t;Independent t-test**,** cm; centimetre, kg; kilogram, BMI; Body mass index, SD; Standard deviation

Evaluations

Static balance assessment was performed using the TecnoBody D-Wall system (TecnoBody®, Bergamo, Italy) in a bipedal stance. To ensure protocol standardization and minimize variability related to base of support, all participants were instructed to stand with their feet positioned at shoulder-width distance, with both feet parallel and evenly loaded. Hand position was standardized by placing the hands alongside the body throughout the balance tests.

The static balance test consisted of two conditions: eyes open and eyes closed. Each condition was performed for 30 seconds, with a two-minute passive rest interval between conditions. During the eyes-open condition, participants were instructed to focus on a fixed visual target (a stationary cross) positioned at eye level on the screen in front of them. Importantly, no real-time center-of-pressure (CoP) or avatar-based visual biofeedback was

provided, and participants were not instructed to actively control or adjust their posture based on screen information. This approach ensured that the eyes-open condition represented a true static balance task rather than a visual biofeedback exercise. During the eyes-closed condition, participants were asked to keep their eyes gently closed while maintaining the same standardized stance.

Static balance performance was quantified using the Center of Pressure (CoP) ellipse area (EA; mm^2) parameter derived from the D-Wall posturographic system, reflecting the spatial dispersion of postural sway during quiet standing.

Following completion of the balance assessments, participants rested passively for five minutes before performing the vertical jump evaluation. Vertical jump performance was assessed using the countermovement jump (CMJ) protocol on the same TecnoBody D-Wall device. Participants performed three maximal CMJ trials, and jump height (cm), maximum force (N), flight time (s), total work (J), and maximum absolute power (W) were recorded. Adequate rest was provided between trials to minimize fatigue, and the best performance among the three trials was used for subsequent analysis.

Anthropometric Measurements

This form consists of information such as gender, height, weight, education, etc. The participants' heights were measured using the TecnoBody D-Wall device. Body Mass Index (BMI) was calculated by dividing the weight in kilograms by the square of the height in meters (kg/m^2) (Norris et al., 2005).

Balance Measurement

TecnoBody has developed various devices used in the field of rehabilitation and sports sciences, one of which is the D-Wall device. D-Wall is an assessment and rehabilitation tool that provides auditory and visual feedback to help improve movement quality. It analyzes and trains postural structure during movement and assesses and improves segmental and global coordination and sensory-motor skills. During movement kinematics, the angles of the joints and biomotor characteristics (balance, agility, etc.) are measured. D-Wall supports each user's movement with immediate biological feedback (Üzümcü et al., 2024).

Countermovement Jump

Prior to the vertical jump assessment, all participants completed a standardized warm-up protocol consisting of 10 minutes of light jogging followed by dynamic stretching exercises targeting the lower extremities. After the warm-up, the athletes performed the countermovement jump test in front of the TecnoBody D-Wall device (Üzümcü et al., 2024). Participants executed the jump in a bipedal stance starting from approximately 90° of knee flexion, with their hands placed on their waists, and were instructed to jump as high as possible. Each athlete performed three maximal jump trials, with a 10-second rest interval provided between successive attempts to minimize fatigue effects. The highest value obtained from the three trials was selected for statistical analysis (Figure 1).

Figure 1

CMJ on TecnoBody D-Wall device

Eyes Open/Closed Balance

Athletes were positioned in front of the D-Wall device, with feet shoulder-width apart and pressure sensors underneath. Hands-free and eyes open and closed for 30 seconds each were used for static balance evaluations (Üzümcü et al., 2024).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics software (Version 26.0; IBM Corp., Chicago, IL, USA). Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were reported as frequencies and percentages. The normality of continuous variables was assessed using the Shapiro–Wilk test. Based on the distribution characteristics, sex-related differences in anthropometric measurements were evaluated using the independent samples t-test for normally distributed variables and the Mann–Whitney U test for variables that did not meet the normality assumption.

To examine the effects of sex on CMJ performance while controlling for static balance parameters, analysis of covariance (ANCOVA) models were applied. In these models, sex was entered as a fixed factor, and eyes-open and eyes-closed center-of-pressure ellipse areas were included as covariates. For all statistical tests, a significance level of $p \leq 0.05$ was considered statistically significant.

The study's sample size was calculated using the G*Power 3.1.9.7 program. 64 people were calculated with 80% power (Goktepe et al., 2016).

RESULTS

Descriptive statistics of CMJ performance and static balance parameters stratified by sex are presented in Table 2. Female participants demonstrated lower values across all CMJ performance variables compared with males. Specifically, males exhibited greater bounce height, longer flight time, higher total mechanical work, greater maximal force, and higher maximal absolute power than females. With respect to static balance performance, females displayed smaller center-of-pressure (CoP) ellipse areas under eyes-open conditions compared with males, indicating reduced postural sway during visually guided stance. Under eyes-closed conditions, mean ellipse area values were comparable between sexes, although greater variability was observed in both groups. These findings suggest sex-related differences in explosive performance parameters, while static balance characteristics exhibited less pronounced differences between females and males.

Table 2

Descriptive Statistics of CMJ Performance and Static Balance Parameters by Sex

Variable	Female (n = 32) Mean ± SD	Male (n = 32) Mean ± SD
Bounce Height (cm)	24.6 ± 3.6	34.5 ± 6.9
Flight Time (s)	0.34 ± 0.05	0.43 ± 0.06
Total Work (J)	163.7 ± 31.0	274.9 ± 69.0
Max Force (N)	1179.5 ± 177.8	1528.6 ± 244.3
Max Abs. Power (W)	1906.3 ± 410.1	3117.3 ± 749.1
OE	116.6 ± 39.8	171.9 ± 94.9
CE	150.3 ± 70.7	164.2 ± 71.4

OE; Eyes open, CE; Eyes closed, EA; Ellipsis area, mm; minimetre, sec; second, cm; centimetre

Table 3

Results for the Effects of Sex and Static Balance Parameters on CMJ Performance

Dependent Variable	Source	df	F	p	ηp²
Jump Height (cm)	Sex	1, 6	5.60	.056	.48
	OE	1, 6	0.11	.753	.02
	CE	1, 6	3.49	.111	.37
Flight Time (s)	Sex	1, 6	7.27	.036*	.55
	OE	1, 6	0.11	.755	.02
	CE	1, 6	0.43	.534	.07
Total Work (J)	Sex	1, 6	22.42	.003**	.79
	OE	1, 6	0.01	.920	.00
	CE	1, 6	6.00	.050*	.50
Max Force (N)	Sex	1, 6	9.39	.022*	.61
	OE	1, 6	0.31	.598	.05
	CE	1, 6	0.22	.658	.03
Max Abs. Power (W)	Sex	1, 6	48.52	<.001***	.89
	OE	1, 6	0.77	.413	.11
	CE	1, 6	3.11	.128	.34

OE; Eyes open, CE; Eyes closed, EA; Ellipsis area, mm; minimetre, sec; second, cm; centimetre $p < .05$, * $p < .01$, ** $p < .001$***.

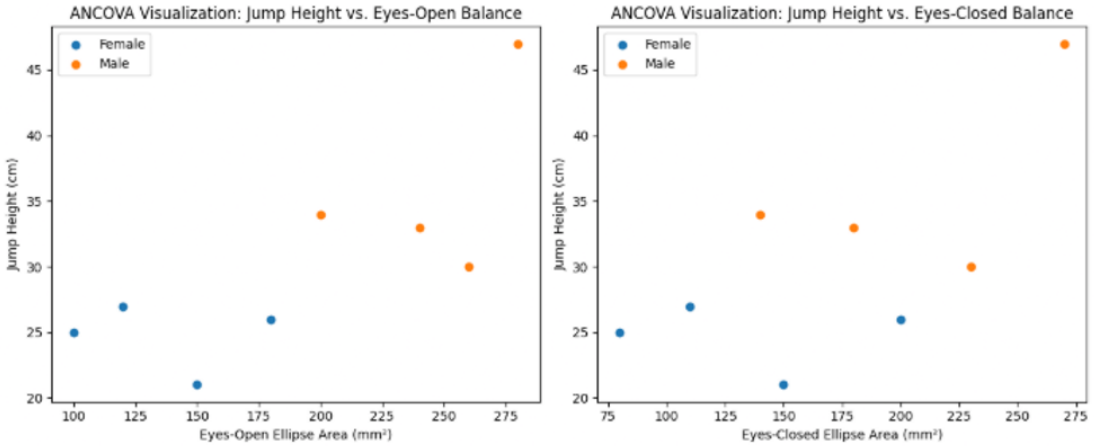
The effects of sex and static balance parameters on countermovement jump (CMJ) performance were examined using separate ANCOVA models for each dependent variable, with sex entered as a fixed factor and eyes-open (OE) and eyes-closed (CE) center-of-pressure ellipse areas included as covariates (Table 3).

Sex demonstrated a significant main effect on several CMJ performance variables. Specifically, significant sex effects were observed for flight time ($p = .036$), total work ($p = .003$), maximal force ($p = .022$), and maximal absolute power ($p < .001$), with large effect sizes ($\eta p^2 = .55–.89$). The effect of sex on jump height approached statistical significance ($p = .056$) and was associated with a large effect size ($\eta p^2 = .48$).

Regarding static balance parameters, eyes-open ellipse area did not show a significant effect on any CMJ performance variable ($p > .05$), with negligible effect sizes across models ($\eta p^2 \leq .11$). In contrast, eyes-closed ellipse area demonstrated a significant effect on total work ($p = .050$, $\eta p^2 = .50$), indicating a moderate-to-large contribution of balance performance under visual deprivation to mechanical work output. No significant effects of eyes-closed balance were observed for jump height, flight time, maximal force, or maximal absolute power ($p > .05$), although moderate effect sizes were noted in some models.

Figure 2

Scatter Plots Showing the Relationships between Jump Height and Center-Of-Pressure (CoP) Ellipse Area under (A) Eyes-Open and (B) Eyes-Closed Conditions, Stratified by Sex.



A **B**

Scatter plots illustrating the relationships between jump height and static balance parameters measured as center-of-pressure (CoP) ellipse area under (A) eyes-open and (B) eyes-closed conditions, stratified by sex. Each data point represents an individual participant. The figures demonstrate sex-specific distribution patterns and visually support the ANCOVA findings, indicating that eyes-open static balance shows no apparent association with jump height, whereas eyes-closed balance reveals a trend toward higher jump performance in males, suggesting a potential contribution of proprioceptive-dominant postural control mechanisms, as shown in Figure 2.

DISCUSSION

The primary finding of the present study was that bipedal static balance performance, quantified via center-of-pressure (CoP) ellipse area under eyes-open and eyes-closed conditions, did not exhibit a robust association with countermovement jump (CMJ)

performance variables when sex-related differences were statistically controlled. These findings suggest that static postural control and explosive jumping performance may represent largely independent motor components under the measurement conditions applied in this study.

Consistent with the existing literature, CMJ performance was strongly influenced by sex, with males demonstrating significantly greater flight time, total mechanical work, maximal force, and maximal absolute power compared with females. These differences are in line with well-documented sexual dimorphism in neuromuscular characteristics, whereby males typically exhibit greater muscle mass, higher muscle–tendon stiffness, and superior absolute force-producing capacity, while females often demonstrate greater joint range of motion and postural adaptability (Chaouachi et al., 2014; Hrysomallis, 2011). The large effect sizes observed across multiple CMJ outcomes reinforce the dominant contribution of sex-related neuromuscular factors to explosive performance.

From a mechanistic perspective, CMJ performance is primarily determined by the rapid generation of force, effective utilization of the stretch–shortening cycle, and neuromuscular synchronization across lower-extremity muscle groups (de Villarreal et al., 2011; Taipale et al., 2012). In contrast, static balance reflects the central nervous system's ability to integrate visual, vestibular, and somatosensory inputs to maintain postural stability with minimal sway (Hrysomallis, 2011). Although these performance domains share common sensorimotor substrates, the principle of task specificity suggests that they rely on distinct control strategies, particularly when balance is assessed under low-demand, bipedal static conditions.

Indeed, previous research has emphasized that the relationship between balance ability and athletic performance is highly dependent on the type of balance assessment employed (Hrysomallis, 2011). Studies reporting stronger associations between balance and jumping performance have predominantly used dynamic or unilateral balance tasks that challenge the limits of postural control. For example, Gualtieri et al. (2008) reported significant relationships between closed-eye balance performance and CMJ outcomes in amateur soccer players using more demanding proprioceptive tasks, while Wilczyński et al. (2021) demonstrated moderate associations between dynamic balance assessed via the Y-Balance Test and vertical jump performance. In contrast, bipedal static stance has been suggested to induce a ceiling effect in healthy and physically active individuals, thereby limiting its sensitivity to detect inter-individual differences (Hrysomallis, 2011). This methodological consideration likely explains the absence of strong associations between static balance and CMJ performance observed in the present study.

Importantly, although eyes-open static balance did not exert a significant effect on any CMJ variable, a borderline effect of eyes-closed balance on total mechanical work was identified. This finding warrants consideration from a neuromechanical perspective. Removal of visual input increases reliance on proprioceptive and vestibular systems, potentially amplifying the contribution of somatosensory feedback to postural regulation and force transmission (Hrysomallis, 2011). Efficient proprioceptive input may facilitate more stable joint positioning and improved force transfer through the kinetic chain during preparatory phases preceding force production. Previous studies have suggested that balance tasks imposing greater proprioceptive demands are more likely to reveal associations with strength and power outcomes (Gualtieri et al., 2008; Wilczyński et al., 2021). Therefore, the observed trend between eyes-closed balance and total work may reflect a subtle proprioceptive contribution to mechanical output that was insufficiently strong to reach conventional levels of statistical significance within the present sample.

Nevertheless, the overall lack of significant balance effects on CMJ performance supports the notion that eliminating visual input alone is not sufficient to meaningfully influence explosive force production in healthy, physically active individuals. Cooper et al. (2020)

reported that despite pronounced reductions in jump performance following lower-extremity fatigue, static balance parameters remained largely unchanged, further supporting the idea that static postural control and explosive power are governed by partially distinct neuromotor mechanisms. These findings are consistent with the present results.

While longitudinal studies have demonstrated that plyometric training can improve balance performance (Ramachandran et al., 2021), such findings primarily reflect training-induced adaptations rather than cross-sectional relationships. Consequently, the existence of long-term interactions between balance and jumping does not necessarily imply that these variables will be significantly associated in acute or cross-sectional assessments.

Overall, the findings of this study indicate that static balance and CMJ performance should be considered complementary yet largely independent components of athletic performance rather than interchangeable measures. This highlights the importance of employing multidimensional and task-specific assessment batteries when evaluating neuromuscular performance in physically active populations.

This study has several limitations. First, balance assessment was restricted to bipedal static conditions, and neither unilateral nor dynamic balance tests were included, which may have reduced sensitivity to detect balance–jump relationships. Second, the cross-sectional design precludes causal inferences. Finally, the absence of electromyographic or kinetic analyses limits direct evaluation of the neuromuscular mechanisms underlying the relationship between balance and jump performance. Future research should incorporate dynamic and unilateral balance tasks, longitudinal designs, and neuromuscular assessments to more comprehensively investigate the role of proprioception and postural control in explosive force production.

Conclusion

The present study demonstrated no statistically significant association between static balance performance and vertical jump performance, indicating that these capacities function as largely independent components of athletic performance. While both balance and explosive jumping are essential for sport success, they rely on distinct neuromuscular and motor control mechanisms and differ substantially in task demands. From a practical standpoint, these findings suggest that improvements in static balance alone are unlikely to translate directly into enhanced vertical jump performance under controlled conditions. Accordingly, training programs should avoid assuming automatic transfer effects between balance and explosive power. Instead, balance training should be primarily emphasized for postural control and injury prevention, whereas jump- and power-specific exercises should be prioritized to improve explosive performance. Coaches and practitioners are encouraged to implement complementary, task-specific training strategies that independently target balance and neuromuscular power to optimize overall athletic performance.

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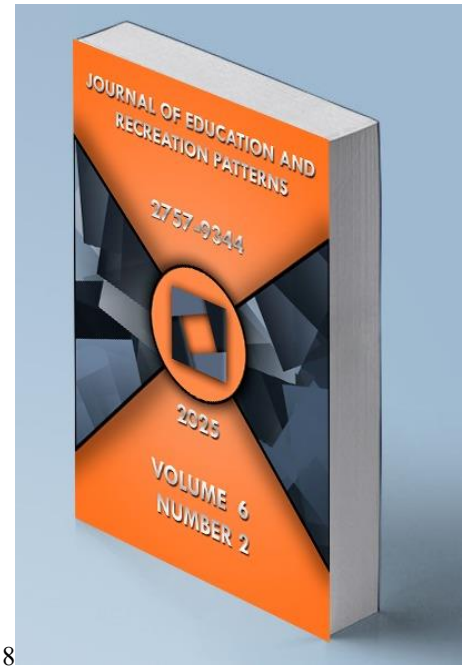

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Foot and Ankle Biomechanical Assessment in Soccer Players: A Narrative Review of Testing Methods

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Foot and Ankle Biomechanical Assessment in Soccer Players: A Narrative Review of Testing Methods

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ABSTRACT
Foot and ankle biomechanics play a central role in soccer performance, influencing stability, movement efficiency, and injury susceptibility. Although numerous structural and functional assessment tools exist, the literature lacks an integrated synthesis that evaluates these tests collectively in relation to injury mechanisms and sport-specific demands. This narrative review aims to critically examine commonly used biomechanical assessments—including FPI-6, Navicular Drop Test, Hallux Valgus Angle, plantar pressure analysis, CAIT, FAAM, weighted dorsiflexion ROM, and tibial torsion measurements—and to highlight their relevance for identifying risk factors in soccer players. Evidence indicates that structural abnormalities such as pes planus, subtalar overpronation, and hallux valgus alter plantar pressure distribution and increase the likelihood of overuse injuries, ankle sprains, and chronic instability. Functional measures including CAIT and FAAM provide complementary insight into ankle instability and sport-related performance limitations. By synthesizing current findings, this review underscores the need for comprehensive, multi-dimensional assessment strategies that support individualized training and injury-prevention programs in soccer.

Keywords: Choronic Ankle Instability, CAIT, FAAM, FPI-6, Plantar Pressure, Soccer Biomechanics.

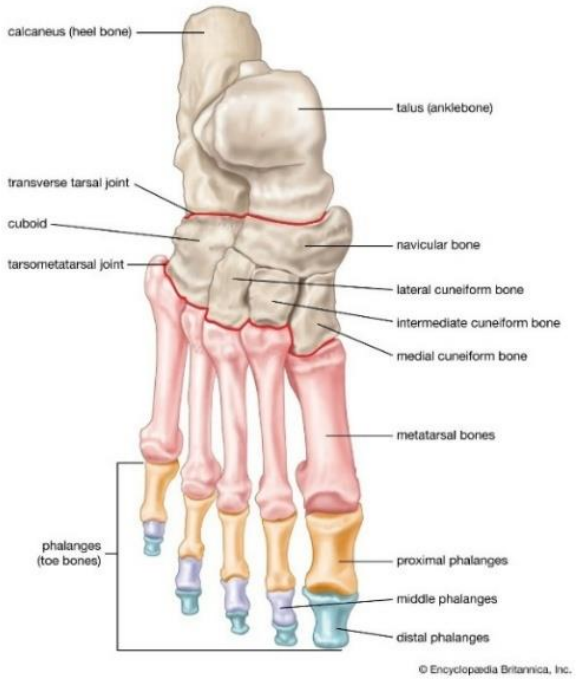
INTRODUCTION

Soccer is characterized by a high-intensity, intermittent activity profile that requires a multifaceted physiological capacity, including strength, agility, balance, and both aerobic and anaerobic systems (Svensson & Drust, 2005). Although these physical qualities vary across playing positions, a common determinant of performance is the biomechanics of the lower extremity, which underpins the execution of technical actions such as sprinting, jumping, changing direction, and kicking (Turner & Stewart, 2014). Accordingly, assessments conducted at the foot and ankle level constitute an essential component of performance monitoring and injury-risk evaluation in soccer players.

The human foot is an anatomically complex structure consisting of 26 bones, 33 joints, and numerous muscles, tendons, and ligaments. Functionally, it plays a central role in load distribution, balance, and force transmission. Anatomically, the foot is divided into the hindfoot (talus and calcaneus), midfoot (navicular, cuboid, and cuneiforms), and forefoot (metatarsals and phalanges) (Chan & Rudins, 1994; Hernández-Díaz et al., 2012) (Figure 1.). The subtalar joint, located between the talus and calcaneus, enables tri-planar movements—including pronation and supination—and is therefore critical for the transition between foot flexibility and rigidity during gait (Rodgers, 1995; Golanó et al., 2014). In sports such as soccer, ankle stability is further ensured by the medial deltoid ligament complex and the lateral ligamentous structures, including the anterior talofibular, calcaneofibular, and posterior talofibular ligaments (Dawe & Davis, 2011).

Figure 1

Foot Area and Structures



Although foot and ankle biomechanics have long been recognised as key determinants of soccer performance, previous literature has predominantly focused on general anatomical descriptions or isolated biomechanical parameters. What remains insufficiently addressed is a comprehensive synthesis of structural and functional assessment tools and how these measures collectively relate to sport-specific injury mechanisms. Moreover, despite growing evidence indicating that common deformities—such as pes planus, pes cavus, hallux valgus, subtalar overpronation, and hindfoot malalignments—contribute to altered plantar-pressure distribution and a heightened risk of stress fractures, ankle sprains, and chronic instability (Ménard et al.,

2021; Bezuglov et al., 2021), there is a lack of integrative reviews that contextualise these findings specifically within the demands of soccer. While foundational studies (e.g., Chan & Rudins, 1994; Rodgers, 1995) provide valuable historical perspectives, the increasing physical intensity of modern soccer and the accumulation of biomechanical data from 2020–2025 necessitate an updated, sport-specific framework.

This need becomes more pronounced given that contemporary soccer places greater mechanical stress on the lower extremities due to higher sprint frequencies, intensified match schedules, and increased demands for rapid deceleration and direction changes. Consequently, an evaluation approach that integrates both structural tests (e.g., FPI-6, Navicular Drop Test, Hallux Valgus Angle) and functional assessments (e.g., CAIT, FAAM, plantar-pressure analysis, Jack's Test, weighted dorsiflexion ROM, tibial-torsion measurements) has become essential. Existing research demonstrates that deviations such as pes planus or subtalar pronation can disrupt plantar loading patterns, predisposing athletes to ankle sprains, chronic instability, and overuse injuries (Valderrabano et al., 2014; Kolokotsios et al., 2021), while functional tests such as CAIT and FAAM provide complementary insight into ankle instability and sport-related functional limitations.

Therefore, the aim of this article is to critically evaluate commonly used foot and ankle biomechanical assessment tools in soccer players, synthesising structural and functional dimensions, identifying their strengths and limitations, and clarifying their relevance for performance optimisation and injury-risk management. By presenting an integrated, evidence-based framework, this review seeks to support the development of individualised training programmes and targeted preventive strategies in professional and amateur soccer contexts.

METHOD

This study was designed as a narrative review with the aim of synthesising and critically evaluating foot and ankle biomechanical assessment methods used in soccer players. A comprehensive literature search was conducted through PubMed, Web of Science, Scopus, Google Scholar, Google Akademik, and ResearchGate using keywords such as "soccer," "football," "foot biomechanics," "ankle biomechanics," "CAIT," "FAAM," "FPI-6," "plantar pressure," "navicular drop," "hallux valgus," and "tibial torsion." Inclusion criteria comprised original research articles, systematic reviews, meta-analyses, and clinical guidelines involving soccer players; studies written in Turkish or English; and those with clearly reported and accessible outcomes. Exclusion criteria included restricted-access publications, studies lacking explicit test results, and research conducted in sports other than soccer. A total of 48 studies were identified, of which 37 met the eligibility criteria and were included in the final synthesis. This methodological approach enabled a coherent and comprehensive integration of current evidence, allowing for a holistic examination of structural and functional foot–ankle biomechanical assessments in soccer populations.

Foot Biomechanical Tests

Cumberland Ankle Instability Test (CAIT)

The Cumberland Ankle Instability Tool (CAIT), which was developed to evaluate the degree of functional ankle instability and is a self-report measurement tool with proven validity and reliability, consists of 9 questions evaluated on a total of 30 points (Hiller et al., 2006). The test, which questions the functional difficulties experienced by the participant in daily life and sportive activities, evaluates whether there is a feeling of 'discharge' in the ankle in situations such as sudden change of direction, landing after jumping and standing on one foot. Each question is scored between 0 and 3 points and the score obtained in total gives information about ankle stability; scores of 27 and above are interpreted as a stable ankle, while scores of 23 and below are considered as a significant risk indicator for chronic ankle instability (CAI)

(Alanazi, 2025; Hiller et al., 2006). The importance of the CAIT test is increasing especially in football players, and this sport involves dynamic movements that strain the ankle, such as repetitive changes in direction, sudden stops and starts. Therefore, CAI is a common clinical picture in football players that negatively affects performance and decreases both training quality and competition performance by increasing the risk of proprioceptive impairment, loss of balance and re-injury (Alanazi, 2025; Kunugi et al., 2018).

Foot and Ankle Ability Measure (FAAM)

The Foot and Ankle Ability Measure (FAAM), which was developed to measure functional abilities related to the foot and ankle and has high validity and reliability, is a self-report-based tool that objectively assesses the functional levels of individuals regarding their daily life activities and sportive performances (Martin et al., 2005). The assessment consists of two parts, the Activities of Daily Living (ADL) subscale (21 items) and the Sports subscale (8 items); each item is scored between 0 (unable to perform) and 4 (no difficulty) and the results are normalised to obtain percentage values between 0-100. FAAM, which determines the level of functional limitation related to the foot and ankle of individuals, provides the opportunity to evaluate not only the presence of symptoms but also the effects of these symptoms on daily life and sportive performance in a holistic manner (Martin et al., 2005). Especially in football players, the FAAM test is widely used to demonstrate functional limitations after CAI, and it has been reported that FAAM scores decrease significantly in individuals with lateral ankle sprain, and this decrease may have long-term negative effects on dynamic balance, proprioception and motor performance (Wilczyński et al., 2024). The decrease observed in the ADL subscale indicates that the footballer has difficulty even in daily life activities, while the decrease in the Sports subscale reveals that his performance on the field is significantly affected.

Foot Posture Index-6 (FPI-6)

It is a multidimensional and observational measurement tool that provides clinical assessment of foot posture. The FPI-6, which enables the assessment of foot posture in three planes (sagittal, frontal and transverse), was developed to objectively classify the foot type (supination, neutral, pronation) of individuals (Redmond et al., 2006). This assessment is frequently used in determining functional differences and biomechanical deviations in the foot structure, especially in injury risk analyses in athletes.

The FPI-6 test is performed with bare feet and while standing. After the individual has assumed a comfortable posture, both feet are assessed according to the following six clinical observation criteria (Redmond et al., 2006):

1. Palpation of the talus head
2. Evaluation of the curves on the lateral malleolus
3. Position of the calcaneus in the frontal plane
4. Prominence in the talonavicular joint
5. Height of the medial longitudinal arch
6. Abduction/adduction position of the forefoot relative to the hindfoot

Each criterion is scored from -2 (supination symptom) to +2 (pronation symptom). The total score ranges from -12 to +12. This total score allows the foot posture to be categorised as follows:

- **Supine foot:** -1 with -12
- **Neutral foot:** 0 to +5
- **Pronated foot:** +6 to +12

The FPI-6 test provides three-plane functional information about the individual's foot type. This information allows not only structural but also functional biomechanical evaluation.

Navicular Drop Test (NDT)

The Navicular Drop Test (NDT) is a widely used, practical and clinically validated measurement method to assess the functional status of the medial longitudinal arch (MLA). This test was developed by Brody (1982) to assess the arch of the foot and is considered an important indicator of foot biomechanics (Brody, 1982; Nielsen et al., 2009).

NDT is based on measuring the height of the navicular bone in two different postures, namely sitting (non-weight bearing) and standing (weight bearing). A ruler or digital caliper is used for the measurement. With the foot flat on the ground, the vertical distance from the navicular tubercle to the ground is measured. The difference between the two positions is recorded as 'navicular drop' in millimetres (mm) (Figure 2.).

While normal limits are between 6-10 mm, values above 10 mm are generally considered as pes planus and less than 5 mm as pes cavus (Adhikari et al., 2014; Nielsen et al., 2009).

Subtalar Pronation Angle (SPA)

The subtalar pronation angle test is an important biomechanical measurement method used to assess the degree of pronation and supination movements in the subtalar joint (Figure 2.). The subtalar joint governs the movement between the ankle and calcaneus and plays a critical role in basic functions such as standing, walking and running (Tartaruga et al., 2010). The measurement is performed under static or dynamic conditions with reference to the posterior part of the calcaneus in a neutral standing position with bare feet; the inclination of the calcaneus relative to the vertical axis determines the subtalar pronation angle (Hagen et al., 2016;Tartaruga et al., 2010). The normal subtalar pronation angle is accepted to be between 4-6 degrees (Tartaruga et al., 2010; Hagen et al., 2016).

Jack's Test (Windlass Mechanism Test)

Jack's Test is a clinical manoeuvre that evaluates the plantar fascia and MLA function in the sole of the foot. During the test, the individual stands barefoot in a neutral posture and the clinician passively forces the hallux into dorsiflexion (Figure 2.). In a healthy response, elevation of the medial arch is observed with thumb dorsiflexion movement and supination occurs at the subtalar joint (Gómez-Carrión et al., 2024a; Noriega et al., 2022). This test provides a rapid assessment of the integrity and functionality of the Windlass mechanism. During normal walking, the first metatarsophalangeal joint (MTP) exhibits approximately 30-50 degrees of dorsiflexion movement, which plays a critical role in energy transmission during the foot propulsion phase (Gómez-Carrión et al., 2024b).

Jack's Test objectively assesses the stability of the medial arch, the functionality of the plantar fascia and the biomechanics of the foot. In positive test results, the medial arch rises with minimal force application; however, in negative results, collapse of the arch structure or limitation of hallux dorsiflexion may be observed. A negative test result may predispose to orthopaedic problems such as plantar fasciitis, medial tibial stress syndrome, patellofemoral pain syndrome, hallux limitus and hallux valgus (Alfaro Santafé et al., 2017; Noriega et al., 2022). In addition, inadequate Windlass mechanism activation may lead to the activation of

compensatory mechanisms in the lower extremity segments and performance losses in dynamic activities such as walking and running (Gómez-Carrión et al., 2024b).

Navicular-Medial Malleolus Distance (NMM)

The Navicular-Medial Malleolus Distance (NMM) test is a reliable measurement method used to assess the structural stability of the ankle complex and bone alignment at the thalocrural joint. During the test, the individual is positioned with the knee flexed 90 degrees and the foot in a relaxed position; then maximal dorsiflexion is achieved and the distance between the navicular tubercle and the medial malleolus is measured using callipers (Kobayashi et al., 2013) (Figure 2.). A large NMM distance (>4.65 cm) indicates decreased stability of the talocrural joint and increases the risk of non-contact lateral ankle sprains (LAS). Studies have shown that athletes with an NMM distance greater than 4.65 cm have a 4.14 times higher risk of experiencing non-contact LAS for the first time compared to those with a shorter distance (Kobayashi et al., 2013). While this test enables early objective determination of ankle stability, positive results may predispose to serious orthopaedic complications such as CAI and long-term development of osteoarthritis. The assessment of NMM distance in footballers is of critical importance, especially in terms of preventing recurrent sprains, preventing performance losses and safely managing the return to the field.

Hallux Valgus Angle (HVA)

The hallux valgus test is performed to determine the severity of medial deviation and pronation by evaluating the thumb deformity at the level of the first MTP joint. During the test, the angle between the axial lines of the thumb and the first metatarsal axis is measured with the foot in the load-bearing position; if this angle is over 15°, the presence of hallux valgus is defined (Deenik et al., 2008; Piqué-Vidal et al., 2006). The measurement can be performed using a manual goniometer or digital imaging systems and the HVA and Intermetatarsal Angle (IMA) parameters are analysed (Piqué-Vidal et al., 2006) (Figure 2.). A positive test result may indicate functional problems such as load distribution disorders in the forefoot, increased plantar pressure, bunion formation and medial plantar pain (Açar & Konakoğlu, 2023). In addition, as the deformity progresses, secondary injuries such as metatarsal instability, plantar fasciitis, knee and hip mechanical disorders may develop (Gorica et al., 2021; Kim et al., 2017).

Plantar Pressure Analysis

Plantar pressure analysis is a non-invasive method that provides detailed information about lower extremity biomechanics and foot function by measuring the distribution of forces applied to the sole of the foot under both static and dynamic conditions (Figure 2.). This analysis is performed using pedobarography systems to record the pressure distribution over the plantar surface during activities such as standing, walking or running (Lorkowski et al., 2021). During the measurement, individuals walk or perform specific functional tasks on pressure-sensitive platforms or systems equipped with in-shoe sensors. The data obtained allows for detailed analyses of pressure profiles in the anterior, medial and posterior parts of the foot and helps in the early detection of pathologies associated with foot biomechanics (Skopljak et al., 2014).

Plantar pressure analysis is used to identify imbalances in load distribution, overpressure zones and asymmetric loading. In particular, orthopaedic conditions such as plantar fasciitis, metatarsal stress fractures, hallux valgus and Achilles tendinopathy are associated with deviations in plantar pressure data (Açar & Konakoğlu, 2023). High-risk findings in the analysis include excessive pressure build-up in the lateral foot area, collapse of the medial arch, and uneven loading in the heel region. Positive test results indicate the presence of biomechanical imbalances in athletes or the general population, which may lead to an increased risk of long-term injury (Choi et al., 2014; Matsuda et al., 2017).

Weight-bearing dorsiflexion ROM

The weight-bearing dorsiflexion ROM test is a reliable measurement method that provides important information about lower extremity biomechanics and injury risk by assessing ankle dorsiflexion range of motion in a functional position. During the test, the individual tries to touch the wall by pressing the foot flat on the ground and moving the knee forwards, while ensuring that the heel does not lose contact with the ground and the knee and foot position is kept at the level of the second toe (Clark & Campbell, 2021; Hankemeier & Thrasher, 2014). The measurement is performed using the angle of the tibia bone with the ground (in degrees) or the distance from the big toe to the wall (centimetres) (Figure 2.). This test is used to assess ankle agility, loading capacity and dynamic balance performance, while dorsiflexion limitation has been associated with injuries such as plantar fasciitis, Achilles tendinopathy, ACL injuries and chronic ankle instability (Hoch et al., 2015; Lagas et al., 2021).

Tibial Torsion Test: The tibial torsion test is a clinical measurement method that aims to evaluate the rotational angle between the proximal and distal articular surfaces of the tibia. In the test application, the knee is flexed 90° while the individual is lying in the prone position and the angle of the transmalleolar axis is measured using a digital goniometer or inclinometer (Hudson, 2008). As a result of the measurement, increases or decreases in the tibial torsion angle are detected, providing information about lower extremity biomechanics (Figure 2.). The normal range of tibial torsion is usually between 20°-40°, and deviations beyond these values are associated with orthopaedic injuries such as patellofemoral instability, medial tibial stress syndrome, anterior knee pain and ankle sprains (Bayrak et al., 2018). Especially in football players, decreased tibial torsion angle increases the risk of LAS and may negatively affect their return to sport (Bayrak, 2024).

Walking and Running Analysis

Gait and running analysis is an important measurement method used to evaluate the lower extremity biomechanics of the individual and to objectively examine motor control mechanisms. In these analyses, spatiotemporal parameters (e.g. stride length, stride duration, cadence, speed), kinematic variables (e.g. joint angles, segmental movements) and kinetic measurements (e.g. ground reaction forces) are evaluated (Benson et al., 2018). While traditional laboratory-based methods include three-dimensional motion capture systems and force plates, nowadays reliable data can be obtained in real-life environments thanks to portable sensors (IMUs, pressure-based systems, accelerometers) (Higginson, 2009). During the analyses, participants walk or run on a treadmill or natural surface; data are evaluated on parameters such as spatiotemporal regularity, stride-asymmetry, contact time, and time of flight (Mason et al., 2023). Walking and running analysis is used to identify injury risk factors and optimise performance.

Balance Tests

Balance analysis is a basic measurement method used to evaluate the effectiveness of an individual's postural control mechanisms. In static balance assessments, central pressure (COP) changes are measured while the individual is standing on a fixed surface, while dynamic balance tests analyse the individual's ability to maintain balance in motion (Clark et al., 2010). Force platforms, accelerometer systems and mobile applications are used for balance assessments in clinical and laboratory settings. For example, low-cost devices such as the Wii Balance Board have the potential to perform COP measurements at laboratory standards (Clark et al., 2010). Traditional measures include protocols such as the Berg Balance Scale, Single Leg Standing Test, and Y Balance Test, and these tests allow an objective assessment of an individual's balance ability qualitatively or quantitatively (Linek et al., 2017).

Figure 2

(A): Plantar Pressure, (B): Hallux Valgus Angle Test, (C): Subtalar Pronation Test, (D): Jack's Test, (E): Tibial Torsion Test, (F): Weight Bearing Dorsiflexion ROM, (G): Navicular Drop Test, (H): Navicula-Medial Malleolus Distance Test.

Findings of Foot-Foot Biomechanical Tests in Soccer Players

The biomechanical assessment methods examined in this review provide important insights into common lower extremity pathologies observed in soccer players; however, interpretation of these findings must consider several methodological limitations within the current literature. Pes planus has been shown to increase lateral loading, thereby predisposing athletes to repetitive inversion trauma, lateral ankle sprains, and subsequent chronic ankle instability (CAI) (Ménard et al., 2021). Plantar pressure analyses further demonstrate that elevated loading in the fourth and fifth metatarsal regions increases the risk of stress fractures, and that cavovarus foot posture may represent a pathogenic configuration among soccer athletes (Ménard et al., 2021). Hallux valgus deformity—often attributed to narrow football boots, repetitive kicking mechanics, and insufficient intrinsic foot strength—can lead to inflammation, pain, and functional loss in the first metatarsophalangeal joint, negatively affecting stability and force production during sprinting, cutting, and shooting (Bezuglov et al., 2021; Deenik et al., 2008; Kim et al., 2017).

Functional assessment tools such as the CAIT are frequently used to evaluate subjective instability, with lower CAIT scores associated with impaired postural control and prolonged mediolateral balance recovery times during single-leg diagonal landing tasks (Kunugi et al., 2018). Similarly, the FAAM sports subscale has demonstrated effectiveness in assessing functional capacity in players with CAI, showing significant associations with balance performance and muscle strength metrics (Subramanian et al., 2021). Collectively, these findings indicate that CAIT and FAAM serve complementary roles in capturing subjective perceptions of instability and objective functional deficits.

Structural assessments, including the FPI-6, provide valuable information regarding foot posture and its relationship to injury risk. Pronated foot posture has been associated with overuse injuries such as medial tibial stress syndrome, plantar fasciitis, and patellofemoral pain (Tong & Kong, 2013; Algaba-Del-Castillo et al., 2023), with increasing pronation linked to poorer medial-lateral stability indices (Chun et al., 2021). NDT findings further contribute to understanding medial longitudinal arch function, as increased navicular drop has been associated with plantar fasciitis, medial tibial stress syndrome, and ACL injuries (Beckett et al., 1992; Zehnder, 2011; Domaradzki, 2024). Notably, navicular drop asymmetry may elevate

injury risk by up to 37-fold (Domaradzki, 2024). Jack's Test provides insight into plantar fascia function and the windlass mechanism, with inadequate activation contributing to instability and force production deficits during high-demand movements such as sprinting, directional changes, and jumping (Gómez-Carrión et al., 2024a; Núñez-González et al., 2025). Plantar pressure assessments further aid in early identification of overloading zones predictive of fifth metatarsal stress fractures and ankle sprains (Wong et al., 2009). Weight-bearing dorsiflexion ROM reflects functional ankle mobility, with restricted dorsiflexion linked to altered landing mechanics and elevated injury risk (Akbari et al., 2023; Hoch et al., 2015). Tibial torsion assessments and gait/running analyses contribute to identifying malalignment and abnormal loading patterns (Carling et al., 2008; Benson et al., 2022; Mason et al., 2023). Additionally, static and dynamic balance tests remain valuable predictors of injuries such as ankle sprains, ACL rupture, and muscle–tendon strains (Butler et al., 2012; Roeing et al., 2017; Linek et al., 2017).

Despite these clinically meaningful associations, the diagnostic and predictive value of these tests must be interpreted cautiously due to several methodological limitations. CAIT, for instance, is a subjective self-reported measure susceptible to mood and perception variability. Plantar pressure analyses lack standardization, as sensor resolution, sampling frequency, and calibration procedures differ substantially across laboratories, limiting generalizability. Tests such as FPI-6 and NDT are evaluator-dependent, introducing inter-rater variability that complicates cross-study comparisons. Moreover, evidence levels across the included literature—ranging from systematic reviews to cross-sectional and case-control studies—were not consistently differentiated, posing challenges for synthesizing conclusions regarding causality and predictive validity.

Taken together, the evidence suggests that no single assessment method is sufficient for identifying biomechanical risk factors in soccer players. Instead, a multidimensional screening approach is warranted, integrating subjective measures (CAIT, FAAM), structural assessments (FPI-6, NDT, HVA), functional mobility measures (weight-bearing dorsiflexion ROM), and load-distribution analyses (plantar pressure). The collective findings indicate that a minimal yet effective screening battery for elite soccer players should include CAIT, FAAM, FPI-6, NDT, and weight-bearing dorsiflexion ROM, as these tests demonstrate strong potential for early risk detection and comprehensive biomechanical profiling.

This narrative review has several limitations. The literature search was not conducted using a systematic protocol, which may introduce selection bias, and the restriction to English and Turkish publications presents a potential language bias. Most included studies were cross-sectional, limiting the ability to draw causal inferences. Additionally, some assessment tools rely on subjective reporting (e.g., CAIT) or evaluator-dependent measurements (e.g., FPI-6, NDT), which may reduce reliability, while variations in plantar pressure systems across laboratories restrict the comparability of findings.

Future research should prioritise longitudinal designs to validate the predictive value of these tests in soccer populations and to determine whether structural risk factors—such as increased pronation or excessive navicular drop—can be mitigated through targeted intervention programmes. Moreover, developing a standardised, evidence-based screening battery for practitioners would enhance the practical application of biomechanical assessments in both injury prevention and performance optimisation.

Conclusion

This review demonstrates that foot and ankle biomechanical assessments offer essential insights for performance optimisation and injury risk prediction in soccer players; however, the evidence also indicates that certain tests provide superior validity, reliability, and feasibility for

practical use. Structural assessments such as the FPI-6 and NDT are effective in identifying overuse-related biomechanical deviations, while functional tools including the CAIT and FAAM reliably capture perceived instability and sport-specific functional capacity. Weight-bearing dorsiflexion ROM further serves as a robust indicator of functional ankle mobility relevant to key soccer movements. Although plantar pressure analysis and Jack's Test contribute valuable information, their specialised equipment requirements limit routine field-based applicability. Collectively, the findings support that a minimal yet effective screening battery for elite soccer players should include CAIT, FAAM, FPI-6, NDT, and weight-bearing dorsiflexion ROM, offering a valid, reliable, and feasible framework to guide early risk identification and the design of individualised, evidence-based preventive and performance-enhancing programmes.

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