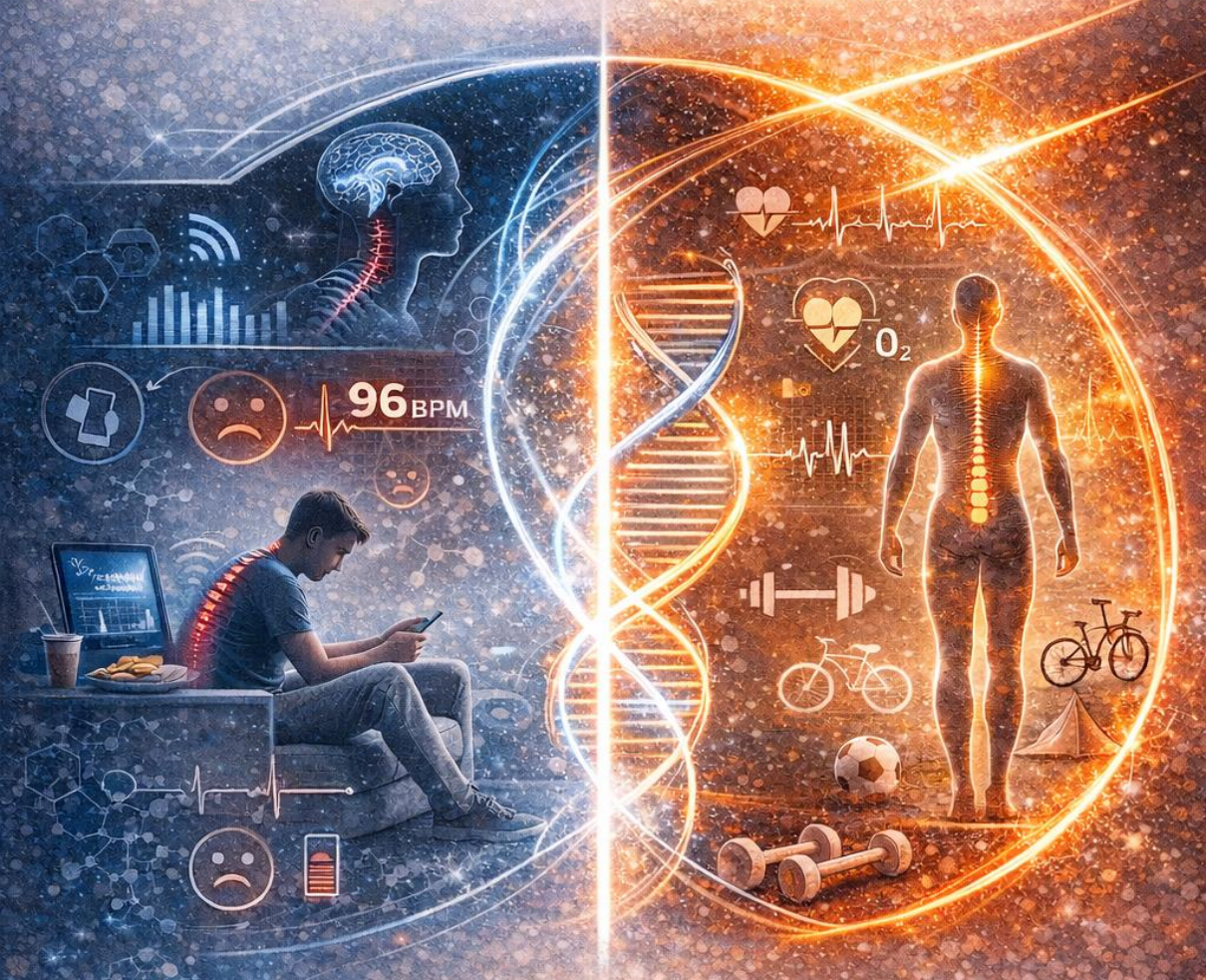
EXERCISE-BASED HEALTH APPROACHES

Sports, Recreation & Preventive Perspectives



Edited by
Assoc. Prof. Úlfet ERBAŞ
Assoc. Prof. Caner CENGİZ
Dr. Hasan OSMANOĞLU

DUVAR

Exercise-Based Health Approaches: Sports, Recreation, and Preventive Perspectives

Editors

Assoc. Prof. Ülfet ERBAŞ
Assoc. Prof. Caner Cengiz
Assist. Prof. Dr. Hasan OSMANOĞLU

Exercise-Based Health Approaches: Sports, Recreation, and Preventive Perspectives

Editors: *Assoc. Prof. Ülfet ERBAŞ, Assoc. Prof. Caner Cengiz*
Assist. Prof. Dr. Hasan OSMANOĞLU

Editor-in-Chief: Berkan Balpetek
Page and Cover Design: Duvar Design
Publication Date: Aralık 2025
Publisher Certificate No: 49837
ISBN: 978-625-8698-69-5

853 Sokak No:13 P.10 Kemeraltı-Konak/İzmir
Tel: 0 232 484 88 68

www.duvaryayinlari.com
duvarkitabevi@gmail.com

Exercise-Based Health Approacahes: Sports, Recreation, and Preventive Perspectives

—✦—

Editors

Assoc. Prof. Ülfet ERBAŞ
Şırnak University
School of Physical Education and Sports
Department of Physical Education and Sports
Physical Education and Sports Division
ORCID: 0000-0002-6507-3046
E-mail: ulfeterbas@gmail.com

Assoc. Prof. Caner CENGİZ
Ankara University
Faculty of Sport Sciences
Department of Physical Education and Sport
Physical Education and Sport Teaching Division
ORCID: 0000-0002-0446-537X
E-mail: canercengiz@ankara.edu.tr

Assist. Prof. Dr. Hasan OSMANOĞLU
Şırnak University
School of Physical Education and Sports
Department of Physical Education and Sports
Physical Education and Sports Division
ORCID:0000-0002-2421-8587

—✦—

—✦—

CONTENTS

CHAPTER 1

USE OF LABORATORY ANIMALS IN SPORTS SCIENCES

Sezgin HEPSERT[1], Engin VURAL[2]

Hepşert, S., & Vural, E. (2025). *Use of laboratory animals in sports sciences*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (Chap. 1, pp. 5–15). Duvar Design. ISBN 978-625-8698-69-5

[1] Ministry of National Education, Physical Education and Sports Teacher, Elazig, Türkiye
Orcid ID: 0000-0002-4299-8548, E-mail: sezginnepsert@gmail.com
[2] Ministry of National Education, Physical Education and Sports Teacher, Bitlis, Türkiye
Orcİd ID: 0000-0002-7717-4928, E-mail: enginvural06@gmail.com

1. Introduction

In sports science, understanding the physiological, metabolic, and molecular effects of exercise is of great importance for performance development, explaining athletes' training adaptations, and scientifically substantiating exercise-related health changes. However, the detailed examination of the acute and chronic effect mechanisms of exercise at the tissue, cellular, and genetic levels requires invasive sampling methods, controlled loading intervention protocols, and multiple tissue analyses, which reveal ethical and methodological limitations in human studies. These limitations highlight the necessity of using animal models in sports science (Lachmann, 1992; Barassi, Benavides & Ceccarelli, 1996). Rats (Rattus norvegicus) show significant similarities to humans in terms of physiological system organization, energy metabolism, musculoskeletal structure, and physiological responses to exercise. For this reason, they are among the most commonly used experimental animals in sports science. Furthermore, rats' ability to easily adapt to endurance, strength, and high-intensity exercise models allows for the controlled study of target tissues such as muscle, liver, brain, and adipose tissue. In all these respects, rat models offer a powerful research tool for mechanistically determining the effects of exercise on oxidative stress, inflammation, hormonal responses, and metabolic regulators. In general terms, the scientific rationale for using laboratory animals is based on the ability to test research hypotheses that cannot be directly applied to humans or are not considered ethically appropriate. Lachmann (1992) emphasizes the fundamental role of animal experiments in the development of biomedical knowledge, arguing that they are particularly important in the development of alternative methods for understanding complex physiological processes.

Current research suggests that rats should be considered not only as “experimental animals” but also as animal models representing specific physiological and pathophysiological processes. Toth (2023) states that this conceptual distinction is scientifically important and that selecting and interpreting animal models appropriately for the research question contributes to the translational value of studies. The use of rat models in sports science allows for the evaluation of exercise-related adaptations within a cause-and-effect framework, strengthening the applicability of findings to human studies.

Additionally, ethical responsibilities and animal welfare principles that researchers must adhere to in the use of laboratory animals are an integral part of scientific research. The current statement published by the American Association for Laboratory Animal Science (AALAS) defines international standards for the

humane care and use of laboratory animals, emphasizing the need to reduce stress, provide appropriate housing conditions, and plan experimental procedures with animal welfare in mind (AALAS, 2023). In experimental interventions that cause physiological stress, such as exercise, adherence to these principles is not only an ethical imperative but also a fundamental requirement for increasing the reliability of experimental data. In this context, the concept of animal welfare emphasizes the balance that must be struck between scientific progress and ethical sensitivity. Jar (2014) states that protecting the welfare of experimental animals not only increases the ethical legitimacy of research but also strengthens the social acceptance of scientific results. Experimental research designs using rats in sports science, when planned within this ethical framework, increase both scientific quality and the reliability of research results.

In conclusion, rat models provide a powerful and highly translational opportunity for understanding the physiological, metabolic, and molecular effects of exercise in sports science. Findings obtained from rats through experimental research planned in accordance with ethical principles can make significant contributions to the advancement of scientific knowledge regarding human performance and health. The aim of this research is to address the use of rats and current approaches from a sports science perspective in a scientifically grounded and detailed manner.

2. Comprehensive Evaluatıon Of Biological Responses Induced By Exercıse In The Rat Model

Exercise is not merely a stimulus that affects the body at a single biological level. It is also a multifactorial physiological process that causes simultaneous and interactive adaptations in gene expression, protein synthesis, cellular organization, and tissue structure. In experimental sports science research conducted on rat models, evaluating physiological responses to exercise using only a single analysis method makes it difficult to fully understand this complex adaptation process. Indeed, exercise-induced differences in mRNA levels do not always translate to protein levels; increases in protein expression may not fully correspond to structural or cellular adaptations at the tissue level. Therefore, multifactorial analysis approaches covering gene, protein, and tissue levels are needed to accurately and reliably evaluate the adaptations caused by exercise in rat tissues. The combined application of complementary methods such as Western blot, PCR, ELISA, and immunohistochemistry enables the quantitative determination of exercise-induced molecular responses, facilitates the correlation of these responses with systemic effects, and allows for the visualization of their tissue-level counterparts. This

enhances the scientific depth and translational value of findings in the field of sports science.

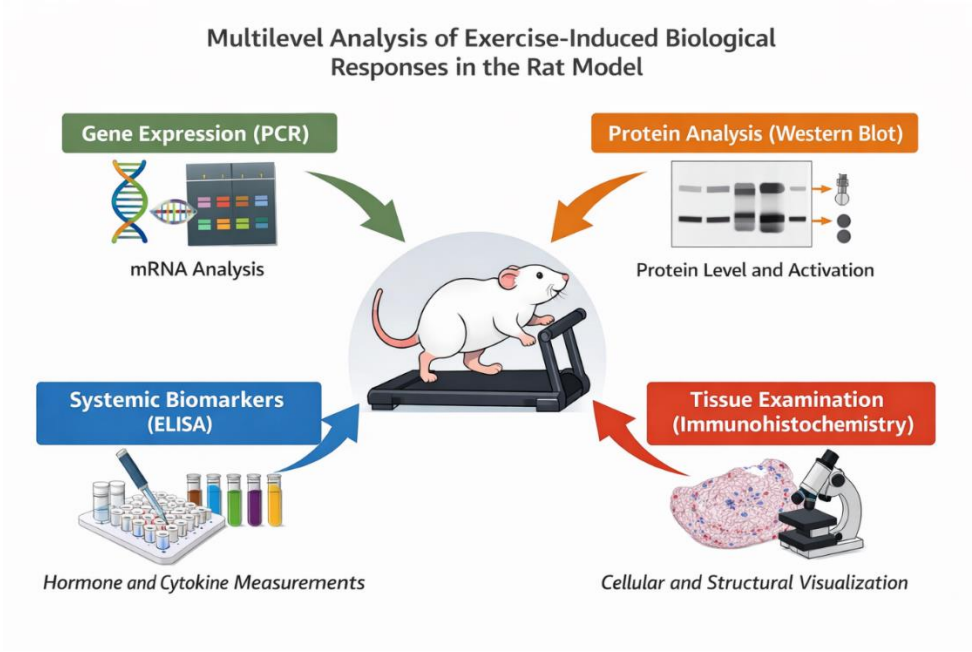


Figure 1. Comprehensive Analysis of Exercise Responses in a Rat Model

2.1. EVALUATION OF RESPONSES TO EXERCISE AT THE GENE EXPRESSION LEVEL (PCR)

Kılıç et al. (2025) investigated the potential mechanisms of action of aerobic and anaerobic exercise on the expression levels of genes related to glucose metabolism, lipid metabolism, and inflammation in brain tissue in a streptozotocin-induced diabetic rat model. In the current experimental design, rats were grouped according to exercise type, and exercise-related molecular responses were tested using gene expression analyses based on polymerase chain reaction (PCR). The study suggested that exercise significantly improved the expression of metabolic regulatory genes in brain tissue; specifically, aerobic and anaerobic exercise types produced distinct molecular response profiles. Changes in genes related to gluconeogenesis, lipogenesis, and inflammatory responses revealed that exercise not only affects peripheral tissues but also paves the way for significant genetic adaptations at the central nervous system level. This highlights the importance of PCR-based approaches in understanding the molecular basis of exercise-induced brain adaptations in experimental models conducted on rats. From a sports science

perspective, this research is important in that it demonstrates that exercise-specific molecular responses can be distinguished at the level of gene expression. Furthermore, PCR analysis has been found to be a reliable and sensitive method for examining the physiological effects of exercise in metabolic disease models such as diabetes. This allows for the identification of early adaptations at the gene level. In this respect, the study provides a strong example supporting the methodological approach to evaluating exercise responses at the gene expression level.

Hepsert (2025) aimed to reveal the early and specific indicators of biological responses generated by experimental exercise protocols applied in a rat model in his completed thesis research. In this context, polymerase chain reaction (PCR)-based gene expression analyses were used in his research. The PCR approach was used because it allows the effects of exercise on metabolic and inflammatory processes to be evaluated at the molecular level before functional and histological changes occur. Gene expression analyses performed on total RNA isolated from liver and adipose tissue samples obtained within the scope of the study quantitatively examined the mRNA levels of target genes associated with chronic inflammation, oxidative stress, and glucose metabolism. These analyses revealed that the molecular responses induced by exercise in different tissues exhibit tissue-specific characteristics; significant expression changes were detected, particularly in genes related to metabolic regulation and inflammatory responses.

PCR results suggest that exercise in the rat model not only induces systemic physiological responses but also contributes to the transcriptional reprogramming of genes involved in regulating metabolic homeostasis. Furthermore, the gene expression profiles observed among different experimental groups have enabled the comparison of the molecular effects of the interventions applied (e.g., exercise, nutrition, or supportive interventions). When evaluated in the context of sports science, this research clearly demonstrates that PCR-based gene expression analyses are a fundamental tool for explaining the molecular basis of adaptation, without limiting the biological effects of exercise to performance outputs or biochemical parameters. These findings obtained at the gene level are indicative for protein expression and structural analyses at the tissue level, providing a scientific basis for the evaluation of exercise-related adaptations using a complex approach.

When considered together, these studies reveal that the biological effects of exercise in the rat model are mediated by early, tissue-specific, and intervention-type-sensitive adaptations at the level of gene expression; PCR-based analyses, meanwhile, serve as a fundamental method for quantitatively characterizing these

molecular responses and for better understanding the mechanistic basis of exercise-induced physiological adaptations.

2.2. Evaluation Of Responses To Exercıse At The Protein Level (Western Blot)

Cao et al. (2024) investigated the beneficial effects of aerobic exercise on insulin resistance in an obesity-induced mouse model, specifically examining metabolic regulations related to BCAA homeostasis and associated protein levels. The effects of the aerobic exercise protocol applied in the experimental design on the expression and activity states of proteins associated with glucose metabolism and insulin signaling pathways were investigated. The present study found that aerobic exercise re-regulates BCAA metabolism impaired by obesity and that this is related to the functional responses of key proteins involved in insulin signaling pathways. It was noted that proteins associated with insulin sensitivity in muscle and liver tissues showed improvement after exercise, and that these regulatory changes in protein levels contributed to the restoration of metabolic flexibility. In the study, the use of Western blot analysis as one of the basic methods for evaluating changes in protein levels has enabled the molecular effects of exercise to be examined at a functional level. From a sports science perspective, this research reveals that aerobic exercise is not limited to being an intervention that increases energy expenditure, but also has a powerful biological signaling feature that reorganizes protein networks associated with amino acid metabolism and insulin signaling. These findings at the protein level emphasize the importance of protein analysis methods such as Western blot in understanding the underlying pathways of exercise-induced metabolic adaptations and reinforce the translational value of exercise in experimental animal models.

Lee et al. (2021) investigated the effects of exercise training on BCAA metabolism, insulin sensitivity, and hepatic steatosis in sedentary dysglycemic and normoglycemic male subjects. The current study aimed to reveal that exercise-induced metabolic adaptations are associated not only with systemic biochemical changes but also with metabolic adjustments at the protein level. Following the exercise program, significant changes were reported in the activity of proteins associated with BCAA metabolism and, consequently, in metabolic response profiles. In particular, it has been shown that the increase in insulin sensitivity is related to the reorganization of protein networks involved in BCAA catabolism. The decrease in liver fat content suggests that exercise positively affects hepatic lipid metabolism through protein-based metabolic pathways. The study directly evaluates molecular mechanisms, demonstrating the decisive role of protein-level changes in

metabolic health. From a sports science perspective, it provides strong translational evidence supporting the relationship between BCAA metabolism and insulin sensitivity, demonstrated in animal models using methods such as Western blot, with functional and clinical outcomes in human exercise studies. Thus, findings obtained at the protein level in experimental rat studies are shown to be consistent with exercise-induced metabolic improvements in humans. This indirectly reinforces the mechanistic importance of Western blot-based protein analyses in sports science research.

When these findings are considered together, it is understood that aerobic exercise reorganizes protein networks associated with BCAA metabolism and insulin signaling in both experimental animal models and humans; these adaptations at the protein level constitute a fundamental mechanism for improving metabolic health and insulin sensitivity. Consequently, it is understood that experimental animal model research conducted at the protein level fills important mechanistic gaps in sports science, possesses unique value, and represents an experimental approach with the potential for transfer to human studies.

2.3. Evaluation Of Exercise Responses At The Elısa Level

Aydın et al. (2025) conducted a review study that comprehensively addressed the basic principles of the ELISA method, different ELISA formats, and current laboratory practices for the quantitative measurement of peptides and proteins in biological fluids. The research aimed to explain the methodological advantages underlying the widespread preference for ELISA in clinical and experimental research due to its high sensitivity and specificity. Within the scope of the current research, pre-analytical and analytical variables encountered in protein and peptide measurements in serum, plasma, and other biological fluids were discussed in detail. In this context, the effects of sample preparation, antibody selection, calibration strategies, and quality control steps on measurement accuracy are emphasized. Furthermore, the importance of ELISA's reproducibility and standardization in detecting low-level but biologically meaningful changes caused by physiological interventions such as exercise is particularly highlighted. From a sports science perspective, this review explains why the ELISA method is important for measuring hormones, myokines, cytokines, and metabolic biomarkers within a methodological framework. The necessity of adopting appropriate laboratory practices for the reliable assessment of exercise-related systemic responses is emphasized; in this respect, the study serves as a fundamental methodological reference source for experimental and translational sports science research.

Aydemir et al. (2026) conducted a systematic review and meta-analysis study that comprehensively evaluated the regulatory effects of exercise on specsin levels and the relationship between these changes and metabolic health. Spexin is a peptide hormone that plays a role in energy balance, lipid metabolism, and glucose homeostasis, and it stands out as an important biomarker for monitoring exercise-induced systemic adaptations. In the majority of the studies reviewed, spexin levels were quantitatively measured in serum or plasma samples using the ELISA method. The high sensitivity and specificity of ELISA has enabled the reliable detection of relatively small but biologically meaningful changes in hormone levels caused by physiological interventions such as exercise. Meta-analysis findings indicate that regular exercise significantly increases spexin levels and that these changes are particularly associated with insulin sensitivity, fat mass, and metabolic risk profiles. From a sports science perspective, ELISA-based hormone analyses represent an important method for revealing exercise-related systemic and endocrine responses. Furthermore, it is emphasized that biomarkers such as spexin hold significant potential for monitoring the metabolic effects of exercise interventions and explaining individual response variations. In this respect, the study provides strong evidence supporting the high experimental and translational value of ELISA as a tool in sports science research.

Bozbay et al. (2025) conducted a randomized controlled experimental study in which the effects of exercise and carnosine supplementation administered in a rat model on gut microbiota-derived metabolites, myokines, and the cardiometabolic profile were comprehensively examined. The current study aimed to investigate that exercise-induced systemic adaptations are not limited to muscle or metabolic tissues but generate multifaceted biological responses through endocrine, immune, and metabolic networks. Within the experimental protocol, myokines, inflammatory markers, and metabolic hormones obtained from serum and tissue samples were quantitatively analyzed using the ELISA method. Thanks to the sensitive and reproducible nature of ELISA, it was explained that the biochemical changes caused by exercise and carnosine administration could be reliably detected. The research findings showed that exercise positively modulates myokine release and microbiota-derived metabolite profiles; this effect became more pronounced with carnosine administration. In the context of sports science, ELISA-based analyses play a critical role in evaluating exercise-related systemic and metabolic responses. Findings obtained specifically through myokines and inflammatory markers contribute to understanding the mechanisms underlying exercise's cardioprotective effects. In this respect, the study strongly supports the indispensability of the ELISA method in

comprehensively evaluating the biological effects of exercise interventions in rat models.

When these studies are evaluated together, it is understood that exercise regulates systemic metabolic responses through hormones, myokines, and microbiota-derived metabolites; while ELISA-based analyses are an indispensable method for sports science research in quantitatively revealing these multifaceted biological adaptations.

2.4. Evaluation Of Responses To Exercise At The Immunohistochemical Level

Yasul et al. (2025) investigated the effects of moderate and high-intensity exercise protocols and coenzyme Q10 (CoQ10) supplementation on tumor statin expression, lipid metabolism, and body mass in a rat model. The study aimed to reveal whether exercise and nutritional supplements induce not only systemic biochemical changes but also structural and cellular adaptations at the tissue level. Specifically, the localization and intensity of tumstatin expression in adipose tissue and related metabolic tissues were evaluated using immunohistochemistry. IHC analyses showed that exercise and CoQ10 administration reduced tumstatin immunoreactivity and that this was associated with improvements in lipid dynamics. These findings demonstrate that the biological effects of exercise and supplementation on the tissue microenvironment can be observed not only at the molecular level but also at the cellular and structural levels. From a sports science perspective, this study highlights the importance of immunohistochemistry in determining the tissue-specific spatial distribution of exercise-induced adaptations and their cellular responses. In particular, the visualization of proteins associated with metabolic and angiogenic processes, such as tumstatin, at the tissue level contributes to a deeper understanding of the effects of exercise on body composition and lipid metabolism. In this respect, the study strongly supports the complementary role of immunohistochemistry in experimental sports science research.

Aydemir et al. (2025) conducted a study comparing the tissue-specific effects of aerobic exercise and metformin administration on spexin expression in a diet-induced obese male rat model. The study aimed to reveal how the effects of exercise on metabolic regulatory peptides are shaped not only at the systemic level but also in the tissue microenvironment. Within the scope of the study, the distribution and intensity of spexin expression in different metabolic tissues were evaluated; it was demonstrated that exercise and metformin interventions differentiated spexin immunoreactivity in a tissue-specific manner. The immunohistochemistry method

allowed for the visualization of the cellular localization of spexin and expression differences between tissues, revealing the structural counterpart of the quantitative findings. From a sports science perspective, this study demonstrates that exercise reshapes the tissue-level distribution of metabolic regulatory hormones in obesity conditions and emphasizes that immunohistochemistry is a critical method for explaining the spatial and cellular dimensions of exercise-induced biological adaptations. In this respect, the study strongly supports the complementary and indispensable role of immunohistochemistry analyses in experimental sports science research.

When these studies are evaluated together, it is understood that exercise significantly modulates the tissue-specific expression and cellular localization of metabolic and vascular regulatory proteins in the rat model; immunohistochemistry, on the other hand, is an indispensable method for revealing the spatial and structural dimensions of exercise-induced biological adaptations.

References

American Association for Laboratory Animal Science. (2007). AALAS position statement on the humane care and use of laboratory animals. *Comparative medicine*, *57*(4), 413.

Aydemir, İ., Çınar, V., Akbulut, T., Yalçın, M. H., Yasul, Y., Gençer, B. T., ... & Bragazzi, N. L. (2025). Tissue-Specific Modulation of Spexin Expression in Diet-Induced Obese Male Rats: Comparative Effects of Aerobic Exercise and Metformin. *Applied Sciences*, *15*(16), 8828.

Aydemir, İ., Yasul, Y., Akbulut, T., Cinar, V., & Migliaccio, G. M. (2026). Exercise-Induced Regulation of Spexin: Implications for Metabolic Health: A Systematic Review and Meta-Analysis. *Medicina*, *62*(1), 107.

Aydin, S., Emre, E., Ugur, K., Aydin, M. A., Sahin, İ., Cinar, V., & Akbulut, T. (2025). An overview of ELISA: A review and update on best laboratory practices for quantifying peptides and proteins in biological fluids. *Journal of International Medical Research*, 53(2), 03000605251315913.

Barassi, N., Benavides, F., & Ceccarelli, A. (1996). Ética en el uso de animales de experimentación. *Medicina*, *56*(5), 1.

Bozbay, K., Çınar, V., Akbulut, T., Yasul, Y., Yalçın, M. H., Orgun, M. C., ... & Lee, D. Y. (2025). Exercise and Carnosine Modulate Microbiota-Derived Metabolites, Myokines, and Cardiometabolic Profiles in Rats: A Randomized Controlled Trial. *Biomedicines*, *13*(12), 2853.

Cao, W., Liu, Y., Wei, H., Dong, Y., Sun, H., Zhang, X., & Qiu, J. (2024). Aerobic exercise attenuates insulin resistance via restoring branched chain amino acids homeostasis in obese mice. *Frontiers in Nutrition*, *11*, 1451429.

Hepsert, S. (2025). *Obezite ve metabolik sendromda kronik egzersiz ve cannabidiol uygulamasının glukoz metabolizması, oksidatif stres ve kronik inflamasyon üzerindeki etkilerinin araştırılması* [Doktora tezi, Fırat Üniversitesi]. Sağlık Bilimleri Enstitüsü.

Jar, A. M. (2014). Bienestar animal y el uso de animales de laboratorio en la experimentación científica. *Revista argentina de microbiología*, *46*(2), 77-79.

Kılıç, Y., Dalkılıç, S., Kadıoğlu Dalkılıç, L., Özdemir, E., Uğurlu, F. M., Pala, R., ... & Ayılgan, E. (2025). Effects of aerobic and anaerobic exercise on glucose, lipid, and inflammation-related gene expression in the brain tissue of streptozotocin-induced diabetic rat model. *Diabetology & Metabolic Syndrome*, *17*(1), 324.

Lachmann, P. (1992). The use of animals in research: medical progress depends on it. *British Medical Journal*, *305*(6844), 1-2.

Lee, S., Gulseth, H. L., Langleite, T. M., Norheim, F., Olsen, T., Refsum, H., ... & Drevon, C. A. (2021). Branched-chain amino acid metabolism, insulin sensitivity and liver fat response to exercise training in sedentary dysglycaemic and normoglycaemic men. *Diabetologia*, *64*(2), 410-423.

Toth, L. A. (2023). Opinion: Laboratory Animals, Animal Models, or Just Animals?. *Journal of the American Association for Laboratory Animal Science*, *62*(3), 197-197.

CHAPTER 2

Leadership in Recreational Activity Management

Batuhan ER[1]

Er, B. (2025). *Leadership in recreational activity management*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (Chap. 2, pp. 16–33). Duvar Yayınları

[1] İstanbul Aydın University, Faculty of Sports Sciences
https://orcid.org/0000-0002-4269-4149

Introduction

The role of the recreation leader in the management and organization of recreational activities points to an induction created by the scheme of the activity or organization as a whole, the management stages. The management stages of these schemes, in turn, include some abstract approaches applicable to recreational activities. The conceptualization of a recreational activity through observation, its planning, feasibility study, marketing, implementation, promotion, and evaluation represent the management dimensions of these stages. In short, certain management practices are required for the pre-event, during, and post-event periods. In terms of these management stages, or more generally, "In the 21st century, we need more leaders than managers within the concept of management." The point here is not to discuss the difference between manager and leader, but rather the importance of the concept of "leader" in recreational activities.

Leadership, in line with centuries-old debates, has become a more needed concept than ever in this century. Individuals may need leadership for general or specific needs, ranging from their need to participate in recreational activities to their ability to manage their own lives. Conversely, considering the assumption that individuals are the leaders of their own lives, this raises the question of why they need a leader when participating in recreational activities. However, will a leader be necessary as a guiding need in recreational activities they participate in to combine their leisure experiences with social interaction? The answers to these questions will be determined by the location, time, and audience of the activity—in short, its nature. An individual who is capable of directing their own life and using their time effectively and efficiently may not need a leader while engaging in angling, regardless of their high or low skill level in the activity they participate in. This is because the individual has established their own "leadership direction/management" and is in the flow. However, a new dance class participant will absolutely need a leader due to their insufficient experience and skills in the choreography, movements, and other aspects. At this point, the leader's competence, experience, communication skills—in short, all of their leadership qualities—will be of paramount importance in the management of recreational activities. Given the importance of the leader's role in recreational activities, it would be beneficial to examine leadership approaches.

What is Leadership?

Since the concept of leadership emerged, many different definitions have been offered. It's possible to argue that some definitions offer answers to the question of what a leader is or what leadership is. Bolden (2024) defines leadership as a complex structure that influences organizational, social, and personal processes. He argues that individuals or groups participate in activities not through coercion, but in line with their own intrinsic motivations and group goals. In another approach, Yukl and Van Fleet (1990) consider leadership as a process that involves influencing group and organization task goals and strategies, persuading people within the organization to implement strategies and achieve goals, influencing group continuity and identity, and influencing organizational culture. Yukl (2010), on the other hand, considers leadership as the process of persuading and reaching agreement with others about what should be done and how it should be done. Author emphasizes the process of facilitating individual and collective efforts to achieve shared goals. From a universal perspective, these definitions address the process nature of leadership rather than its outcome focus.

Who is the Leader?

While some aspects of leadership are universal, they are similar across the regions studied. However, some leadership traits can vary from country to country, depending on the specific culture and context. For example, as countries' industrialization efforts increase, their leaders begin to share many common values. At the same time, they may maintain some values specific to their own culture (Bass & Bass, 2009). Leaders often act as if they have their own ethical code. Actions that are wrong for the rest of the group may be right for them. This is where leadership ethics comes into play and can be relativistic. This is the view that right and wrong vary from person to person or society to society. When applied to leadership ethics, this understanding of morality allows leaders to act as they or their culture deems appropriate. In other words, a leader—as an individual or as a member of a particular society—can claim righteousness because they "possess their own morality" (Price, 2008).

Table 1. Social Clusters and Leadership Styles

<table>
<tr><th>Performance Oriented (Higher)</th><th>Team Oriented (Higher)</th><th>Participant (Higher)</th><th>Human (Higher)</th><th>Autonomous (Higher)</th><th>Self- and group-based protection (Higher)</th></tr>
<tr><td rowspan="2">Anglo
Germany
Scandinavian
Southeast Asia
Latin Europe
Latin America</td><td rowspan="4">Southeast Asia
Confucius
Latin America
Eastern Europe
Africa
Latin Europe
Scandinavian
Anglo
Middle East
Germany</td><td>Germany
Anglo
Scandinavian</td><td>Southeast Asia
Anglo
Africa</td><td rowspan="4">Germany
Eastern Europe
Confucius
Scandinavian
Southeast Asia
Anglo
Africa
Middle East
Latin Europe
Latin America</td><td>Middle East
Confucius
Southeast Asia</td></tr>
<tr><td>Latin Europe
Latin America
Africa</td><td>Germany
Middle East
Latin America
Eastern Europe</td><td>Africa
Latin Europe</td></tr>
<tr><td>Confucius
Africa
Eastern Europe</td><td rowspan="2">Eastern Europe
Southeast Asia
Confucius
Middle East</td><td rowspan="2">Latin Europe
Scandinavian</td><td rowspan="2">Anglo
Germany
Scandinavian</td></tr>
<tr><td>Middle East</td></tr>
<tr><th>Performance Oriented (Lower)</th><th>Team Oriented (Lower)</th><th>Participant (Lower)</th><th>Human (Lower)</th><th>Autonomous (Lower)</th><th>Self- and group-based protection (Lower)</th></tr>
</table>

Reference: Yeşil, 2013

In his study, Yeşil (2013) listed the universally accepted leadership qualities as being trustworthy, fair, foresighted, planning in advance, encouraging, positive, dynamic, creating and increasing motivation, instilling confidence, motivating, determined, perfectionist, secure, intelligent, effective bargaining, win-win problem solver, administratively skilled, high communication skills, knowledgeable and aware of everything, coordinator and team developer. In the same study, the universally undesirable leadership qualities were stated as being a loner, unsociable, unclear and unclear, uncooperative, angry, self-centered, merciless and dictatorial. Leadership qualities that vary by culture are as follows; These are listed as forward thinking, ambitious, autonomous, careful, class conscious, compassionate, shrewd, authoritarian, elite, eager, evasive, formal, tradition-bound, independent, indirect, individualistic, creating intergroup competition, avoiding intragroup conflict,

instinctive, logical, micromanager, organized, adhering to procedures, provocateur, risk-taker, prescriptive, dignified, self-compromising, sensitive, sincere, status-conscious, obedient, unique, stubborn and materialistic (Yeşil, 2013).

Weese (1995), in him study on campus recreation in the United States, stated that four important critical culture-building activities (managing change, achieving goals, coordinated teamwork, and customer focus) were more successfully carried out in campus recreation programs managed with a high level of transformational leadership behavior than in programs managed by leaders with a low level of transformational leadership behavior.

According to the cultural understanding of leadership, paternalism, a significant characteristic of social culture, is particularly prevalent in Eastern societies. According to the idea of paternalism, the state benefits from the ideology of welfare by providing protection and assistance to its citizens. According to this approach, bilateral relations are often structured around duties and responsibilities between superiors and subordinates. This is indicative of Eastern culture's collective action and greater power distance compared to Western cultures.

In this context, paternalism is more prevalent in cultures that operate communally and embrace a wide power distance. Considering that the dominant social culture in Turkey shares similar characteristics, it would not be inaccurate to suggest that a paternalist approach could be adopted. The dominant culture within an organization is largely influenced by its societal culture. Organizations located in a society characterized by paternalistic culture will also be influenced by this cultural characteristic, and the dominant culture within the organization may also exhibit paternalistic characteristics.

Leadership Styles

Donuk (2016) stated that the leadership style or management style chosen by managers will significantly impact their effectiveness as a leader. Furthermore, it was stated that choosing the appropriate leadership style and using appropriate motivational techniques will contribute to the achievement of individuals' and organizations' goals. He categorized leadership styles as follows: Autocratic Leadership, Democratic Leadership, Liberal Leadership, Transformational Leadership, Visionary Leadership, Charismatic Leadership, Situational Leadership, and Strategic Leadership. While Donuk (2016) also discusses liberal, visionary, situational, and strategic leadership styles differently from some other sources, as

these approaches fall within the characteristics of many leadership styles, the presentation will address different leadership styles.

Demirtaş and Karaca (2020) examined leadership styles in a broader context in their study. The study emphasized that we need a new generation of leaders, not new managers, to survive in the 21st century. Furthermore, leadership styles were defined as: Moral Leadership, Transformational Leadership, Transactional Leadership, Participative (Democratic) Leadership, Servant Leadership, Charismatic Leadership, Authentic Leadership, Spiritual Leadership, Implicit and Explicit Leadership, Autocratic Leadership, Democratic Leadership, Resonant Leadership, Digital Leadership, Cross-Cultural Leadership, Paternalistic Leadership, Complex Leadership, and Coach Leadership. Leadership styles can be examined within these approaches.

Moral Leadership

This style of leadership reflects a leadership style built on moral and ethical foundations. Connock and Johns (1995) define it as a leadership style based on establishing a moral criterion, incorporating values into this criterion, and effectively implementing this predetermined criterion. Ko et al. (2018) defines it as a leader whose attitude is ethical and trustworthy, serving as a source of motivation for followers.

	Similarities with Moral Leadership	**Differences from Moral Leadership**
Transformational Leadership	Consideration of others (Altruism-Sacrifice) Moral decision-making Integration	Moral leaders emphasize moral management and ethical standards.
Spiritual Leadership	Consideration of others (Altruism-Sacrifice) Integration Being a role model	Moral leaders emphasize moral management. Spiritual leaders emphasize vision,
Authentic Leadership	Consideration of others (Altruism-Sacrifice) Moral decision-making Integration	Moral leaders engage in awareness of others and emphasize moral governance (in a more interactive, i.e.,

Reference: Demirtaş ve Karaca (2020)

Transformational Leadership

Bass (1999) defined transformational leadership as the leader's influence on a target audience. Author stated that the combination of love, respect, trust, motivation, and commitment to the target group will result in greater than expected performance. According to Bass, a leader can transform followers in the following ways:

- By increasing awareness of the meaning and importance of the mission,
- By instilling the idea of prioritizing the organization's interests over one's own,
- By stimulating high-demand needs.

Demirtaş and Karaca (2020) stated the characteristics of the transformational leadership style as follows:

- Creative thinking: A process of change that involves new methods and new ideas.
- Collaboration and sharing to determine the future: All shared work is to determine the intended and imagined future, to plan, develop and imagine the future.
- Communication and high motivational skills: The goal of transformational leadership is to facilitate change and transformation. To achieve this, illustrated goals are conveyed to those who will collaborate to achieve these goals.
- Representation of change: A transformational leader must be creative in trying new and different methods instead of the known and practiced ones. It represents the symbol that breaks known taboos.
- Charismatic influence: Charisma is the ability to easily influence people, possess superior persuasive skills, and possess self-confidence. In transformational leadership, charisma is used to achieve high levels of performance or followership and to better connect with goals.
- Flexible management approach: Transformational leaders are prepared for changing situations. They prioritize goal-oriented alternatives and flexible changes over rigid, unchanging rules.
- Emotional resilience: Being brave and taking risks. A transformational leader must possess a resilient, fearless, strong, and determined demeanor in every environment.
- Empowerment: Transformational leaders place great emphasis on teamwork. They also place great importance on participation in decision-making.

- Trustworthiness and confidence: Trust is a key characteristic not only in transformational leadership but in all leadership styles. Establishing a sense of trust is the first step in influencing a group or society.
- Lifelong learning: Lifelong learning is a never-ending process. In this century, with the almost daily advancements and changes in science and technology, creating new knowledge is an inevitable necessity. The end of learning means the end of development.
- Valuing teamwork: Synergy, a concept we've heard frequently in recent years, emphasizes the importance of working together. The impact of combined forces is greater than the sum of the individual forces.
- A sense of humor: Eisenhower, the 34th President of the United States, actually gave the best definition of leadership and humor when he said: "A sense of humor is part of the art of leadership—to manage people and get things done."

Ideal influence, a key dimension of transformational leadership, is crucial for recreational activity participants. While this characteristic alone is not sufficient to increase activity participant success and satisfaction, transformational leadership behaviors should be considered and implemented holistically, in line with the leader's sphere of influence (Cengiz, 2008).

Transactional Leadership

What makes individual leaders ready for transformational or transactional leadership? Answers include individual differences in personality and differences in cognitive, social, and emotional competencies (Bass, 2008).

Avolio and Bass (2001) proposed that transactional leadership occurs when a leader rewards or disciplines a follower based on the adequacy of the follower's performance. Transactional leadership relies on contingent reinforcement, such as positive contingent reward or more negative active or passive forms of management by exception.

Transactional leadership, especially with contingent reward, provides a broad foundation for effective leadership. However, when complemented by transformational leadership, transactional leadership can lead to greater effort, effectiveness, innovation, risk-taking, and satisfaction.

Contingent Reward: This constructive process has been found to be reasonably effective, though not as effective as any of the transformative components, in motivating others to achieve higher levels of development and performance.

Management by Exception: This corrective action tends to be less effective. However, it may be necessary in some cases. Management by exception can be either active or passive. When active, the leader actively monitors the follower's assignments for deviations from standards, errors, or errors and takes corrective action when necessary.

Laissez-faire Leadership: This is the avoidance or absence of leadership. By definition, it is the least effective form of leadership. It is also the least effective, according to nearly all research on the style. In laissez-faire leadership, nothing gets done.

Participatory (Democratic) Leadership

Participative leadership, also known as democratic leadership, is based on Kurt Lewin's classic three-style leadership model, known for his work in social psychology and experiential learning. According to Lewin, participative leadership is the balance between autocratic and laissez-faire leadership; he also argues that it is established through mutual respect between a leader and followers (Yener, 2020).

They solicit advice, ideas, and information from their followers and share their decision-making process with them. Democratic leaders use their power to set constraints within which followers are encouraged to participate when deciding what to do. Democratic leaders depend on their own interpersonal skills and their knowledge of their followers' individual needs, interests, and talents, as well as the skills of their followers (Bass, 2009).

Democratic leaders believe that employees are intrinsically motivated to succeed and seek opportunities to demonstrate their autonomy and worth. These leaders shift decision-making to lower levels in organizational hierarchies, encourage inquiry and ideas from below about better ways to do things, are open to criticism, treat subordinates' mistakes as learning opportunities, celebrate subordinates' successes, and promote subordinates' ideas to higher authorities. However, democratic leaders often need to do more to involve their followers in decision-making. According to Gill (1996), five principles govern all democratic societies: (1) personal responsibility, (2) empowering others to lead, (3) inclusiveness, (4) equality, and (5) full deliberation. Democratic leadership is inherently conflicted and often disorganized. This should not be confused with laissez-faire leadership, where the leader withdraws or abdicates responsibility and exhibits none of the concerns seen in authoritarian or democratic settings (Bass, 2009).

Servant Leadership

There are various definitions of this leadership style. Some define servant leadership as a type of leadership that values and develops people, builds community, demonstrates integrity, fosters empowerment, serves the organization as a whole, and demonstrates integrity.

In another definition, servant leadership is a leadership style in which the primary purpose is to serve others, achieve the common good, achieve goals and develop others.

Servant leadership can be expressed as the general purpose of an organization, the needs of an organization and the needs of people, the demands and needs of a leader and guiding behavior for others (Bayram and Geylan, 2020).

Some characteristics of servant leadership are;

Listening: Leaders are often judged by their communication and decision-making abilities. Listening to others is among the most important qualities of servant leaders. A servant leader must be able to seek out and respond to the group's needs and listen to what the group wants and doesn't want. Listening plays a crucial role in a leader's development.

Empathy: A servant leader must strive to understand and empathize with others. People want their personal talents to be recognized and acknowledged. When their special talents are recognized and valued, their performance will improve. Therefore, a good servant leader must be a good, empathetic listener.

Treatment: Learning to treat people well is a key strength in transformational and integrative leadership. Many people in an organization may experience emotional distress and personal distress. This is a natural consequence of being human. At this point, a servant leader must connect with them and help them.

Awareness: General and personal awareness are among the qualities of servant leaders. The commitment to fostering awareness can be daunting because people don't know what they're up against. Awareness is crucial for understanding what's happening in an organization.

Persuasion: Another skill of servant leaders is their ability to persuade. They prefer to persuade others rather than use force. A servant leader aligns with the group. This characteristic distinguishes them from other traditional leaders.

Conceptualization: Servant leaders pursue big dreams. Unlike traditional managers, they don't make short-term plans. Instead of just saving a day, they strive to build the future.

Foresight: Foresight is a skill that allows servant leaders to learn from the past, see the realities of the present, and make decisions about the future.

Servant: Servant leadership is a core philosophy. A servant leader strives to serve rather than be served.

Consistently Ensuring People's Development: A servant leader is responsible for the development of all people in the group. They must work tirelessly toward their personal, spiritual, and professional development.

Building Community: Servant leaders must learn from the past to build communities committed to each other and to the organization's goals. Organizational success lies in the interdependence of these communities.

Charismatic Leadership

A charismatic leader aims to foster superior performance in their employees through their charisma. Charismatic leaders pursue their vision, have dedicated followers, motivate their employees to maximize their performance, are committed to their vision, and foster a perspective on the future. Employees trust charismatic leaders. Employee trust and belief in charisma will facilitate a leader's ability to make radical decisions to achieve the organizational vision (Kendirli et al., 2022).

In charismatic leadership, managers possess a sense of vision and mission. Other characteristics of charismatic leadership include respect, trust, and loyalty. These leaders enable followers to identify strongly with their personality and leave intense emotional impressions on them.

The characteristics of a charismatic leader are listed as follows;

1) Possessing extraordinary abilities,

2) High self-confidence,
3) A need for high influence and dominance,
4) The ability to persuade based on one's beliefs,
5) Taking risks,
6) Self-sacrifice for the cause,
7) Attention to the needs of the audience,
8) Ability to produce radical solutions in crisis situations,
9) Sustainability in one's abilities, and
10) Possessing superior intelligence.

The negative consequences of organizations led by charismatic leaders are summarized as follows:

- The importance of a leader's decisions reduces the number of good suggestions that can be followed by followers.
- Leaders' willingness to accept unconditionally can limit criticism from followers.
- Followers' excessive admiration for a leader can lead to the misconception that the leader is infallible.
- Overconfidence and optimism can blind a leader to real dangers.
- Denial of problems and failures reduces organizational learning.
- Risky and ambitious projects are more likely to fail.
- Attributing all success to a leader undermines the efforts of some important followers.
- Thoughtless and unconventional behavior creates enemies as well as influences believers.
- Dependence on a leader inhibits the development of competent successors.
- Failure to develop various outcomes and solutions in a leadership crisis (Akça, 2020).

Authentic Leadership

Authentic (authentic) leadership is a leadership concept that encompasses being true to yourself, knowing yourself at your core, being honest with yourself and others, and possessing an internalized sense of morality. Authentic leaders are seen as a crucial solution and savior for businesses struggling to cope with today's rapidly changing world and the instability associated with this pace of change. This concept,

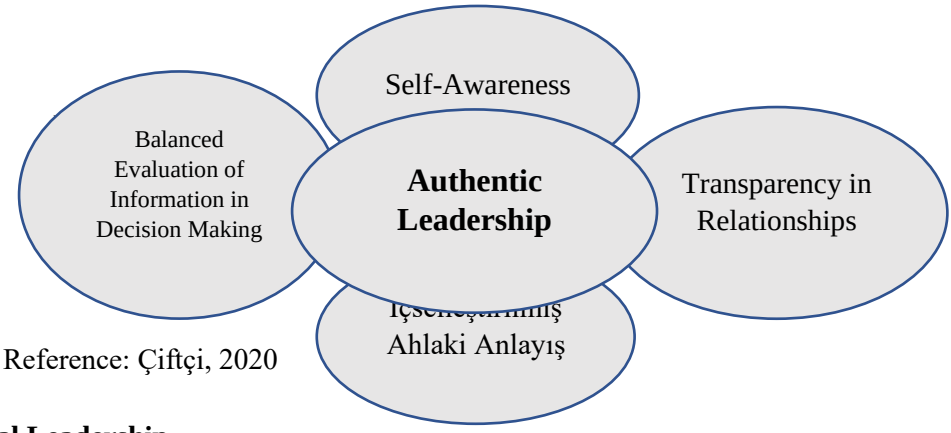
which first emerged towards the end of the twentieth century, has gained well-deserved prominence in the last decade, attracting the attention of both theorists and practitioners. The success and performance of authentic leaders in the business world has fueled this interest.

Unlike other leaders, authentic leaders cultivate long-term, meaningful relationships and possess the self-discipline to achieve results. Yet, authentic leaders are also deeply aware of who they truly are.

Avolio & Bass (2001) views authentic leadership as a root structure that can be transformative and encompasses ethical leadership. According to them, authentic leaders can be direct, participative, and even authoritarian, as reflected in transformational leadership. It is not the style itself that distinguishes an authentic leader from an inauthentic one. Authentic leaders act in accordance with deeply held personal values and beliefs, earning the respect and trust of their followers by encouraging a multitude of perspectives and building collaborative networks. The characteristics that make up authentic leaders and distinguish them from other leaders can be listed as follows:

- Authentic leaders don't fake their leadership. Authentic leaders don't act as leaders simply because they hold a leadership position (e.g., leaders become managers through an appointment process). They also don't work to enhance their image or personality. Fulfilling a leadership function and related activities are self-expressive actions for authentic leaders.
- Authentic leaders do not assume a leadership role or engage in leadership activities for status, honor, or other personal rewards. Rather, their leadership stems from their self-belief and achievements. They have a valuable cause or a mission they desire to fulfill. The ability to promote this cause or mission is a key motivation that drives them to lead others.
- Authentic leaders are original, not imitative. This doesn't mean they are unique or significantly different in terms of their personality traits. Furthermore, their values, beliefs, causes, or missions may be similar in content to those of other leaders and their followers. However, the process of living by these beliefs and causes is not a process of imitation. Rather, they internalize these processes based on their personal experiences.
- Authentic leaders are leaders whose actions are grounded in their values and beliefs. What authentic leaders say is consistent with what they believe, and their actions are consistent with their words and beliefs. Authentic leaders can be characterized as having higher integrity because

they act in accordance with their values and beliefs rather than to please an audience, gain popularity, or advance some personal or narrow political interest (Çiftçi, 2020).



Reference: Çiftçi, 2020

Spiritual Leadership

According to the renowned Russian writer Tolstoy, "If we want to be happy, we must believe that life lies in the soul, not in the object." Spiritual leadership styles, like other leadership styles, have been defined in various ways. Spiritual leadership has been defined as "a framework of organizational values proven in culture that encourages employees to experience self-transcendence throughout the work process, facilitating feelings of connection that foster compassion and joy." It has also been defined as a leadership style that strives to increase work efficiency by fostering a sense of purpose, fostering a sense of commitment and meaning among employees, and fostering organizational spirituality.

However, in different definitions, spiritual leadership is expressed in three different dimensions:

Inner life: Employees have both an inner and outer life. Recognizing and supporting employees' inner lives will translate into a more productive and meaningful experience.

Meaningful work: Employees want the work they do to mean something to them, and if their work becomes meaningful, they are more likely to do it with greater commitment.

Connection and community: Employees need to be with other employees in a workplace and be part of a community for spiritual growth.

The advantages of spiritual leadership are;

- Increases morale and productivity

- Increases performance
- Increases employee motivation
- Increases the ability to adapt to change as a learning organization.
- Improves the physical and mental health of employees
- Improves mental and spiritual health
- Contributes to the personal development of employees
- Increases job satisfaction
- Increases organizational citizenship behavior
- Reduces organizational skepticism
- Improves the quality of work life
- Improves employee flexibility and creativity
- Improves honesty and trust
- Improves organizational commitment
- Increases academic success in schools (Polatçı, 2020).

Autocratic Leadership

Autocratic leadership has always been one of the most frequently used leadership styles, from past to present. However, it can be argued that defining the concept presents significant challenges. The belief that autocratic leadership is a flawed and dangerous management style in dictatorships and that there is no place for authoritarian leadership in a democratic system leads organizations to avoid authoritarian leadership. These ideas stem from a misunderstanding of the meaning of autocracy and the concept of autocratic leadership. Autocratic leadership can be the right leadership style when time is tight and quick decisions are required. When used by the right person in the right place, the concept benefits organizations. At this stage, the fundamental characteristics of autocratic leadership must be well understood, and the circumstances under which an autocratic leader must make decisions must be well planned. When used correctly and effectively, autocratic leadership can be a savior for organizations in crisis situations; it fosters a strong team spirit, provides a time advantage, reduces organizational costs, and enables more work to be completed in a shorter time with fewer employees.

Under autocratic leadership, harsh measures can be taken against opposition. An authoritarian leader may view any opposition as a limit to their power. Opposition can be seen as a significant obstacle to an authoritarian leader's ability to reach their subordinates, keep them under control, and carry out directives. In this process, an authoritarian leader's primary goal is to quickly eliminate opposition.

The need for an authoritarian leader is sometimes linked to employees rather than the structure of an organization. In other words, employees may decide that autocracy is the best form of governance for their organization. There are two main reasons for this. First, the direct loyalty of an organization's members to an authoritarian leader. Members are loyal to an authoritarian leader; they unquestioningly follow his decisions. Members quickly dismiss even the slightest criticism of an authoritarian leader. To achieve this, an authoritarian leader must keep their members loyal. To this end, an authoritarian leader must leverage leadership charisma, leadership culture, and so on. Second, an organization's members are under authoritarian leadership from the very beginning. After working under an authoritarian leader for many years, members are required to act in accordance with his orders (Yıldırım et al., 2020).

Digital Leadership

A digital leader is defined as an entrepreneur, an innovative and vibrant participant, and someone who co-creates a vision with a team. A digital leader isn't just digital; they are also a leader, a follower, and a member of a team. As a leader who pursues goals with their team, they act as leaders by winning the hearts and minds of others. A digital leader is fair and open, shares their earnings with open minds, and acts with entrepreneurship and innovation based on the value they create with their team.

Digital leadership primarily means understanding and internalizing technology and rapid changes, and positioning oneself, the team, and the organization to meet the needs of the high-tech world. In today's tech world, digital leaders are those who manage the information, the work, and the organization's vision, creating a competitive advantage because information is accessible everywhere and to everyone.

Some of the characteristics that digital leaders should have are listed as follows:

Personalization: Managers are expected to manage employees in individual teams. Each individual must be evaluated individually based on their own needs.

Innovation and Entrepreneurship: Today, intrapreneurs contribute to companies by bringing new approaches.

Inspiration: A key skill for leaders in the digital age is to inspire their teams. Leaders who inspire their teams can generate new ideas.

Vision: Once leaders have set the vision in advance, they are now asked to define the vision with their employees and integrate it into an engaged team.

Fairness: It's important for leaders to treat employees fairly. In the digital age, leaders need to act individually.

Reverse Consulting: A manager doesn't need to know how to code. But they do need to understand what coders do and how they do it, and they should know what can be done when working with the team, even if they don't write their own code.

Authenticity: Leaders should act naturally and avoid artificiality.

To be knowledgeable: Leaders were previously expected to know everything. However, instead of trying to know everything, leaders are now asked to be the ones who share with the team the issues they don't know and haven't planned (Çizmeci, 2020).

Conclusion

The "evaluation and judgment" stage is one of the most crucial decision-making elements for a leader. It's quite difficult to evaluate individuals based on an event that hasn't occurred, and in addition, it can be difficult to assess the kind of leader an individual would be, especially for a specific event, based on their behavior, appearance, or daily routine. In managing recreational activities, the qualities a leader should possess, their responsibilities, and their vision will determine the quality of the event. In this case, using the theoretical approaches and concrete characteristics in this section, depending on the current structure, will be beneficial for recreational leaders.

References

Akça, C. (2020). Chapter Eıght Charısmatıc Leadershıp. *A Handbook Of Leadership Styles*, 167.

Avolio, B. J., & Bass, B. M. (Eds.). (2001). *Developing potential across a full range of Leadership Tm: Cases on transactional and transformational leadership*. Psychology Press.

Bass, B. M. (1999). Two decades of research and development in transformational leadership. *European journal of work and organizational psychology*, *8*(1), 9-32.

Bass, B. M., & Bass, R. (2009). *The Bass handbook of leadership: Theory, research, and managerial applications*. Simon and Schuster.

Bayram, A., & Geylan, A. (2020). Chapter Seven Servant Leadershıp. *A Handbook Of Leadership Styles*, 149.

Bolden, R. (July, 2004). *What is leadership?* (Research Report 1). Exeter, United Kingdom: Leadership South West.

Cengiz, R. (2008). Profesyonel futbol kulübü yöneticilerinin dönüşümsel liderlik stilleri ile kulüplerinin örgüt sağlığı ve futbolcuların yıldırma (mobbing) yaşamaları arasındaki ilişki. Doktora Tezi, Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü.

Connock, S., and Johns, T. (1995). Ethical leadership. Institute of Personnel and Development, London.

Çizmeci, B. (2020). Chapter Fıfteen Dıgıtal Leadershıp. *A Handbook Of Leadership Styles*, 351.

Demirtas, O., & Karaca, M. (2020). *A Handbook Of Leadership Styles*, Cambridge Scholars Publishing.

Donuk, B. (2016). *Liderlik ve spor*. Ötüken.

Ko, C., Ma, J., Bartnik, R., Haney, M. H., and Kang, M. (2018). Ethical leadership: An integrative review and future research agenda. Ethics & Behavior, 28(2), 104–132.

Köksal, O. (2011). Bir Kültürel Liderlik Paradoksu: Paternalizm. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *8*(15), 101-122.

Polatçı, S. (2020). Chapter Ten Spırıtual Leadershıp. *A Handbook Of Leadership Styles*, 231.

Price, T. L. (2008). *Leadership Ethics: An Introduction*. Cambridge University Press.

Weese, W. J. (1995). Leadership And Organizational Culture: An Investigation Of Big Ten And Mid-American Conference Campus Recreation Administrations. *Journal Of Sport Management*, *9*(2), 119-134.

Yener, S. (2020). Chapter Six Participative Leadership. *A Handbook Of Leadership Styles*, 126.

Yeşil, S. (2013). Kültür ve Kültürel Farkliliklar: Liderlik Açisindan Teorik Bir Değerlendirme. *Elektronik Sosyal Bilimler Dergisi*, *12*(44), 52-81.

Yıldırım, K. E., Cakı, C., & Harmancı, Y. (2020). Chapter Twelve Autocratıc Leadershıp. *A Handbook Of Leadership Styles*, 294.

Yukl, G. & Van Fleet, D.D. (1990). Theory and research on leadership in organizations. In M.D. Dunnette & L.M. Hough (Eds.), *Handbook of industrial & organizational psychology,* Second Edition, Volume 3, Palo Alto, CA: Consulting Psychologists Press.

Yukl, G. (2010). *Leadership in organizations* (7th ed). Upper Saddle River, NJ: Prentice Hall.

Kendirli, S., Oğur, Y. G., Soysal, S., Bozdağ, B. (2022). Antrenör Adaylarının Liderlik Yönelimi ve Boş Zaman Profilleri. Uluslararası Bozok Spor Bilimleri Dergisi, 3(3), 170-180.

CHAPTER 3

Postural Deformities in Sedentary Women

Şebnem ŞARVAN CENGİZ[1]

Şarvan Cengiz, Ş. (2025). *Postural deformities in sedentary women*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (Chap. 3, pp. 34–51). Duvar Yayınları.

[1] Manisa Celal Bayar University, Faculty of Sports Sciences
Department of Coaching Education, Division of Movement and Exercise Science
ORCID: 0000-0002-2916-4784, Email: csebnem@gmail.com

Introduction

Musculoskeletal disorders are highly prevalent in contemporary societies, and upper body posture is a key indicator of muscular imbalances and a critical target for preventive strategies (Ohlendorf et al., 2023). Demographic characteristics such as sex and age substantially influence postural patterns and the risk of musculoskeletal problems (Ohlendorf et al., 2023). Sedentary lifestyles, which are increasingly common among women across the lifespan, contribute to the development and progression of a range of postural deformities (Madeleine et al., 2019).

This chapter focuses on **postural deformities in sedentary women**, synthesizing current evidence on biomechanical deviations, associated musculoskeletal pain, and the underlying physiological and psychosocial mechanisms. Confounding factors such as menstruation and high-heeled shoe use are considered separately in the literature (e.g., El-Shafei et al., 2021) and are not the primary focus here, in order to isolate the impact of sedentarism itself.

The chapter aims to:

- Identify **prevalent postural deviations** in sedentary women, with particular attention to spinal curvature (lumbar and thoracic), pelvic tilt, and shoulder girdle and cervical alignment.
- Examine the association between **sedentary behavior and musculoskeletal pain conditions** in women, distinguishing between occupational and non-occupational sedentary activities (Dzakpasu et al., 2021).
- Describe the **biomechanical, neuromuscular, and physiological mechanisms** that contribute to these deformities (Batebi et al., 2024; Salsali et al., 2023).
- Summarize e postural vidence on the **efficacy of interventions** designed to prevent or correct postural deformities in sedentary women, including sex-specific exercise and ergonomic strategies.

Where relevant, the chapter also highlights methodological issues in measuring sedentary behavior and posture, and outlines directions for future research and clinical practice.

Sedentary Behaviour and Musculoskeletal Health

Global burden of musculoskeletal disorders

Sedentary behavior—characterized by low energy expenditure in seated or reclined postures—has emerged as a major, modifiable risk factor for

musculoskeletal disorders (Alzahrani et al., 2022; Singh et al., 2024). Over the past four decades, there has been a global rise in musculoskeletal pain that parallels a decline in physical activity and an increase in sedentary time (Hanna et al., 2019). Large-scale analyses confirm that musculoskeletal disorders are among the **leading contributors to disability worldwide**, with a substantial burden in working populations (Bouziri et al., 2021, 2022; Liu et al., 2022; Zhou et al., 2024).

Low back pain (LBP) represents a major component of this burden. Prolonged sitting and other sedentary behaviors are strongly associated with LBP onset and progression (Alzahrani et al., 2022; Mahdavi et al., 2021). Musculoskeletal disorders more broadly—and LBP in particular—are major contributors to work disability and absenteeism among white-collar and other occupational groups (Grabara, 2025; Żywień et al., 2022).

Sedentary domains and musculoskeletal pain

Sedentary behavior occurs across multiple domains:

- **Occupational** (e.g., desk-based work, computer tasks, teaching in seated postures).
- **Non-occupational** (e.g., television viewing, smartphone use, leisure sitting).

Systematic reviews indicate that sedentary behavior in both domains is associated with increased risk of musculoskeletal pain, including low back, neck, and shoulder pain (Dzakpasu et al., 2021). For example, prolonged television viewing has been linked to higher risk of low back pain disability in women (Dzakpasu et al., 2021; Adıguzel & Doğru, 2021), while desk-based work is associated with neck and shoulder symptoms (Balaguier et al., 2019; Vinstrup et al., 2019).

Interventions that interrupt workplace sitting with standing or light walking breaks have shown beneficial effects on musculoskeletal discomfort and pain in desk-based workers (Dzakpasu et al., 2021; Şakar et al. 2024; Aydemir et al., 2024; Hazar & Koç, 2020; Uslu vd.,2022; Bozkuş vd., 2013; Özavci vd., 2023; Yaşar & Yılmaz, 2021), underscoring the importance of **movement breaks** in mitigating the adverse effects of prolonged static postures.

Biological and inflammatory contributions

Sedentary behavior is also associated with increased adiposity, which in turn contributes to a pro-inflammatory milieu via cytokines and adipokines. These factors may exacerbate musculoskeletal pain and accelerate degenerative changes in vertebral discs and other structures (Dzakpasu et al., 2021; Verdú et al., 2021). Thus,

mechanical loading, physical inactivity, and metabolic/inflammatory processes interact to shape musculoskeletal outcomes in sedentary individuals.

Sex- and Gender-Specific Vulnerabilities in Sedentary Women

Higher prevalence of musculoskeletal disorders in women

A consistent finding across occupational and community studies is that **women report a higher prevalence of musculoskeletal symptoms**—particularly in the neck, shoulders, and lower back—than men performing similar activities (Balaguier et al., 2019; Grabara, 2025; Nath et al., 2024). Even when exposure levels appear comparable, women often exhibit greater discomfort and functional limitations (Madeleine et al., 2019; Ansah et al., 2023).

This sex-specific vulnerability is observed in various contexts:

- Female teachers reporting more pain than male colleagues (Ansah et al., 2023).
- Women showing higher prevalence of neck and shoulder symptoms during device use (Chen et al., 2024).
- Female workers displaying stronger associations between sitting time and neck pain (Dzakpasu et al., 2021; Madeleine, 2019).

These patterns support the need for **sex- and gender-specific perspectives** in musculoskeletal health research and intervention design.

Biomechanical and neuromuscular differences

Sedentary women demonstrate distinct biomechanical responses and neuromuscular control characteristics compared to men. Examples include:

- **Higher cervical extensor and upper trapezius muscle activity** during smartphone use in women, despite smaller neck flexion angles (Chen et al., 2024).
- **Poorer trunk neuromuscular control** and slower postural responses to perturbations in women, indicating decreased spinal stability and increased injury risk (Reeves et al., 2020).
- Greater deviations in movement patterns from healthy controls in women with chronic pain, despite similar pain thresholds (Archibeck et al., 2025).

These findings suggest that women may experience **greater muscular effort and earlier fatigue** during sedentary tasks, particularly in cervical and shoulder regions, contributing to pain and postural adaptations.

Pain perception, hormones, and psychosocial factors

Sex differences in pain mechanisms and perceptual responses also play a crucial role. Women often show:

- Higher pain sensitivity or intensity in experimental and clinical pain models (Otto et al., 2019).
- Distinct trajectories from acute to chronic pain, influenced by hormonal fluctuations and genetic predispositions (Madeleine, 2017; Bogaert et al., 2023).

Psychosocial factors—such as work-related stress, job demands, and ergonomic awareness—further modulate pain experience and coping, and may affect women differently (Bogaert et al., 2023; Singh et al., 2024; Sarışık & şahin, 2021). These biological and psychosocial elements combine with mechanical factors to create a complex risk profile for postural deformities and musculoskeletal pain in sedentary women.

Postural Deformities in Sedentary Women

Postural deformities are typically described in relation to spinal alignment (sagittal and frontal planes), pelvic position, and shoulder–cervical posture. In sedentary women, the most frequently reported patterns include **lumbar hyperlordosis or flattening, thoracic hyperkyphosis, anterior or posterior pelvic tilt, forward head posture, and rounded shoulders** (Batebi et al., 2024; Czaprowski et al., 2018; Cepková et al., 2023; Ceviz & Gözaydin, 2023).

Lumbar spine and pelvic alignment

Several studies highlight **gender differences in lumbar curvature and pelvic parameters**:

- Young adult women often present **greater lumbar lordosis** and altered pelvic incidence compared to men (Grabara & Witkowska, 2024; Allam et al., 2023).
- Sedentary university students show sex-specific effects of sitting: prolonged sitting is more detrimental to the **thoracic spine in men** and to the **lumbar spine in women** (Cepková et al., 2023).

- Hyperlordosis in women is associated with reduced core endurance and altered trunk flexibility, potentially increasing injury risk (Fallahasady et al., 2022).

Adaptive shortening of hip flexor muscles, common with prolonged sitting, can increase anterior pelvic tilt and lumbar lordosis, whereas inactivity may also be associated with posterior pelvic tilt in other populations (Salsali et al., 2023; Grabara & Witkowska, 2024). These changes increase lumbar loading, predispose women to LBP, and may influence lower limb joints and osteoarthritis risk.

Thoracic hyperkyphosis

Thoracic hyperkyphosis is a frequent sagittal deformity, particularly in older women and those with low bone density:

- Osteopenic and osteoporotic women show more pronounced kyphotic curves compared with healthy menopausal women (Eftekhari et al., 2021).
- Sedentary behavior and inadequate trunk muscle endurance contribute to progression of thoracic hyperkyphosis, with implications for balance, respiratory function, and fall risk (Jenkins et al., 2021; Marijančić et al., 2023).

Hyperkyphosis often co-exists with forward head posture and compensatory lumbar changes, illustrating the **segmental interdependence** of spinal curves (Czaprowski et al., 2018; Noll et al., 2017).

Cervical posture and shoulder girdle

Forward head posture and rounded shoulders are widely reported in women with sedentary lifestyles, particularly those engaged in computer or smartphone use:

- Women frequently report more neck and shoulder discomfort than men during device use, despite less extreme neck flexion angles (Chen et al., 2024).
- Increased activation of cervical extensors and upper trapezius suggests compensatory strategies that may promote fatigue and pain (Chen et al., 2024; Mehri et al., 2020).
- Rounded shoulder posture is associated with shortened pectoralis minor and weakness of scapular retractors; young women show improvement with targeted trapezius strengthening and pectoralis minor stretching (Hasan et al., 2023).

These cervical–shoulder adaptations can interact with thoracic alignment abnormalities, exacerbate headache and upper-quarter pain, and impair functional capacity (Mehri et al., 2020; Noll et al., 2017).

Pelvic floor and lumbopelvic stability

The pelvic floor muscles (PFM) are integral to **lumbopelvic stability**. In sedentary women:

- Increased lumbar curvature and anterior pelvic tilt have been linked to urinary incontinence and sexual dysfunction, with pelvic tilt and lumbar angle predicted by machine-learning models (Hady & El-Hafeez, 2023).
- Combined core and PFM training improves lumbar function and muscle performance in sedentary women with LBP (Si et al., 2025).

Thus, postural deformities in the lumbopelvic region are not only mechanical but also functionally connected to pelvic floor health and continence.

Biomechanical and Physiological Mechanisms

Spinopelvic adaptations to sitting

The transition from standing to sitting substantially alters **spinopelvic parameters**:

- Sitting induces pelvic retroversion and reduced lumbar lordosis, requiring compensatory adjustments to maintain an upright posture (Durbas et al., 2025).
- Repeated and prolonged transitions impose stress on spinal structures and supporting musculature (Bernetti et al., 2020).

In sedentary women, shortened hip flexors, reduced core endurance, and altered pelvic alignment can further flatten or exaggerate lumbar curves, increasing segmental loading and the risk of LBP (Grabara & Witkowska, 2024; Żywień et al., 2022).

Core musculature and proprioception

Core muscle endurance is critical for spinal stability and injury prevention (Fallahasady et al., 2022). Research on core stabilization exercises indicates that:

- Deep stabilizing muscles and neuromuscular control are essential for maintaining neutral alignment during functional tasks (Lee, 2023; Lee, 2025).

- Weakened core musculature and impaired proprioceptive feedback, often seen in sedentary individuals, undermine spinal stability and increase postural sway (Żuk et al., 2019; Reeves et al., 2020).

These deficits may be more pronounced in women, contributing to the higher incidence of postural deformities and pain.

Muscle stiffness and static sitting

Prolonged static sitting without regular muscle contractions leads to increased **back muscle stiffness**, which is associated with musculoskeletal discomfort:

- Regular, even low-intensity muscle contractions during sitting can reduce stiffness, highlighting the importance of frequent movement breaks (Kett et al., 2021).
- This supports interventions that encourage micro-breaks and dynamic sitting strategies in sedentary environments.

Assessment of Sedentary Behaviour and Posture

Device-measured versus self-reported sedentary time

Advances in accelerometry and posture sensors (e.g., ActiGraph, activPAL) have enhanced the precision of sedentary behaviour assessment (Dzakpasu et al., 2021). However:

- Associations between **device-measured** sedentary time and musculoskeletal pain are sometimes inconsistent, especially for full-day sedentary metrics and LBP (Dzakpasu et al., 2021).
- **Self-reported** domain-specific measures (e.g., TV viewing, work sitting) often show more robust associations with pain outcomes (Dzakpasu et al., 2021).

These discrepancies highlight methodological challenges and underscore the importance of **context-specific assessment** when examining postural and pain outcomes in sedentary women.

Postural assessment techniques

Posture is evaluated using various methods:

- Photogrammetry, rasterstereography, and other imaging techniques to quantify spinal curves and body alignment (Bernetti et al., 2020; Markova et al., 2024).
- Clinical assessments of sagittal curves, pelvic tilt, and scapular positioning (Czaprowski et al., 2018; Żuk et al., 2019).

- Emerging machine-learning approaches to detect forward head posture from non-contact imaging (Yang et al., 2023).

These tools facilitate the identification of non-structural misalignments, early detection of deformities, and monitoring of intervention outcomes.

Interventions and Preventive Strategies

Promoting movement and reducing sedentariness

A central recommendation across the literature is to **reduce total sedentary time and increase movement**:

- Interrupting sitting with short bouts of standing or walking improves musculoskeletal comfort and may reduce pain (Dzakpasu et al., 2021; Kett et al., 2021).
- Public health strategies should promote movement throughout the day, not only structured exercise, especially in populations with high sedentary exposure such as office workers and students (Bucciarelli et al., 2023; Singh et al., 2024).

Corrective exercise and postural training

Structured exercise programs can effectively address specific postural deformities:

- **Thoracic hyperkyphosis:** Systematic reviews show that targeted exercise programs (strengthening, stretching, postural training) reduce thoracic kyphosis and improve function (Jenkins et al., 2021; Katzman et al., 2017; Park et al., 2022).
- **Forward head posture and neck pain:** Corrective exercises improve posture, pain, and muscle activation in women with chronic neck pain and FHP (Mehri et al., 2020).
- **Rounded shoulders:** Combined trapezius strengthening and pectoralis minor stretching correct rounded shoulders and improve shoulder flexion ROM in young women (Hasan et al., 2023).
- **Core and pelvic floor training:** Core stabilization and PFM training enhance deep muscle function, neuromuscular control, and lumbopelvic stability, benefiting sedentary women with LBP and urinary symptoms (Hady & El-Hafeez, 2023; Lee, 2025; Si et al., 2025).

Effective programs typically integrate **stretching, strengthening, and neuromuscular control**, and should be individualized according to the type and severity of deformity and the woman's functional capacity.

Sex-specific ergonomic and behavioral approaches

Given the documented sex differences in spinal loading, neuromuscular control, and pain experience, interventions should be **specifically tailored for women**:

- Ergonomic recommendations must account for female anthropometry, preferred postures, and device use patterns (Firouzabadi et al., 2021; Chen et al., 2024).
- Behavioral programs should address motivational barriers to strength and posture training in women, as these differ from men's and influence long-term adherence (Vasudevan & Ford, 2021).
-

Education, early intervention, and interdisciplinary care

Early intervention is especially important in young women and university students, where sedentary habits and postural patterns become established:

- Educational programs on ergonomics, proper sitting, and the risks of prolonged sitting promote early adoption of healthy behaviors (Cepková et al., 2023; Marijančić et al., 2023).
- Interdisciplinary management—integrating physical therapists, exercise professionals, and other health providers—supports holistic care for women with complex postural and pain presentations (Nath et al., 2024; Bernetti et al., 2020).
-

Future Directions

Several areas require further investigation to refine prevention and treatment of postural deformities in sedentary women:

1. **Long-term consequences**

Longitudinal studies are needed to clarify how specific postural deformities (e.g., hyperkyphosis, hyperlordosis, forward head posture) influence systemic health, including cardiometabolic and mental health outcomes (Singh et al., 2024).

2. **Personalized, sex-specific interventions**

Future research should develop and validate **sex-specific exercise and ergonomic protocols** that incorporate differences in anatomy, hormones, pain mechanisms, and behavior (Madeleine, 2017, 2019; Archibeck et al., 2025).

3. **Body composition and activity levels**

Investigations into how body composition and even moderate physical activity mitigate spinal curvature abnormalities and balance deficits in young women can inform early life interventions (Grabara & Witkowska, 2024; Marijančić et al., 2023).

4. **Technology-supported solutions**

Wearable devices, smart furniture, and non-contact posture monitoring systems offer promising tools for real-time feedback and behavior change (Anwary et al., 2020; Yang et al., 2023; Markova et al., 2024). Their effectiveness in sedentary women specifically warrants systematic evaluation.

5. **Psychosocial and occupational determinants**

More nuanced models integrating stress, job design, psychosocial load, and ergonomic context are needed to fully explain sex-specific risk patterns (Bogaert et al., 2023; Singh et al., 2024).

Conclusion

Sedentary lifestyles play a central role in the development and exacerbation of **postural deformities in women**, including anterior pelvic tilt, altered lumbar lordosis, thoracic hyperkyphosis, forward head posture, and rounded shoulders (Batebi et al., 2024; Cepková et al., 2023). These deformities are intimately linked with muscle imbalances, impaired neuromuscular control, and altered proprioception, and they contribute to chronic pain and functional limitations rather than representing merely cosmetic deviations (Reeves et al., 2020; Żuk et al., 2019).

Women exhibit distinct **biomechanical, physiological, and psychosocial vulnerabilities**, including higher reported pain intensity, different neuromuscular control profiles, and sex-dependent spinal loads and postural responses (Archibeck et al., 2025; Firouzabadi et al., 2021; Chen et al., 2024). These factors underscore the necessity of **sex-specific prevention and rehabilitation strategies**.

The literature supports several key strategies for mitigating postural deformities in sedentary women:

- **Reducing sedentary time and promoting frequent movement breaks** throughout the day (Kett et al., 2021; Dzakpasu et al., 2021).
- Implementing **targeted exercise programs** for core, pelvic floor, and postural muscles, tailored to the specific deformities and functional needs of

women (Jenkins et al., 2021; Mehri et al., 2020; Hasan et al., 2023; Si et al., 2025).

- Designing **sex-specific ergonomic interventions** that consider female anthropometry and work patterns (Firouzabadi et al., 2021; Chen et al., 2024).
- Prioritizing **early education and preventive programs** in highly sedentary populations such as students and white-collar workers (Cepková et al., 2023; Marijančić et al., 2023).
- Adopting **interdisciplinary care models** to address the multifactorial nature of postural disorders and associated pain.

Collectively, the evidence indicates that postural deformities in sedentary women are both **highly prevalent and modifiable**. By integrating biomechanical insights, sex-specific physiology, and behavioral strategies, clinicians and researchers can develop more effective interventions to protect spinal health, reduce chronic musculoskeletal pain, and improve quality of life for women living in increasingly sedentary environments.

References

Adıgüzel, S., & Doğru, Y. (2021). The effects of 10-week reformer exercises on postural impairment and physical parameters. Turkish Journal of Sport and Exercise, 23(3), 297-301.

Alessa, F. M., & Ning, X. (2017). Changes of lumbar posture and tissue loading during static trunk bending. Human Movement Science, 57, 59. https://doi.org/10.1016/j. humov.2017.11.006

Allam, N. M., Ebrahim, H. A., Ibrahim, A. M., Elneblawi, N. H., El-Sherbiny, M., & Fouda, K. Z. (2023). The association of hamstring tightness with lumbar lordosis and trunk flexibility in healthy individuals: gender analysis. Frontiers in Bioengineering and Biotechnology, 11. https://doi.org/10,3389/fbioe.2023.1225973

Alzahrani, H., Alshehri, M. A., Alzhrani, M., Alshehri, Y. S., & Attar, W. S. A. A. (2022). The association between sedentary behavior and low back pain in adults: a systematic review and meta-analysis of longitudinal studies [Review of The association between sedentary behavior and low back pain in adults: a systematic review and meta-analysis of longitudinal studies]. PeerJ, 10. PeerJ, Inc. https://doi.org/10.7717/peerj.13127

Ansah, E. W., Adabla, M., Jerry, N., Aloko, E. A., & Hagan, J. E. (2023). Investigating sedentariness and health status of primary school teachers in Ghana. BMC Health Services Research, 23(1). https://doi.org/10.1186/s12913-023-09925-3

Anwary, A. R., Çetinkaya, D., Vassallo, M., & Bouchachia, H. (2020). Smart-Cover: A real time sitting posture monitoring system. Sensors and Actuators A Physical, 317, 112451. https://doi.org/10.1016/j.sna.2020.112451

Archibeck, E. S., Strigo, I. A., Scheffler, A., Torres-Espín, A., Khattab, K., Silvestros, P., Matthew, R. P., Regan, C., Hodges, P. W., O'Neill, C., Lotz, J. C., Ahn, J., Benirschke, K., Bryson, A., Bunda,

K., Davis, B., Dorofeyev, C., Espiritu, R., Fereydouni, P., … Bailey, J. F. (2025). Sex-based differences in biomechanical function for chronic low back pain and how it relates to pain experience. European Spine Journal. https://doi.org/10.1007/s00586-025-08730-2

Aydemir, U., Hazar, K., & Çelik, H. (2024). Fiziksel aktivitenin sağlık ve yaşam kalitesi üzerindeki etkisi. In F. Çatıkkaş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 78–95). Duvar Yayınları

Balaguier, R., Jadaud, A., Larinier, N., Moureaux, E., Madeleine, P., & Vuillerme, N. (2019). Does training duration of a worksite-supervised adapted physical activity program affect trunk functional capacities and pressure pain sensitivity over the low back among vineyard-workers? Research Portal Denmark, 159. https://local.forskningsportal.dk/local/dki- training

Batebi, M., Namin, B. G., Nasermelli, M. H., Abolhasani, M., & Fard, A. H. S. (2024). The relationship between static and dynamic postural deformities with pain and quality of life in non-athletic women. BMC Musculoskeletal Disorders, 25(1). https://doi.org/10.1186/s12891-024-07880-6

Bernetti, A., Agostini, F., Cacchio, A., Santilli, V., Ruiu, P., Paolucci, T., Paoloni, M., & Mangone, M. (2020). Postural Evaluation in Sports and Sedentary Subjects by Rasterstereographic Back Shape Analysis. Applied Sciences, 10(24), 8838. https://doi.org/10.3390/app10248838

Bogaert, W. V., Liew, B. X. W., Fernández-de-las-Peñas, C., Valera-Calero, J. A., Varol, U., Coppieters, I., Kregel, J., Nijs, J., Meeus, M., Cagnie, B., Danneels, L., & Malfliet, A. (2023). Exploring Interactions Between Sex, Pain Characteristics, Disability, and Quality of Life in People With Chronic Spinal Pain: A Structural Equation Model. Journal of Pain, 25(3), 791. https://doi.org/10.1016/j.jpain.2023.10.010

Bouziri, H., Descatha, A., Roquelaure, Y., Dab, W., & Jean, K. (2021). Can we distinguish the roles of demographic and temporal changes in the incidence and prevalence of musculoskeletal disorders? A systematic search and review. medRxiv (Cold Spring Harbor Laboratory). https://doi.org/10.1101/2021.09.20.21263840

Bouziri, H., Roquelaur, Y., Descatha, A., Dab, W., & Jean, K. (2022). The spatio-temporal distribution of musculoskeletal disorders: results of the Global Burden of Disease in 204 countries and 21 subregions between 1990 and 2019. medRxiv (Cold Spring Harbor Laboratory). https://doi.org/10.1101/2022.09.16.22280040

Bozkuş, T., Türkmen, M., Kul, M., Özkan, A., Öz, Ü., & Cengiz, C. (2013). Beden eğitimi ve spor yüksekokulu'nda öğrenim gören öğrencilerin fiziksel aktivite düzeyleri ile sağlikli yaşam biçimi davranişlarinin belirlenmesi ve ilişkilendirilmesi. International Journal of Sport Culture and Science, 1(3), 49-65.

Brandt, M., Madeleine, P., Samani, A., Ajslev, J. Z. N., Jakobsen, M. D., Sundstrup, E., & Andersen, L. L. (2019). Results of a Participatory Ergonomics Intervention With Wearable Technical Measurements of Physical Workload in the Construction Industry. Research Portal Denmark, 156. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-

Bucciarelli, V., Mattioli, A. V., Sciomer, S., Moscucci, F., Renda, G., & Gallina, S. (2023). The Impact of Physical Activity and Inactivity on Cardiovascular Risk across Women's Lifespan: An Updated Review [Review of The Impact of Physical Activity and Inactivity on Cardiovascular Risk across Women's Lifespan: An Updated Review]. Journal of Clinical Medicine, 12(13), 4347. Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/jcm12134347

Cepková, A., Zemková, E., Šooš, Ľ., Uvaček, M., & Muyor, J. M. (2023). Sedentary lifestyle of university students is detrimental to the thoracic spine in men and to the lumbar spine in women. PLoS ONE, 18(12). https://doi.org/10.1371/journal.pone.0288553

Ceviz, E., & Gözaydın, G. (2023). E-spor ve omurga sağlığı. In M. Güçlü, F. Çatıkkâş, & Z. Çakır (Eds.), Farklı boyutlarıyla spor araştırmaları 2 (pp. 22–40). Duvar Yayınları.

Chen, Y., Chan, Y.-C., & Alexander, H. (2024). Gender differences in neck muscle activity during near-maximum forward head flexion while using smartphones with varied postures. Scientific Reports, 14(1). https://doi.org/10.1038/s41598-024-63734-0

Czaprowski, D., Stoliński, Ł., Tyrakowski, M., Kozinoga, M., & Kotwicki, T. (2018). Non-structural misalignments of body posture in the sagittal plane [Review of Non-structural misalignments of body posture in the sagittal plane]. Scoliosis and Spinal Disorders, 13(1). BioMed Central. https://doi.org/10.1186/s13013-018-0151-5

Durbas, A., Subramanian, T., Simon, C., Allen, M., Samuel, J., Colón, L. A., Mazzucco, M., Pagan, C., Karasavvidis, T., Vigdorchik, J. M., Cunningham, M. E., Kim, H. J., & Lovecchio, F. (2025). Evaluating Variations in Spinopelvic Parameters from Sitting to Standing: A Comparative Analysis of 1447 Older Adults Across Age, BMI, and Gender Subgroups. Journal of Clinical Medicine, 14(9), 2952. https://doi.org/10.3390/jcm14092952

Dzakpasu, F. Q. S., Carver, A., Brakenridge, C. J., Cicuttini, F., Urquhart, D. M., Owen, N., & Dunstan, D. W. (2021). Musculoskeletal pain and sedentary behaviour in occupational and non-occupational settings: a systematic review with meta-analysis [Review of Musculoskeletal pain and sedentary behaviour in occupational and non-occupational settings: a systematic review with meta-analysis]. International Journal of Behavioral Nutrition and Physical Activity, 18(1). BioMed Central. https://doi.org/10.1186/s12966-021-01191-y

Eftekhari, M., Daneshmandi, H., & Sedaghati, P. (2021). Comparison of Postural Alignment of Osteopenic and Osteoporotic Women With Healthy Menopausal. Physical Treatments - Specific Physical Therapy, 11(1), 31. https://doi.org/10.32598/ptj.11.1.434.1

El-Shafei, M. A., Yousef, A. M., Hamada, H. A., Mohamed, M. F., Al-Shenqiti, A. M., Koura, G., & Sánchez, G. F. L. (2021). Effect of Low Versus High-Heeled Footwear on Spinopelvic Alignment at Different Phases of Menstrual Cycle in Young Adult Women: A Biopsychosocial Perspective. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.792446

Fallahasady, E., Rahmanloo, N., Seidi, F., Rajabi, R., & Bayattork, M. (2022). The relationship between core muscle endurance and functional movement screen scores in females with lumbar hyperlordosis: a cross-sectional study. BMC Sports Science Medicine and Rehabilitation, 14(1). https://doi.org/10.1186/s13102-022-00567-2

Firouzabadi, A., Arjmand, N., Pan, F., Zander, T., & Schmidt, H. (2021). Sex-Dependent Estimation of Spinal Loads During Static Manual Material Handling Activities—Combined in vivo and in silico Analyses. Frontiers in Bioengineering and Biotechnology, 9. https://doi.org/10.3389/fbioe.2021.750862

Grabara, M. (2025). Prevalence of musculoskeletal disorders among Polish white-collar workers: the role of physical activity and risk factors. Frontiers in Public Health, 13. https://doi.org/10.3389/fpubh.2025.1551728

Grabara, M., & Witkowska, A. (2024). Sagittal spinal curvatures of young adults in the context of their self-reported physical activity and somatic parameters. Scientific Reports, 14(1). https://doi.org/10.1038/s41598-024-62929-9

Hady, D. A. A., & El-Hafeez, T. A. (2023). Predicting female pelvic tilt and lumbar angle using machine learning in case of urinary incontinence and sexual dysfunction. Scientific Reports, 13(1). https://doi.org/10.1038/s41598-023-44964-0

Hanna, F., Daas, R. N., El-Shareif, T. J., Al-Marridi, H. H., Al-Rojoub, Z. M., & Adegboye, O. A. (2019). The Relationship Between Sedentary Behavior, Back Pain, and Psychosocial Correlates Among University Employees. Frontiers in Public Health, 7. https://doi.org/10.3389/fpubh.2019.00080

Hasan, S., Iqbal, A., Alghadir, A. H., Alonazi, A., & Alyahya, D. (2023). The Combined Effect of the Trapezius Muscle Strengthening and Pectoralis Minor Muscle Stretching on Correcting the Rounded Shoulder Posture and Shoulder Flexion Range of Motion among Young Saudi Females: A Randomized Comparative Study. Healthcare, 11(4), 500. https:// doi.org /10.3390 /healthcare11040500

Hazar, K., ve Koç, A.F. (2020). Bedensel Engelli Sedanter ve Sporcu Bireylerin Fiziksel Aktiviteye Karşı Tutumları ve Yaşam Tatmin Düzeylerinin İncelenmesi. Gaziantep Üniversitesi Spor Bilimleri Dergisi, 5(4), 541- 554. https://doi.org/10.31680/gaunjss.822392

Jenkins, H., Downie, A., Fernandez, M., & Hancock, M. J. (2021). Decreasing thoracic hyperkyphosis – Which treatments are most effective? A systematic literature review and meta-analysis [Review of Decreasing thoracic hyperkyphosis – Which treatments are most effective? A systematic literature review and meta-analysis]. Musculoskeletal Science and Practice, 56, 102438. Elsevier BV. https://doi.org/10.1016/j.msksp.2021.102438

Katzman, W. B., Parimi, N., Gladin, A., Poltavskiy, E., Schafer, A. L., Long, R., Fan, B., Wong, S., & Lane, N. E. (2017). Sex differences in response to targeted kyphosis specific exercise and posture training in community-dwelling older adults: a randomized controlled trial. BMC Musculoskeletal Disorders, 18(1). https://doi.org/10.1186/s12891-017-1862-0

Kett, A. R., Milani, T. L., & Sichting, F. (2021). Sitting for Too Long, Moving Too Little: Regular Muscle Contractions Can Reduce Muscle Stiffness During Prolonged Periods of Chair-Sitting. Frontiers in Sports and Active Living, 3. https://doi.org/10.3389/fspor.2021.760533

Lee, K. (2023). Motion Analysis of Core Stabilization Exercise in Women: Kinematics and Electromyographic Analysis. Sports, 11(3), 66. https://doi.org/10.3390/sports11030066

Lee, K.-J. (2025). Effects of Core Stability Training on Deep Stabilizing Muscle Function and Neuromuscular Control. Medicina, 61(3), 364. https://doi.org/10.3390/medicina61030364

Liu, S., Wang, B., Shuzhen, F., Wang, Y., Zhan, Y., & Ye, D. (2022). Global burden of musculoskeletal disorders and attributable factors in 204 countries and territories: a secondary analysis of the Global Burden of Disease 2019 study. BMJ Open, 12(6). https://doi.org/10.1136/bmjopen-2022-062183

Madeleine, P. (2017). Sex-specific mechanisms of acute to chronic neck-shoulder pain. Research Portal Denmark, 61. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src =aau&id

Madeleine, P. (2019). Effects of active pauses on muscle activity in the shoulder region. Research Portal Denmark, 83. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-b096f77a-8284-40e0-8c0d-d4f6f0ca7ace&ti=Effects%20of%20active

Madeleine, P., Marandi, R. Z., Norheim, K. L., & Samani, A. (2019). Sitting dynamics are age-dependent during computer work. Research Portal Denmark, 368. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-81483e18-e34e-412f-adee-39b2d370a9b0&ti=Sitting%20dynamics%20are%20age-dependent%20during

Madeleine, P., Nymark, M., Søndergaard, A. M., Pedersen, M. M., Nielsen, J. D., & Kristiansen, M. V. (2018). Sex-differences in surface electromyography during pull-up tests. Research Portal Denmark, 36. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src= aau&id= aau-1c6dbdec-4135-4602-9d01-c15889979f90&ti=Sex-differences%20in%20surface%20

Mahdavi, S. B., Riahi, R., Vahdatpour, B., & Kelishadi, R. (2021). Association between sedentary behavior and low back pain; A systematic review and meta-analysis [Review of Association between sedentary behavior and low back pain; A systematic review and meta-analysis]. Health Promotion Perspectives, 11(4), 393. Tabriz University of Medical Sciences. https://doi.org/10.34172/hpp.2021.50

Marijančić, V., Kezele, T. G., Peharec, S., Zubalj, N. D., Žeželj, S. P., & Starčević-Klasan, G. (2023). Relationship between Physical Activity and Sedentary Behavior, Spinal Curvatures, Endurance and Balance of the Trunk Muscles-Extended Physical Health Analysis in Young Adults. International Journal of Environmental Research and Public Health, 20(20), 6938. https://doi.org/10.3390/ijerph20206938

Markova, V., Markov, M., Petrova, Z., & Filkova, S. (2024). Assessing the Impact of Prolonged Sitting and Poor Posture on Lower Back Pain: A Photogrammetric and Machine Learning Approach. Computers, 13(9), 231. https://doi.org/10.3390/computers13090231

Mehri, A., Letafatkar, A., & Khosrokiani, Z. (2020). Effects of Corrective Exercises on Posture, Pain, and Muscle Activation of Patients With Chronic Neck Pain Exposed to Anterior-Posterior Perturbation. Journal of Manipulative and Physiological Therapeutics, 43(4), 311. https://doi.org/10.1016/j.jmpt.2018.11.032

Nath, A., Schimmelpfennig, S., & Konradt, U. (2024). Effects of Office-Yoga and Walking at the Workplace to Improve Health and Wellbeing: A Longitudinal Randomized Controlled Trial. Occupational Health Science. https://doi.org/10.1007/s41542-024-00194-y

Noll, M. A., Candotti, C. T., Rosa, B. N. da, Valle, M. B. do, Antoniolli, A., Vieira, A., & Loss, J. F. (2017). High prevalence of inadequate sitting and sleeping postures: a three-year prospective study of adolescents. Scientific Reports, 7(1). https://doi.org/10.1038/s41598-017-15093-2

Norheim, K. L., Samani, A., Bønløkke, J. H., Omland, Ø., & Madeleine, P. (2019). Objective predictors of physical work ability in aged manual workers. Research Portal Denmark, 210. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-0ecd345b-fb1f-43d6-8c0d-f04f72946d11&ti=Objective%20predictors%20of%20physical%20work

Ohlendorf, D., Avaniadi, I., Adjami, F., Christian, W., Doerry, C., Fay, V., Fisch, V., Gerez, A., Goecke, J., Kaya, U., Keller, J., Krüger, D., Pflaum, J., Porsch, L., Loewe, C., Scharnweber, B., Sosnov, P., Wanke, E. M., Oremek, G. M., Maurer, C. (2023). Standard values of the upper body posture in healthy adults with special regard to age, sex and BMI. Scientific Reports, 13(1). https://doi.org/10.1038/s41598-023-27976-8

Otto, A., Emery, K., & Côté, J. N. (2019). Sex differences in perceptual responses to experimental pain before and after an experimental fatiguing arm task. Biology of Sex Differences, 10(1). https://doi.org/10.1186/s13293-019-0253-7

Özavci, R., Korkutata, A., Gözaydın, G., & Çakır, Z.(2023). Üniversite öğrencilerinde algılanan stresin yaşam doyumu ve rekreasyonel sağlık algısına etkisi. The Online Journal of Recreation and Sports (TOJRAS), 12(3), 454-461. https://doi.org/10.22282/tojras.1314763

Park, Y.-J., Kim, W.-M., Yu, J.-H., Moon, H.-H., & Seo, Y.-G. (2022). Effects of Combined Exercise Program on Spinal Curvature and Balance Ability in Adolescents with Kyphosis. Children, 9(12), 1999. https://doi.org/10.3390/children9121999

Reeves, N. P., Celi, V. G. S. y R., Ramadan, A., Popovich, J. M., Radcliffe, C. J., Choi, J., & Cholewicki, J. (2020). Quantifying trunk neuromuscular control using seated balancing and stability threshold. Journal of Biomechanics, 112, 110038. https://doi.org/10.1016/j.jbiomech.2020.110038

Salsali, M., Sheikhhoseini, R., Sayyadi, P., Hides, J. A., Dadfar, M., & Piri, H. (2023). Association between physical activity and body posture: a systematic review and meta-analysis [Review of Association between physical activity and body posture: a systematic review and meta-analysis]. BMC Public Health, 23(1). BioMed Central. https://doi.org/10.1186/s12889-023-16617-4

Samani, A., Marandi, R. Z., Madeleine, P., Omland, Ø., & Vuillerme, N. (2019). Improved Planning for Active Pauses during Computer Work via Ocular Biofeedback. Research Portal Denmark, 299. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-4208ca5d-5ea4-4656-8872-a21a2fb955df&ti=Improved%20Planning%20for%20Active

Sarışık, D. Ç., & Şahin, F. N. (2021). Polifenollerin Sağlık Ve Spor Performansına Etkileri. SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi, 19(3), 14-29.)

Si, X., Zhang, L., Li, F., & liang, hongbing. (2025). The effectiveness of pelvic floor muscle training on lumbar function and muscle performance in sedentary women with lower back pain: a randomized controlled trial. BMC Women s Health, 25(1). https://doi.org/10.1186/s12905-025-03644-z

Singh, C. L., Bandre, G., Gajbe, U., Shrivastava, S. R., Tiwade, Y. R., Bankar, N., & Moizuddin, K. (2024). Sedentary Habits and Their Detrimental Impact on Global Health: A Viewpoint. National Journal of Community Medicine, 15(2), 154. https://doi.org/10.55489/njcm. 150220243590

Şakar, M., Güzel, S., & Yel, K. (2024). Dijitalleşmenin spor ve fiziksel aktivite üzerindeki psikolojik yansımaları: Bir inceleme. In F. Çatıkkâş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 43–65). Duvar Yayınları.adı

Uslu, S., Badur, K. I., Babur, E., & Ileri, M. (2022). Investigation of some physical characteristics of young elite soccer players in different age groups. African Educational Research Journal

Vasudevan, A., & Ford, E. (2021). Motivational Factors and Barriers Towards Initiating and Maintaining Strength Training in Women: a Systematic Review and Meta-synthesis [Review of Motivational Factors and Barriers Towards Initiating and Maintaining Strength Training in Women: a Systematic Review and Meta-synthesis]. Prevention Science, 23(4), 674. Springer Science+Business Media. https://doi.org/10.1007/s11121-021-01328-2

Verdú, E., Homs, J., & Boadas-Vaello, P. (2021). Physiological Changes and Pathological Pain Associated with Sedentary Lifestyle-Induced Body Systems Fat Accumulation and Their

Modulation by Physical Exercise [Review of Physiological Changes and Pathological Pain Associated with Sedentary Lifestyle-Induced Body Systems Fat Accumulation and Their Modulation by Physical Exercise]. International Journal of Environmental Research and Public Health, 18(24), 13333. Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/ijerph182413333

Vinstrup, J., Jakobsen, M. D., Madeleine, P., & Andersen, L. L. (2019). Patient transfers and risk of back injury : An electromyographic evaluation of assistive devices. Research Portal Denmark, 347. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=aau&id=aau-450b4532-b24f-467f-bd85-bf5e9394b996&ti=Patient%20transfers%20and%20risk%20of

Yang, G., He, S., Meng, D., Wei, M., Cao, J., Guo, H., Ren, H., & Wang, Z. (2023). Body landmarks and genetic algorithm-based approach for non-contact detection of head forward posture among Chinese adolescents: revitalizing machine learning in medicine. BMC Medical Informatics and Decision Making, 23(1). https://doi.org/10.1186/s12911-023-02285-2

Yaşar, Y., & Yılmaz, U. (2021). Ortopedik engellilerde beden eğitimi ve spor uygulamaları. In M. Uzun (Ed.), Engelsiz yaşamlar: Özel gereksinimli bireylerde fiziksel aktivite ve spor (1. baskı, ss. 79-88). İzmir: Efe Akademi.

Zhou, J., Xie, S., Xu, S., Zhang, Y., Li, Y. G., Sun, Q., Zhang, J., & Zhao, T. (2024). From Pain to Progress: Comprehensive Analysis of Musculoskeletal Disorders Worldwide. Journal of Pain Research, 3455. https://doi.org/10.2147/jpr.s488133

Żuk, B., Sutkowski, M., Paśko, S., & Grudniewski, T. (2019). Posture correctness of young female soccer players. Scientific Reports, 9(1). https://doi.org/10.1038/s41598-019-47619-1

Żywień, U., Barczyk, K., & Sipko, T. (2022). Associated Risk Factors with Low Back Pain in White-Collar Workers—A Cross-Sectional Study. Journal of Clinical Medicine, 11(5), 1275. https://doi.org/10.3390/jcm11051275

CHAPTER 4

A New Space In The Digital Universe Of Free Time: E-Sports

Engin VURAL[1], Dr. Sezgin HEPSERT[2]

Vural, E., & Hepşert, S. (2025). *A new space in the digital universe of free time: E-sports*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (Chap. 4, pp. 52–63). Duvar Yayınları.

[1] *Ministry of National Education, Physical Education and Sports Teacher, Bitlis, Türkiye ORCID ID: 0000-0002-7717-4928, E-mail: enginvural06@gmail.com*

[2] M*inistry of National Education, Physical Education and Sports Teacher, Elazig, Türkiye ORCİD ID: 0000-0002-4299-8548, E-mail: sezginnepsert@gmail.com*

INTRODUCTION

Traditional values and practices have taken on a different meaning during the transformation process. In this context, the phenomenon of sports, which has supported both physical and mental health, strengthened social harmony, and kept the spirit of competition alive since the dawn of humanity, has also transcended traditional boundaries and moved into a digital dimension (Özkan, 2024). Human needs play a decisive role in shaping the world order. Technology's entry into the center of life has contributed to making these needs more visible and developing them rapidly. These transformations have also directly affected innovations in the field of sports. The development of sport-specific programs using technology has simplified usage processes and enabled increased efficiency. Furthermore, the opportunities offered by technology have accelerated the spread of sports and led to significant positive developments in the field (Dere, 2024). In the literature, e-sports, referred to by various names such as digital sports, video games, cyber games, or virtual games, is considered a rapidly developing and noteworthy field of sports today. In the 2018 issue of Sports Business magazine, the fundamental components of e-sports were classified as clubs, games, tournaments, leagues, broadcasters, social media platforms, viewers/consumers, game developers and providers, sponsors, brands, and investors. In general terms, e-sports can be defined as a form of sport that emerges from the reproduction of the fundamental characteristics of traditional sports through digital and technological tools (Bostancı, 2019). E-sports competitions are held both online and offline and are presented to a wide audience (Jenny et al., 2016). Before e-sports was accepted as a sport, young people and children played various games, voluntarily participated in national and international tournaments organized at amateur or professional levels, and enjoyed these events (Roberts et al., 1988). Initially, individuals turned to e-sports on a voluntary basis, but over time, they began participating in e-sports competitions to make use of their free time. Martončik (2015) emphasizes in his study that digital games are among the most popular ways individuals spend their free time today. E-sports has begun to be regarded not only as a means of spending free time and entertainment, but also as an area that contributes to individuals' personal development and supports discipline and a sense of responsibility. Indeed, the first game developed by American physicist William Higinbotham in a laboratory environment for entertainment purposes is considered the starting point of e-sports, which has since evolved into a major industry (Nosowitz, 2008). Today, e-sports, which has reached an important market position, cannot be considered solely as an activity focused on prizes or financial gain. Among the reasons individuals turn to e-sports are elements such as making

use of their free time, escaping their daily routine, socializing, having fun, and experiencing different things. With its growing popularity, especially among younger generations, e-sports has emerged as an alternative to traditional leisure activities (Özkan, 2024). Participation in e-sports competitions is seen as an activity that individuals can engage in during their free time without expending much effort, and is therefore considered a reasonable option by many athletes. While other sports require various materials and equipment to be practiced in leisure time, e-sports only require a computer and an internet connection, making this field more advantageous in terms of both material procurement and time usage.

1. THE CONCEPT OF FREE TIME

The English term "leisure," which corresponds to the concept of free time, derives from the Latin word licere, meaning "to be permitted" and "freedom." In line with these root meanings, which express freedom from obligation and the possibility of free choice, leisure time has been accepted as a period of time that individuals can use as they wish. Within this framework, different understandings and approaches to the concept of leisure time have been developed, and numerous definitions have been put forward in the literature (Öztürk, 2013). While leisure time is defined as a constructive period of time outside of an individual's compulsory needs and work obligations that can be spent on activities, free time is approached as a concept that carries connotations of directionlessness and uncertainty (Kılbaş, 2010). Leisure time can be defined as the period of time remaining after an individual has fulfilled their work obligations and met their essential personal needs; it is a period of time that they can use at their own discretion and in which they have freedom of choice (Köknel, 1993). Leisure time is defined as the period of time during which an individual willingly engages in activities determined by their own preferences, which may involve various difficulties for both themselves and their environment. In this context, leisure time can also be described as free time that an individual can use entirely at their own discretion, without any external obligations (Bakır, 1990). According to Tezcan (1993), leisure time is defined as the period during which an individual is free from obligations that are necessary for themselves and their environment, engages in activities determined by their own preferences, and can behave independently and freely during this process. The importance of the concept of leisure time and the effective use of this time lies in meeting individuals' needs for rest and recreation, as well as strengthening their bonds with life and increasing their subjective well-being and happiness levels (Kaya, 2003; Gönülateş, 2018). Individuals enjoy activities aimed at resting and engaging in enjoyable activities with

their close circle during periods outside of their work obligations. In this context, it can be stated that non-working time has significant value for individuals (Şahin et al., 2009). During the Industrial Revolution, industrialization and urbanization accelerated; consequently, social problems such as migration, poverty, crime, and child labor increased. Harsh working conditions and low wages restricted individuals' living spaces; during this period, opportunities for leisure and recreational activities were extremely limited (Torkildsen, 2005). The twentieth century stands out as a period in which production and technical progress came to the fore, and the relationship that individuals established with their own selves weakened during this process. Following World War II, with the scientific approach gradually evolving into an individual-centered structure, the need for rest and recreation became apparent in the last quarter of the century. Parallel to this, reductions in working hours and social, cultural, and physical arrangements aimed at improving the quality of life of workers became widespread (Sezgin, 1987). Leisure time varies depending on numerous variables such as social factors, cultural structure, economic conditions, family structure, occupation, income level, place of residence, age, and gender. Within this multidimensional structure, leisure time has three basic functions. These are: rest, which allows the individual to renew themselves physically and mentally; recreation, which supports feelings of pleasure and satisfaction; and development functions, which contribute to the improvement of individual competencies (Karaküçük, 2008). Leisure time has social, physical, and psychological benefits for individuals (Yaşar & Direkçi, 2025). Individuals have not only physiological needs but also social needs, which they fulfill through the socialization process. Leisure activities play an important role in social development by contributing to the individual's learning of social values and role expectations (Kılbaş, 1995). The concept of health is often primarily associated with physical well-being, but it is a holistic structure that also encompasses the individual's mental and spiritual dimensions. In this context, sport, as a leisure activity, not only contributes to being healthy and maintaining a healthy lifestyle, but also provides the individual with various gains in different areas (Erdemli, 2002). The positive evaluation of leisure activities contributes to the formation of a balanced personality structure by supporting the individual's psychological development; it plays an important role in social adaptation, reducing loneliness, and developing extroverted personality traits (Tel, 2007).

2. THE CONCEPT OF E-SPORTS

Electronic sports (e-sports) is a phenomenon that is evaluated within today's modern understanding of sports and owes its development largely to technological advances. This concept, which is still in the early stages of development, has been defined in various ways by different researchers over the years. Some of these definitions indicate that, as in traditional sports, there are winners and losers in a competitive environment, and that e-sports can be described as a general term for online games (Kocaömer, 2018). Although there are many different definitions in the literature, according to Wagner (2006), e-sports is considered a sporting field where individuals utilize technological opportunities to achieve mental and physical development, while also finding opportunities to demonstrate their various physical skills (Wagner, 2006). Hamari and Sjöblom (2017) describe e-sports as a form of sport that takes place through digital software infrastructures, where players interact and compete via computers or game consoles. According to Qian et al. (2019), e-sports is considered an area of interaction that brings together individuals interested in online games. Electronic sports (e-sports) stand out as one of the fastest growing areas of the digital entertainment industry. Widespread access to technological capabilities and increased internet usage have significantly boosted the popularity of online games (Cranmer et al., 2021). E-sports primarily focuses on neutralizing opponents' virtual characters or achieving victory, similar to traditional sports. The key in this process is to use time efficiently and achieve the highest score (Jonasson & Thiborg, 2010). E-sports is an activity based on technological infrastructure in digital environments, performed individually or in teams, at amateur or professional levels, and based on specific rules. This structure involves the interaction of many stakeholders, from game developers to players, teams to organizers, sponsors, and viewers (Mustafaoğlu et al., 2018).

2.1. History of E-Sports

Developed in the 1940s, Tennis for Two is considered one of the early examples of electronic sports due to its Nim-based structure. The game was demonstrated in front of an audience at an event held in Berlin in 1951 and attracted public attention when it was tried out by the then Minister of Economics, Dr. Erhard (Bowden, 1953). The origins of e-sports lie in the simple graphics of games played in arcades in the 1970s and 1980s. During this period, game consoles developed by companies such as Atari and Nintendo provided the opportunity to play games at home, significantly increasing interest in digital games (Deen et al., 2006). O'Hagan and Mangiron (2013) state that digital games have become a significant industry since the 1980s and that this period represents a critical stage in the historical development of the

gaming industry. The competitive aspect of electronic sports first emerged in arcades and developed on a global scale with the spread of the internet. The "Red Annihilation" tournament held in the UK in 1997 is considered the first prize-winning event in this field, and e-sports began to gain international recognition with the establishment of the "Cyberathlete Professional League." Today, numerous international tournaments are held at various levels, such as the World Cyber Games, European Nations Championship, and ESL leagues (Argan et al., 2006). The Spacewar event organized by Stanford University students in 1972 is considered the first video game competition in the literature. The first large-scale tournament in this context was organized by Atari in 1980. It is reported that approximately 10,000 people across the United States participated in this event, called Space Invaders (Akgöl, 2019; Evren et al., 2019). In subsequent years, e-sports leagues were established, and in a 2017 announcement, it was revealed that electronic sports would be included as an official competition at the 2022 Asian Games in Hangzhou, China (Üçüncüoğlu & Çakır, 2017).

2.2. E-Sports Characteristics

E-sports has a unique structure that is performed in a digital environment, unlike other sports. This field consists of competitions played on online platforms based on the principle of competition, with its foundation rooted in computer or console-based digital games. The most fundamental condition for a game to fall under the scope of e-sports is that it must have a competitive nature. Furthermore, its low cost is another distinguishing feature that sets e-sports apart. Anyone with the necessary technical equipment can participate in this sport individually (Akgöl, 2019). Argan and Akın (2007) defined e-sports as a digital game-based sport requiring both cognitive and physical effort, and outlined five fundamental characteristics of this field. According to them, the prominent features of e-sports are as follows:

- Can be played in a virtual environment via computer,
- Does not require a physical facility or space,
- Offers the opportunity for international participation,
- Can be played individually or in teams without club or team affiliation,
- Cognitive and physical performance being supported by special hardware tools such as headphones and keyboards, and these tools enhancing the competitive environment (Argan & Akın, 2007).

E-sports enables individuals to develop their ability to perform multiple activities simultaneously. This allows players to engage in activities such as listening to music, messaging, or participating in other activities while focusing on the game. This

flexibility and lack of strict limitations make e-sports more appealing than other activities (Chiu et al., 2021).

2.3. E-Sports Game Types

E-sports encompasses a wide range of game genres. Prominent genres within this scope include fighting games, sports games, and real-time strategy games (RTS). Additionally, massively multiplayer online role-playing games (MMORPGs), survival-based games (battle royale), multiplayer online battle arena games (MOBA), and first-person shooter games (FPS) also form the core categories of e-sports. This diversity contributes to e-sports appealing to different player audiences and gaining widespread popularity on a global scale (Karaoğlu, 2025).

2.4. Benefits of E-Sports

Receiving instant feedback in a gaming environment has a positive effect on individuals' attention and concentration levels. Furthermore, the increasing difficulty of game levels encourages participants to try again to achieve success, emerging as a mechanism that motivates them to exert continuous effort throughout this process (Granic et al., 2014). Avnik (2024) states that e-sports has positive effects on individuals in various areas and summarizes these benefits under the following headings:

- Contributing positively to the educational process,
- Supporting foreign language learning,
- Developing quick decision-making and strategic thinking skills,
- Strengthening limb coordination, particularly hand-eye coordination,
- Contributing to the development of motor skills,
- Serving as a source of motivation for individuals and an effective leisure activity,
- Offering the possibility of therapeutic use (Avnik, 2024).

2.5. E-Sports in Turkey

In 2005, the ‘Team Turquality’ team was formed, followed by the ‘HWA Gaming’ teams in 2008. The Beşiktaş e-sports team was established in 2005, while the Galatasaray and Fenerbahçe e-sports teams were founded in 2016. In addition, many university teams formed their own squads and participated in competitions. Starting in 2014, e-sports licenses began to be issued to athletes participating in professional tournaments through provincial youth and sports directorates (Keçeci, 2020). The development of game companies and studios in Turkey has enabled young players to stand out internationally, paving the way for large companies to invest in the

sector. Additionally, many brands such as Asus, Acer, Vodafone, Bahçeşehir University, Puma, Migros, Turkish Airlines, and Nescafé have been sponsoring and supporting the gaming industry and e-sports teams for a long time (Emre, 2022).

2.6. E-Sports Around the World

The first of two organizations that played a significant role in the global development of e-sports was the Cyberathlete Professional League (CPL), founded in 1997, and the other was the Electronic Sports League (ESL), founded in 2000. These organizations contributed to the spread of e-sports and its acquisition of a professional identity through the tournaments they organized. Furthermore, the World Cyber Games (WCG), which began to be held worldwide in 2000, is considered a critical turning point in the international momentum of e-sports (Gürçay et al., 2019). The institutionalization process of e-sports began with the Cyberathlete Professional League (CPL), founded in 1997. Subsequently, the launch of the Electronic Sports League (ESL) in 2000, Major League Gaming (MLG) in 2002, and the International E-Sports Federation (IeSF) in 2008 marked important milestones in this process. In Turkey, the Turkish Digital Games Federation was established in 2011, and since 2013, work has been carried out under the Digital Games Branch within the Federation of Developing Sports Branches. Additionally, the General Directorate of Sports under the Ministry of Youth and Sports issues e-sports licenses to athletes who will compete at a professional level (Yükçü & Kaplanoğlu, 2018).

3. E-Sports And Leisure Time Relationship

The rapid advancement of technology and its impact on nearly every aspect of life today has led individuals to turn to different activities to spend their free time. In this regard, e-sports has emerged as one of the most notable leisure activities in recent years (Sjöblom & Hamari, 2017). In a study conducted by Uzuner and Kahveci (2023), it was determined that individuals from all walks of life, regardless of geographical differences, participate in e-sports activities. The study also concluded that e-sports is a beneficial activity for individuals when motivations such as socialization, relational self, and leisure time utilization are taken into account. As Caillois (2001) and Huizinga (2023) emphasize, the fundamental element that makes both traditional and digital games a leisure activity is the player's freedom to stop playing whenever they wish (Caillois, 2001; Huizinga, 2023). The fact that digital games, especially in the mobile sphere, have become a means of passing time and entertainment for individuals has paved the way for the emergence of a structure that can be described as the “entertainment industry” (Yiğitoğlu, 2019). One of the most

important factors in the acceptance of e-sports as a leisure activity is that it offers individuals the opportunity to manage their time as they wish. Players can start or pause e-sports activities whenever they want. This situation makes e-sports attractive by providing independence in time usage. Therefore, at the heart of the relationship between leisure time and e-sports is the individual's ability to flexibly control their own time. This feature transforms e-sports from being merely a gaming experience into a form of leisure time evaluation where personal preferences and freedom are at the forefront.

4. Conclusion

The rapid advancement of technology and its pervasive influence across all aspects of life have fundamentally transformed individuals' understanding of leisure time and how they choose to spend it. One of the most striking examples of this change is the evolution of digital games into a global sport under the e-sports umbrella, organized within a competitive framework. E-sports is not merely a means of entertainment for individuals; it is also an activity that offers multidimensional benefits such as strategic thinking, quick decision-making, collaboration, discipline development, and socialization. Another important element emphasized in the literature is that the most fundamental feature that distinguishes e-sports from other leisure activities is that individuals have complete control over their time. Players can start, pause, or quit the game whenever they want. This flexibility allows individuals to manage their free time according to their preferences and makes e-sports an attractive option, especially for younger generations. In Turkey, the establishment of federations, the expansion of the licensed player system, and brand sponsorship activities have paved the way for the institutionalization of e-sports. On a global scale, this rapidly growing field, facilitated through leagues, championships, and federations, is pioneering a new dimension in both sports and leisure time. As a result, e-sports has become a productive area of life for individuals, where they can develop themselves, socialize, and find satisfaction, thanks to the freedom, accessibility, and flexibility it offers. In this sense, e-sports is considered an important phenomenon that is redefining today's leisure culture and is expected to increase its impact on social life in the future.

References

Akgöl, O. (2019). Spor endüstrisi ve dijitalleşme: Türkiye'deki elektronik spor yapılanması üzerine bir inceleme. *TRT Akademi, 4*(8), 206–224.

Argan, M., & Akın, E. (2007). Elektronik spor; özellikleri, kavram ve uygulamalarına yönelik kuramsal çerçeve. *Akdeniz 4. Uluslararası Spor Bilimleri Kongresi Bildiri Kitabı* içinde (9–11 Kasım 2007, Antalya).

Argan, M., Özer, A., & Akın, E. (2006). Elektronik spor: Türkiye'deki siber sporcuların tutum ve davranışları. *Spor Yönetimi ve Bilgi Teknolojileri, 1*(2), 1–11.

Avnik, Y. A. (2024). *Üniversite öğrencilerinin dijital oyun bağımlılıkları ile e-spora katılım motivasyonları arasındaki ilişkinin incelenmesi* (Yüksek lisans tezi). İstanbul Gelişim Üniversitesi, Lisansüstü Eğitim Enstitüsü, İstanbul.

Bakır, M. (1990). *Rekreasyon ve turizm ilişkisinin turizm politikalarının oluşturulmasındaki önemi* (Doktora tezi). İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Bostancı, B. (2019). *Elektronik spor alanının sektörel ve akademik bağlamda değerlendirilmesine yönelik bir araştırma* (Yüksek lisans tezi). İzmir Kâtip Çelebi Üniversitesi, Sosyal Bilimler Enstitüsü, İzmir.

Bowden, B. V. (Ed.). (1953). *Faster than thought: A symposium on digital computing machines*. London: Sir Isaac Pitman & Sons.

Caillois, R. (2001). *Man, play and games* (M. Barash, Trans.). Chicago: University of Illinois Press.

Chiu, W., Fan, T. C. M., Nam, S. B., & Sun, P. H. (2021). Knowledge mapping and sustainable development of esports research: A bibliometric and visualized analysis. *Sustainability, 13*(18), 10354.

Cranmer, E. E., Han, D. I. D., van Gisbergen, M., & Jung, T. (2021). Esports matrix: Structuring the esports research agenda. *Computers in Human Behavior, 117,* 106671.

Deen, G., Hammer, M., Bethencourt, J., Eiron, I., Thomas, J., & Kaufman, J. (2006). Running Quake II on a grid. *IBM Systems Journal, 45*(1), 21–44.

Dere, N. (2024). *Sınava hazırlık dönemi lise öğrencilerinin serbest zaman etkinliklerine ve e-spora katılım motivasyonlarının incelenmesi* (Yüksek lisans tezi). Selçuk Üniversitesi, Sağlık Bilimleri Enstitüsü, Konya.

Emre, E. (2022). *Türkiye'de oyuna ve espor'a yatırım yapan markalar*. https://gamizm.com/turkiyede-oyuna-ve-espora-yatirim-yapan-markalar/ (Erişim tarihi: 29 Temmuz 2025).

Erdemli, A. (2002). *Temel sorunlarıyla spor felsefesi*. İstanbul: E Yayınları.

Evren, T., Kargün, M., Pala, A., & Yazarer, İ. (2019). Spora yenilikçi yaklaşım: Elektronik spor. *Uluslararası Sosyal Araştırmalar Dergisi, 12*(66), 1423–1434.

Gönülateş, S. (2018). Farklı ülkelerde rekreatif katılımın yaşam kalitesi üzerine etkisi. Akademisyen Kitabevi.

Granic, I., Lobel, A., & Engels, R. C. M. E. (2014). *The benefits of playing video games*. *American Psychologist, 69*(1), 66–78.

Gürçay, H., Kepenek, E. B., & Tekin, E. C. (2019). *Türkiye'de dijital oyun ve animasyon*. Ankara: Retro Basım Yayın.

Hamari, J., & Sjöblom, M. (2017). What is eSports and why do people watch it? *Internet Research, 27*(2), 211–232.

Huizinga, J. (2023). *Homo ludens: Oyunun toplumsal işlevi üzerine bir deneme* (M. A. Kılıçbay, Çev.). Doğu Batı Yayınları.

Jenny, S. E., Manning, R. D., Keiper, M. C., & Olrich, T. W. (2016). Virtual(ly) athletes: Where esports fit within the definition of "sport." *Quest, 69*(1), 1–18.

Jonasson, K., & Thiborg, J. (2010). Electronic sport and its impact on future sport. *Sport in Society, 13*(2), 287–299.

Karaküçük, S. (2008). *Rekreasyon: Boş zamanları değerlendirme*. Ankara: Gazi Kitabevi.

Karaoğlu, S. (2025). *E-spor alanında toplumsal cinsiyet eşitsizliği: Lisanslı e-sporcuların algı ve görüşleri* (Yüksek lisans tezi). Kocaeli Üniversitesi, Sosyal Bilimler Enstitüsü, Kocaeli.

Kaya, S. (2003). *Yetiştirme yurdunda kalan gençlerin boş zamanlarını değerlendirme eğilimi ve etkinliklerin sosyalleşmeye etkisi* (Doktora tezi). Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Ankara.

Keçeci, O. (2020). Popülerlik bazında futbolun en büyük rakibi: Pazarlama perspektifinden elektronik spor. *FOCUSS Spor Yönetimi Araştırmaları Dergisi, 1*(1), 1–16.

Kılbaş, Ş. (1995). *Gençlik ve boş zaman*. Adana: Çukurova Üniversitesi Basımevi.

Kılbaş, Ş. (2010). *Rekreasyon: Boş zamanları değerlendirme.* Ankara: Gazi Kitabevi.

Kocaömer, C. (2018). *Elektronik spor faaliyetlerinde sponsorluğun marka değeri üzerine etkisi: League of Legends örneği* (Yüksek lisans tezi). Ege Üniversitesi, Sosyal Bilimleri Enstitüsü, İzmir.

Köknel, Ö. (1993). *İnsanı anlamak* (4. bs.). İstanbul: Altın Kitaplar Yayınevi.

Martončik, M. (2015). e-Sports: Playing just for fun or playing to satisfy life goals? *Computers in Human Behavior, 48,* 208–211.

Mustafaoğlu, R., Zirek, E., & Yasacı, Z. (2018). E-spor oyuncularının demografik özellikleri, oyun oynama süreleri ve başarılarını etkileyen faktörler. *Bağımlılık Dergisi, 19*(4), 115–122.

Nosowitz, D. (2008, Ekim 16). *Retromodo: Tennis for two, the world's first graphical videogame*. https://gizmodo.com/retromodo-tennis-for-two-the-worlds-first-graphical-v-5080541 (Erişim tarihi: 24 Temmuz 2025).

O'Hagan, M., & Mangiron, C. (2013). *Game localization: Translating for the global digital entertainment industry*. Amsterdam: John Benjamins Publishing.

Özkan, N. B. (2024). *Turizm öğrencilerinin boş zaman değerlendirmesi bağlamında elektronik spor (E-spor) aktivitelerine katılımının incelenmesi* (Yüksek lisans tezi). Ankara Hacı Bayram Veli Üniversitesi, Lisansüstü Eğitim Enstitüsü, Ankara.

Öztürk, H. (2013). *Sanayi çalışanlarının rekreatif aktivitelere katılımlarının örgütsel bağlılık ve tükenmişlik düzeylerine etkisi (Gaziantep uygulaması)* (Doktora tezi). Gazi Üniversitesi, Sağlık Bilimleri Enstitüsü, Ankara.

Qian, T. Y., Wang, J. J., Zhang, J. J., & Lu, L. Z. (2019). It is in the game: Dimensions of esports online spectator motivation and development of a scale. *European Sport Management Quarterly, 20*(32), 1–22.

Roberts, K., York, C. S., & Brodie, D. A. (1988). Participant sport in the commercial sector. *Leisure Studies, 7*(2), 145–157.

Sezgin, S. (1987). *Türk toplumunun rekreasyon alışkanlıkları: İstanbul örneği* (Doktora tezi). Mimar Sinan Güzel Sanatlar Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Sjöblom, M., & Hamari, J. (2017). Why do people watch others play video games? An empirical study on the motivations of Twitch users. *Computers in Human Behavior, 75*, 985–996.

Şahin, C. K., Akten, S., & Erol, U. E. (2009). Eğirdir meslek yüksekokulu öğrencilerinin rekreasyon faaliyetlerine katılımlarının belirlenmesi üzerine bir çalışma. *Artvin Çoruh Üniversitesi Orman Fakültesi Dergisi*, *10*(1), 62–71.

Tel, M. (2007). *Öğretim üyelerinin boş zaman etkinlikleri üzerine sosyolojik bir araştırma: Doğu Anadolu örneği* (Doktora tezi). Fırat Üniversitesi, Sosyal Bilimler Enstitüsü, Elazığ.

Tezcan, M. (1993). *Boş zamanlar sosyolojisi*. Ankara: Ankara Üniversitesi Yayını.

Torkildsen, G. (2005). *Leisure and recreation management* (5th ed.). New York: Taylor and Francis Group.

Uzuner, M. E., & Kahveci, M. S. (2023). Bireylerin rekreatif amaçlı e-spora katılım motivasyonlarının incelenmesi. *Spor ve Rekreasyon Araştırmaları Dergisi, 5*(1), 63–77.

Üçüncüoğlu, M., & Çakır, V. O. (2017). Modern spor kulüplerinin elektronik spor faaliyetlerine ilgi gösterme nedenleri üzerine bir araştırma. *İnönü Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi, 4*(2), 34–47.

Wagner, M. (2006). *On the scientific relevance of e-sports*. In *Proceedings of the 2006 International Conference on Internet Computing & Conference on Computer Games Development* (pp. 437–442). Las Vegas, NV: CSREA Press.

Yaşar, Y., & Direkçi, V. (2025). Rekreasyon yönetimi: Türkiye ve dünya perspektifi. In M. Gönen, M. A. Ceyhan, & Z. Çakır (Eds.), Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler (pp. 24–36). Duvar Yayınları.

Yiğitoğlu, V. (2019). *Oyun değer*. Ankara: Gece Akademi.

Yükçü, S., & Kaplanoğlu, E. (2018). UİK e-spor endüstrisi. *Uluslararası İktisadi ve İdari İncelemeler Dergisi, (18)*, 533–550.

CHAPTER 5

Dance as Recreational Activities: Effects on Individuals' Psychosocial Development

Begüm Kadriye OYUNCU[1]

Gülçin GÖZAYDIN[2]

Oyuncu, B., & **Gözaydın**, G. (2025). Dance as recreational activities: Effects on individuals' psychosocial development. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (pp. 64–80). Duvar Yayınları.

[1] * Çanakkale Onsekiz Mart University, Graduate School of Education, Department of Recreation, Çanakkale, Turkey. ORCID ID: https://orcid.org/0009-0006-8777-4560
bgmoync1717@gmail.com

[2] Çanakkale Onsekiz Mart University, Faculty of Sport Sciences, Department of Recreation, Çanakkale, Turkey. ORCID ID: https://orcid.org/0000-0001-8612-6074
gulcingozaydin@comu.edu.tr

INTRODUCTION

The intense pace of modern life has brought individuals' physical, psychological, and social needs to the forefront; consequently, the effective use of leisure time and the development of healthy lifestyle habits have become increasingly significant issues (Yaman et al., 2016; Bar et al., 2016; Şakar et al., 2024). In this context, recreation is defined as a multidimensional field that aims to promote mental and physical revitalisation through activities in which individuals voluntarily participate during their free time (Karaküçük, 2014, p. 52; Turkish Language Association [TDK], 2012). Recreational activities exert a broad range of effects, supporting not only physical health but also individuals' psychological well-being and social interaction (Hacıoğlu et al., 2017, p. 27; Yaşar & Direkçi, 2025; Güney & Osmanoğlu, 2021).

Within this framework, dance is regarded as a distinctive form of recreation that stands out through its physical and artistic dimensions, enabling individuals to utilise their leisure time in a meaningful and productive manner. This activity, which integrates rhythmic movements with music, enables individuals to simultaneously fulfil multiple functions, including self-expression, stress management, socialisation, and maintaining psychological balance (Zorba & Yermakhanov, 2022, p. 444; Rokka et al., 2015, p. 76). Beyond its cultural and artistic aspects, the psychosocial benefits of dance are strongly supported by academic research, which emphasises its contribution to emotional relief, the development of self-confidence, social belonging, and overall life satisfaction (Duberg et al., 2020, p. 2; Jeong et al., 2005, p. 1717; Koch et al., 2019, p. 9; Dadswell et al., 2020, p. 291).

This chapter examines the psychological and social effects of dance on individuals, as well as its contributions to psychosocial adaptation. Furthermore, the role and significance of dance among recreational activities are evaluated in light of the existing scientific literature.

2.1. Recreation

The concept of recreation originates from the Latin term "recreatio," which conveys meanings such as "renewal," "re-creation," and mental and physical revitalisation. In Turkish usage, the term is primarily used to refer to the evaluation and utilisation of leisure time (Karaküçük, 2014, p. 52). According to the Turkish Language Association, recreation is defined as a dual-faceted concept encompassing both the voluntary participation of individuals in activities for entertainment or sports purposes during their free time and the process of organising spaces in a manner that meets people's needs for rest and enjoyment (Turkish Language Association [TDK], 2012).

When these definitions are considered collectively, recreation emerges as a comprehensive framework that includes not only activity-based practices grounded in individual participation but also spatial and organisational arrangements designed to address societal needs. In this respect, recreation extends beyond a mere set of leisure activities and represents a multidimensional field that integrates individual well-being with social planning and environmental design. By contributing to physical vitality, psychological recovery, and social interaction, recreational practices play a crucial role in enhancing overall quality of life and supporting sustainable, healthy living patterns.

2.2. Leisure Time and Recreation

Leisure time has predominantly been conceptualized in relation to working life and is commonly defined as the period during which individuals are free from occupational obligations, duties, and responsibilities. The central position of work in human life, together with its intrinsic relationship to processes such as rest, enjoyment, and relaxation, has led to leisure time being largely interpreted through the lens of employment and productivity (Akyıldız, 2012, pp. 232–234).

The intense pace of contemporary working life and the stressful, monotonous, and demanding conditions associated with urban living place considerable strain on individuals both physically and psychologically, potentially exerting adverse effects on overall health (Çelik, 2025; Can, 2015, p. 2; Bozkuş, 2013; Çakır et al., 2025a; 2025b). Within such a lifestyle, recreation plays a vital role by offering individuals opportunities to voluntarily participate in activities aimed at rest, enjoyment, and renewal during their leisure time. Through these activities, recreation contributes significantly to stress reduction and the promotion of well-being (Hacıoğlu et al., 2017, p. 27). Consequently, it can be asserted that individuals increasingly tend to engage in recreational activities during their leisure time as a means of enhancing both physical and psychological resilience.

2.3. Classification of Recreational Activities

The primary factors that determine the categorisation of recreation into different types are individuals' purposes, interests, and expectations that motivate them to engage in recreational activities. Accordingly, the classification of recreation is shaped by the functions attributed to activities or by the criteria employed in their evaluation. Depending on the underlying motivation guiding an individual's participation in a recreational activity, a corresponding type of recreation emerges (Karaküçük, 2014, p. 66). Considering that the fundamental functions of recreation include rest, relaxation, enjoyment, and the enhancement of physical and

psychological capacities, it is evident that individuals' choices of recreational activities are influenced mainly by these needs and expectations (Zorba & Yermakhanov, 2022, p. 443).

Within this framework, recreational activities may be classified according to a variety of criteria, such as the mode of participation, the environment in which the activity is performed, the intended purpose, the nationality of participants, age groups, and the number of individuals involved in the activity (Hacıoğlu et al., 2017, p. 25; Kaymaz & Ulema, 2022, p. 9).

2.3.1. Physical Activities

Physical recreation encompasses movement-based activities that individuals voluntarily engage in during their leisure time for enjoyment, health promotion, and overall well-being. A substantial component of the recreational domain is constituted by physical activity and sport, and numerous movement-oriented activities performed in accordance with individuals' interests and preferences exhibit a recreational character (Zorba & Yermakhanov, 2022, p. 444).

From this perspective, physical recreation is viewed as a field that supports physical fitness, promotes psychological relaxation, and fosters social interaction (Akpınar, 2023; Güler & Işıklı, 2024; Ağırbaş, 2021). Evidence suggests that short-term mindfulness practices alone have a limited effect on improving physical and cognitive recovery (Aras et al., 2023), indicating that recreational activities require continuity and active engagement to support individuals' mental health effectively. Indeed, it is well established that regular physical activity enhances quality of life, reduces stress levels through increased physical mobility, and contributes to the development of more positive daily life behaviours (Kekeç & Kolukısa, 2024, p. 86; Çabuk et al., 2020; Aydemir et al., 2024; Özlü et al., 2021).

Physical recreation refers to sport-related recreational activities that require active, movement-based participation and take place in either outdoor or indoor environments (Metin, Kesici, & Kodaş, 2013, p. 5028). Within this scope, fundamental bodily movements such as walking, running, jumping, swimming, and cycling, as well as various sports disciplines involving head, neck, and limb coordination, dance, exercise, games, and activities of daily living, are considered core components of physical activity (Bulut, 2013, p. 209; Gönülateş, 2018; Er & Cengiz, 2025)

2.3.2. Social Activities

Social recreation encompasses recreational activities that enable individuals to utilise their leisure time through social interaction and are aimed at strengthening

interpersonal relationships (Hacıoğlu et al., 2017, p. 36). This type of recreation is shaped by individuals coming together and participating in shared activities, thereby contributing to the development and maintenance of social bonds (Metin, Kesici, & Kodaş, 2013, p. 5028). Moreover, it has been noted that increases in individuals' levels of welfare are associated with higher participation in socially oriented recreational activities (Soyer, 2020, p. 30; Güler & Işıklı, 2024).

In this regard, recreational activities provide individuals with opportunities to spend their leisure time through both social interaction and physical activity or exercise, thereby supporting physical, psychological, and social well-being (Yıldız et al., 2024a; 2024b; Şeyhanlı et al., 2024; Güler & Akpınar, 2023). Within this context, gatherings with friends and family, celebrations, club and association events, volunteering activities, group games, and community-based social events are examples of social recreation.

2.3.3. Artistic Activities

Art is regarded as the process through which individuals consciously or unconsciously filter their experiences derived from the environment in which they live, society, and accumulated cultural knowledge, transforming these experiences into aesthetic expression (Ünlü, 2009, p. 23). Within this framework, artistic recreation constitutes a form of recreation that involves individuals' participation in processes of aesthetic production and expression, encompassing a broad spectrum of visual and auditory arts ranging from music and painting to sculpture and theatre (Yeşilyurt & Çalışkan, 2020, p. 49).

The recreation literature emphasises that such activities form a rich and diverse field that includes music, various sports games, folk dances, art-related activities conducted in both indoor and outdoor settings, as well as cultural and intellectual pursuits (Özkan et al., 2013). In this context, engaging in activities such as playing a musical instrument, painting, dancing, or participating in theatrical performances is considered part of artistic recreation, as these practices support both individuals' aesthetic expressive abilities and their creative potential (Karaküçük, 1995, pp. 66–72).

3. The Concept of Dance

Dance is regarded as one of the oldest forms of expression that has existed throughout human history. In periods when verbal language had not yet developed, individuals expressed their emotions and thoughts through bodily movements; in this sense, dance emerged as an initial solution to the absence of verbal communication and functioned as a fundamental means of interaction (Altay, 2019, p. 9). Therefore,

dance should be understood not merely as an aesthetic performance but as a multifaceted activity arising from individuals' need for self-expression and for establishing connections with others (Koutedakis & Jamurtas, 2004, p. 5).

In its most basic definition, dance is a performing art composed of energy-demanding sequences of movement that encompass a wide variety of forms and styles (Allen et al., 2024, p. 1). Through the harmonious integration of bodily movements with music, dance facilitates the externalisation of emotions and supports psychological relaxation (Gençel, 2006, p. 705). Furthermore, the term *"dance*" in Turkish has been derived from the Arabic-origin word *"raks*" and is used to denote the modern concept of dance (Eroğlu, 2017, p. 218).

3.1. Cultural, Artistic, and Social Dimensions of Dance

Dance is not merely an individual means of expression but also a social and cultural practice, as evidenced by its historical development. In early human societies, dance constituted an integral component of rituals performed to communicate with nature or supernatural forces. During this period, dance functioned primarily as a collective social action rather than an artistic pursuit. Over time, however, and in parallel with broader societal transformations, dance evolved into an aesthetic performance presented before an audience, thereby acquiring an artistic identity. In particular, the emergence of ballet from courtly entertainments in the late fifteenth century represents a significant turning point in the institutionalisation of dance as a performing art (Sönmemiş, 2021, pp. 102–103).

In the contemporary world, dance continues to exist in diverse forms across different societies, with each culture shaping dance in accordance with its own traditional values and norms. In this respect, dance functions as a universal medium of expression while simultaneously manifesting distinctive forms and meanings within each cultural context. Moreover, as a non-verbal, movement-based, and symbolic mode of expression, dance serves as a powerful instrument of social interaction among individuals (Sönmemiş, 2021, pp. 103–105).

For these reasons, dance should be regarded not only as an artistic form of expression but also as a component of collective memory. In the modern era, dance has gained prominence as both a recreational activity and a cultural and artistic expression. Indeed, individuals increasingly utilise dance as a means of spending their leisure time, experiencing aesthetic pleasure, and achieving both physical and mental relaxation (Ayyıldız, 2015, pp. 1–2).

3.2. Psychosocial Effects of Dance on Individuals

3.2.1. The Concept of Psychosocial

The concept of *psychosocial* refers to the interaction between individuals' mental and emotional processes and their social and environmental conditions. This concept focuses on explaining the reciprocal relationship between individuals' internal characteristics and their social environment (APA, 2018; Terappin, 2023). Representing the intersection of psychology and the social sciences in terminological terms, the psychosocial framework defines the developmental trajectory of individuals, which is shaped by external influences and unfolds through different psychological stages across the lifespan (Dürüst, 2022, p. 44).

At its core, the concept emphasises the existence of a dynamic and continuous relationship between individuals' psychological structures and their social interactions (Altunpul & Sargın, 2022, p. 48). Within this framework, the psychosocial approach emphasises the close connection between individuals' cognitive processes and behavioural patterns, as well as the social variables that influence them, arguing that individual existence cannot be examined independently of social factors (Büyükkara et al., 2024, p. 2).

3.2.2. The Relationship Between Dance and the Psychological Dimension

Dance constitutes a holistic activity that supports individuals' psychological well-being, restructures their inner world, and deepens self-awareness (Şakar & Kızılkaya Namlı, 2023). Academic research emphasises that dance enhances overall psychological well-being, increases body acceptance, and reduces perceptions of loneliness and the accompanying sense of inner confinement experienced by individuals (Bilge & Öğce, 2008, p. 126). In particular, studies conducted among children and adolescents indicate that the positive effects of dance on self-confidence, self-esteem, and self-expression skills function as protective factors that foster individuals' internal sense of security and self-worth (Duberg et al., 2020, p. 2; Bilge & Öğce, 2008, p. 126). In this process, dance transforms complex emotions and thoughts within the inner world into bodily expression, thereby serving as a powerful form of "body language" that enables individuals to establish healthy communication with their inner selves in contexts where verbal expression proves insufficient (Sönmemiş, 2021, p. 100).

Dance movement therapy, which integrates music, physical movement, and sensory interaction, offers a practical non-pharmacological approach for supporting individuals with mild depression (Jeong et al., 2005, p. 1713). Experimental studies have demonstrated significant reductions in negative psychological symptoms such as somatisation, obsessive–compulsive tendencies, anxiety, and anger among

individuals participating in such interventions. These improvements have been reported to be closely associated with the modulation of serotonin and dopamine concentrations within the brain's reward and emotion regulation systems (Jeong et al., 2005, p. 1717). Dance-based interventions further assist individuals in perceiving their bodily responses more clearly and in gaining personal awareness through the enrichment of their movement repertoire; this development facilitates the emergence of new channels of expression in both the emotional domain and verbal communication (Kaya, 2017, p. 413). Recent research has also demonstrated that even brief dance breaks can rapidly improve mood, owing to the inseparable connection between emotional experience and bodily movement (Schmidt & Christensen, 2025, p. 2).

By supporting psychological processes that contribute to emotion regulation, dance enables individuals to experience a sense of integration between body and mind (Koch et al., 2019, p. 9). When performed in group settings, dance further reinforces a sense of social belonging, thereby creating a protective buffer against the psychological risks associated with loneliness (Li et al., 2025, p. 4). Dance activities conducted in joyful and supportive environments have been shown to reduce individuals' levels of social physique anxiety (SPA) while significantly enhancing physical self-esteem (PSE) (Liu et al., 2025, p. 2). In maintaining psychological balance, individuals enhance their psychological flexibility by employing strategies such as cognitive reappraisal to cope with negative emotions (Milne et al., 2025, p. 1). This artistic process, which grants individuals the freedom to release their emotions, fosters a state of mindfulness by encouraging focus on the body through the principle of "here and now," thereby enhancing stress-coping capacities (Yang, 2025, p. 1; Koch et al., 2019, p. 9). Ultimately, dance is regarded as a dynamic and supportive psychological healing tool that facilitates the emergence of personal potential and contributes to the restoration of mental health (Özdal, 2023, p. 14).

3.2.3. The Relationship Between Dance and the Social Dimension

Dance supports social well-being by directly influencing the cognitive and behavioural processes that govern interpersonal relationships, regardless of the context in which it is performed (Zafeiroudi, 2023, p. 97). Within this framework, dance enhances participants' capacities for interaction and functions as a dynamic communication network that facilitates the establishment and maintenance of healthy social bonds (Zafeiroudi, 2023, p. 90). Through face-to-face interaction, shared rhythmic experiences, and the production of synchronised movement, dance practices enable individuals to utilise non-verbal channels of communication

actively. In this process, interactional indicators such as body orientation, spatial proximity, and rhythmic alignment contribute to the strengthening of interpersonal perception and the enhancement of mutual sensitivity. From this perspective, dance extends beyond being merely a jointly performed activity and emerges as a space in which social interaction is structured and relational harmony is experienced.

Particularly during group dance, the emergence of action synchrony triggers a neurobiological process that fosters a sense of self–other merging. This phenomenon contributes to the reduction of psychological distance between individuals, thereby strengthening social trust and cooperative tendencies (Tunçgenç et al., 2024, p. 1920). Participation in inclusive dance communities not only facilitates the development of individual skills but also nurtures a sense of togetherness and collective joy, enabling the construction of strong social cohesion (Olvhoj et al., 2025, p. 4). In the academic literature, social integration is conceptualised as the outcome of processes involving emotional security, shared identity formation, and interpersonal synchronisation that develop through sustained participation in similar group activities (Liu, 2025, p. 349).

Numerous studies have demonstrated that dance reduces feelings of loneliness and enhances individuals' sense of active belonging within a community (Dadswell et al., 2020, p. 290). Indeed, research conducted by Dadswell et al. (2020) revealed that interactional elements such as shared enjoyment, mutual encouragement, and companionship significantly strengthen social relationships (p. 291). Similarly, individuals who actively engage in dance at local festivals have been found to develop higher levels of community consciousness compared to those participating in non-dance-related events (Kawase & Eguchi, 2025, pp. 1–2). In conclusion, community-based dance practices create a protective social experiential space against the risk of social exclusion by enabling individuals to reconstruct their social roles and identities (Li et al., 2025, p. 9).

3.2.4. The Contribution of Dance to Psychosocial Adaptation and Socialisation

Dance offers an integrated experiential domain that simultaneously supports individuals' psychological and social dimensions. Within this process, dance enhances self-perception, self-worth, and positive attitudes toward body image, thereby laying the emotional and behavioural foundations for participation in social life (Du et al., 2025, p. 2). Scientific evaluations indicate that dance is not merely an individual movement practice but also a holistic activity that enhances individuals' capacities for social adaptation and contributes comprehensively to their developmental processes (Duran et al., 2025, p. 3). This adaptive process is not

limited to behavioural change alone; instead, it is accompanied by intangible gains such as feelings of happiness and satisfaction that emerge during dance performance (Duran et al., 2025, p. 3). In this context, psychosocial adaptation can be conceptualised as an individual's capacity to maintain internal well-being while establishing balanced, sustainable, and functional relationships with their social environment.

Particularly during critical periods of identity formation, such as adolescence, dance programs have been shown to foster strong senses of belonging and social attachment, thereby generating positive psychological well-being outcomes (Sango & Pickard, 2024, p. 335). Primary research findings further demonstrate that dance facilitates meaningful improvements in interpersonal relationships by reinforcing emotional stability and resilience mechanisms under pressure (Yang, 2025, p. 49). Within this framework, dance functions as a fundamental catalyst that enhances self-confidence, life satisfaction, and social skills, guiding individuals away from passive lifestyles toward more active and engaged patterns of living (Du et al., 2025, p. 2).

4. Dance as a Recreational Activity

Dance is not merely an artistic or sporting activity; rather, it constitutes a multidimensional form of recreation in which individuals voluntarily engage during their leisure time. Within the context of youth recreation, dance is classified alongside disciplines such as football and basketball as a sport and physical activity, as it enables individuals to express their character, emotions, and spiritual values through rhythmic movement (Uslu, 2023, p. 6; Korkutata, 2016, p. 2835). In this respect, dance transcends the boundaries of a purely physical act. It offers a unique recreational domain in which individuals can express themselves freely, find opportunities for socialisation, and experience profound psychological relaxation.

The processes of individualisation and digitalisation associated with modern life may distance individuals from direct social interaction (Babakaya et al., 2021; Karadağ et al., 2021). At this juncture, recreational activities function as strategic instruments that strengthen social bonds within communal life and foster a shared cultural ground by enhancing individuals' sense of belonging (Tapşın & Alev, 2024, p. 121; Akpınar, 2023). Research indicates that group dance practices, in particular, cultivate strong social connections among participants, support psychological well-being, and help individuals develop a more positive perspective on life (Tunçgenç et al., 2024, p. 1). By integrating aesthetics, music, and choreographed movement sequences within a structured framework of social interaction, dance facilitates the merging of self and other. This process enhances in-group coordination through

neural pathways that encode action and perception, thereby reinforcing solidarity among participants (Fong Yan et al., 2024).

Neurobiological studies have demonstrated that, due to its unique structure, dance induces pleasurable effects in the brain and significantly reduces stress levels (Wal et al., 2025). Within the literature, dance is often described as a "stress inoculation," protecting individuals against the pressures of daily life and exerting a restorative influence on brain regions responsible for regulating stress responses (Hanna, 2006; Wal et al., 2025). Compared to many traditional forms of physical activity, dance offers more comprehensive psychological benefits, including reduced anxiety levels, enhanced self-esteem, and improved mental health. Recent meta-analyses report that dance-based interventions decrease individuals' levels of Social Physique Anxiety (SPA) while increasing Physical Self-Esteem (PSE). In particular, dance forms performed in group settings have been shown to intensify positive emotions, such as enthusiasm and excitement, while exerting a more substantial effect in minimising negative emotional states, including stress, anger, and hopelessness (Liu et al., 2025).

Another key characteristic of dance as a recreational practice is its high accessibility. Ala-Mutka (2020) emphasises that dance occurs as both a personal and social activity in homes, parties, festivals, and community gatherings, and that this diversity renders dance exceptionally inclusive compared to other physical activities. Requiring no specialised equipment and appealing to individuals across all age groups, dance thus emerges as a sustainable recreational strategy accessible to broad segments of the population.

In conclusion, dance, as a recreational activity, constitutes a holistic practice that simultaneously supports individuals' physical, psychological, and social development. Findings within the academic literature clearly indicate that regular participation in dance plays a critical role in stress management, reinforces self-confidence, and strengthens a sense of social belonging (Wal et al., 2025; Fong Yan et al., 2024). Owing to the absence of specific prerequisites and its applicability across the lifespan, dance stands out in modern society as one of the most effective, creative, and enjoyable recreational methods through which individuals can maintain both physical and mental health during their leisure time.

Conclusion

Dance occupies a distinctive position within the field of recreation due to its multidimensional structure that integrates physical activity, artistic expression, and social interaction. While the primary aim of recreational activities is to enable individuals to utilise their leisure time in a voluntary, satisfying, and restorative manner, dance stands out as an activity that simultaneously contributes to this

objective at both physical and psychosocial levels (Karaküçük, 2014, p. 52; Hacıoğlu et al., 2017, p. 27).

The recreational literature widely acknowledges that participation in physical activities enhances individuals' quality of life, reduces stress levels, and supports psychological well-being (Yermakhanov & Zorba, 2022, p. 444). Dance, however, extends beyond these general effects; through its integration of movement with music and rhythm, it deepens bodily awareness and positively transforms the individual's relationship with their own body. Empirical evidence indicates that regular participation in recreational dance activities improves body image, strengthens self-esteem, and promotes active lifestyle behaviours (Duberg et al., 2020, p. 2; Burkhardt & Brennan, 2012, p. 148).

One of the fundamental factors enhancing the significance of dance within the field of recreation is its regulatory effect on psychological well-being. Although it is well established that recreational activities enable individuals to disengage from the stresses of daily life, dance is emphasised as possessing a distinctive function in the regulation of emotions, the reduction of anxiety and tension, and the facilitation of mental relaxation (Jeong et al., 2005, p. 1713; Koch et al., 2019, p. 9). Dance practices performed in conjunction with rhythmic movement and music strengthen the individual's "here and now" experience, thereby reinforcing the restorative and regenerative functions of recreation.

From a social perspective, dance demonstrates a strong potential for community building among recreational activities. Group-based dance practices enhance interaction among participants and foster a sense of belonging, solidarity, and social connectedness (Dadswell et al., 2020, p. 291). Such recreational contexts offer functional social spaces where individuals can renegotiate their social roles and develop relational attunement through nonverbal communication (Sango & Pickard, 2024, p. 335).

Another factor that reinforces the importance of dance within the field of recreation is its accessible and inclusive nature. The absence of a requirement for specialised equipment and its adaptability to different age groups render dance a sustainable recreational alternative for broad segments of the population (Ayyıldız, 2015, pp. 1–2). Due to these characteristics, dance is regarded as a viable and effective tool within contemporary recreational practices and healthy lifestyle strategies.

In conclusion, dance occupies a central position in the recreational domain not merely as an entertainment-oriented leisure activity, but as a holistic recreational practice that supports physical health, strengthens psychological resilience, and enhances social integration. Findings in the literature clearly demonstrate that dance

is among the most effective and sustainable recreational activities in promoting both individual and societal well-being (Fong Yan et al., 2024; Du et al., 2025).

References

Ağırbaş Ö, Tatlısu, B., & Karakurt, S. (2021). Geçmişten günümüze sağlık alanında egzersizlerin rolü. E. Aggön, Y. Çakmak & S. Ağırbaş Öztürk (Ed.), *Spor ve sağlık araştırmaları (1. bs., ss. 1–14). Akademisyen Kitabevi* A.Ş. ISBN 978-625-7496-05-6

Akpınar, Ö. (2023). Eğitsel Oyunlar Ve Fiziksel Aktivite İlişkisi. Psikolojik ve Sosyal Boyutlarıyla Fiziksel Aktivite ve Spor, 31-43. Editör: Mustafa Barış Somoğlu, Ahmet Yılmaz Albayrak. Efe Akademi Yayınları: İstanbul

Akyıldız, M. (2013). Boş zamana" Ciddi" Bir Bakış: Boş Zaman Araştırmalarında Ciddi Boş Zaman Teorisi. *Pamukkale Journal of Sport Sciences*, *4*(2).

Ala-Mutka, K. (2020). *Dancing for health and wellbeing: Social practice with underappreciated potential*.

Allen, J., Hutchinson, M., & Thomas, C. (2024). *Dance in performance and practice*. Oxford University Press.

Altay, O. (2019). *Rekreatif amaçlı dans faaliyetlerine katılan bireylerin mutluluk düzeylerinin yaşam kalitesi üzerine etkisinin incelenmesi* (Yüksek lisans tezi, Erciyes Üniversitesi, Sağlık Bilimleri Enstitüsü). YÖK Tez Merkezi.

Altunpul, N., & Sargın, N. (2022). **Bağımlılıkla mücadelede psikososyal destek**. İçinde *9. Ulusal KOP Bölgesel Kalkınma Sempozyumu Bildiri Kitabı* (ss. 41–55). Konya Teknik Üniversitesi.

American Psychological Association. (2018). *Psychosocial*. In *APA Dictionary of Psychology*.

Aras, D., Durmus, T., Cengiz, C., Guler, D., Guler, Y., Ugurlu, A., ... & Gülü, M. (2023). A brief body scan mindfulness practice has no positive effect on the recovery of heart rate variability and cognitive tasks in female professional basketball players. Frontiers in Psychology, 14, 1196066-1196066.

Aydemir, U., Hazar, K., & Çelik, H. (2024). Fiziksel aktivitenin sağlık ve yaşam kalitesi üzerindeki etkisi. In F. Çatıkkaş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 78–95). Duvar Yayınları

Ayyıldız, T. (2015). *Rekreatif dans faaliyetlerine katılan bireylerin serbest zaman tatmin düzeylerinin incelenmesi. Gazi Üniversitesi Sağlık Bilimleri Enstitüsü* (Doctoral dissertation, Yüksek Lisans Tezi, Ankara).

Baba Kaya, H., Tiryaki, K., & Akpınar, S. (2021). Spor Bilimleri Fakültesi Öğrencilerinin Akıllı Telefon Bağımlılık Düzeylerinin Sosyal-Duygusal Yalnızlıkları Üzerinde Etkisi. Düzce Üniversitesi Spor Bilimleri Dergisi, 1(1), 9-16.

Bar, M., Yaman, M. S., & Hergüner, G. (2016). Problems Encountered by Religious Vocational Secondary School and Other Secondary School Students in Physical Education and Sports Activities. Universal Journal of Educational Research, 4(4), 664-674.https://doi.org/10.13189/ujer.2016.040402

Bilge, A., & Öğce, F. (2008). Dansın beden ve ruh sağlığı açısından önemi. *Motif Akademi Halkbilimi Dergisi*, *1*(2), 123-134.

Bozkuş, T., Türkmen, M., Kul, M., Özkan, A., Öz, Ü., & Cengiz, C. (2013). Beden eğitimi ve spor yüksekokulu'nda öğrenim gören öğrencilerin fiziksel aktivite düzeyleri ile sağlikli yaşam biçimi davranişlarinin belirlenmesi ve ilişkilendirilmesi. International Journal of Sport Culture and Science, 1(3), 49-65.

Bulut, S. (2013). Sağlıkta sosyal bir belirleyici; fiziksel aktivite. Türk Hijyen ve Deneysel Biyoloji Dergisi, 70(4), 205-214.

Burkhardt, J., & Brennan, C. (2012). The effects of recreational dance interventions on the health and well-being of children and young people: A systematic review. *Arts & Health*, 4(2), 148-161.

Büyükkara, F. (2024). Çocukluk çağı travmalarının ve bireylerin kendilik algısının psikolojik iyi oluş üzerindeki etkileri. *Avrasya Sosyo-Ekonomik Araştırmalar Dergisi (ASEAD)*, *11*(4), 548–555.

Can, E. (2015). Boş zaman, rekreasyon ve etkinlik turizmi ilişkisi, İstanbul Sosyal Bilimler Dergisi, (1-17).

Çabuk, R., Çayır, H., Yıldız, M., Onat, T., Cincioğlu, G., Adanur, O., & Kayacan, Y. (2020). Egzersizin fizyolojik sistemler üzerine etkileri: Sistematik Derleme. Helal Yaşam Tıbbı Dergisi, 2(1), 21-38. https://dergipark.org.tr/tr/pub/hlm/issue/56266/770352

Çakır, Z., Çatıkkaş, F., Türkmen, M., Şengönül, A., Yaman, M. S., Öktem, T., Gönen, M., Güzel, S., & Yel, K. (2025b). Preservice teachers' attitudes toward pedagogical humour: The role of physical activity, sociodemographic factors, and academic discipline. BMC Psychology, 13, 1423. https://doi.org/10.1186/s40359-025-03751-4

Çakır, Z., Erbaş, Ü., Gönen, M., Ceyhan, M. A., Öktem, T., Kul, M., Dilek, A. N., & Güzel, S. (2025a). Examination of trauma levels and earthquake stress coping strategies of university students who exercise and do not exercise after an earthquake. BMC Psychology, 13, 867. https://doi.org/10.1186/s40359-025-03108-x

Çelik, H. (2025). Fiziksel aktivitenin mental sağlık üzerindeki koruyucu etkileri. M. Gönen, M. A. Ceyhan & Z. Çakır (Ed.), *Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler* içinde (ss. 37–50). Duvar Yayınları

Dadswell, A., Bungay, H., Wilson, C., & Munn-Giddings, C. (2020). The impact of participatory arts in promoting social relationships for older people within care homes. *Perspectives in Public Health, 140*(5), 286–293.

Du, M., Hancox, J. E., Hooper, O., Sandford, R., & Huang, C. (2025). Dancing towards wellbeing: A scoping review of dance interventions for therapeutic purposes in educational settings. *International Review of Sport and Exercise Psychology*, *18*(1), 1-24.

Duberg, A., Jutengren, G., Hagberg, L., & Möller, M. (2020). *The effects of a dance intervention on somatic symptoms and emotional distress in adolescent girls: A randomized controlled trial*. Journal of International Medical Research, 48(2), 1–12.

Duran, B., Akkaya, C. C., Tan, H., Yavuz, A., & Akkaya Boyraz, D. E. (2025). Investigation of the effect of Capoeira dance education on the dance self-efficacy, happiness and self-confidence levels of disadvantaged children between the ages of 7-13. *Journal of Sport and Recreation Researches*, *7*(1), 50-59.

Dürüst, Ç. (2022). Covid-19 sürecinin psikososyal açıdan değerlendirilmesi. *Uluslararası Sosyal Bilimler ve Sanat Araştırmaları Dergisi*, *1*(1), 41-55.

Er, B., & Cengiz, R. (2025). The form of happiness in the digital age: examining the effect of ınternet usage in digital leisure on flow Experience. International Journal of Recreation and Sports Science, 9(1), 29-44. https://doi.org/10.46463/ijrss.1608338

Eroğlu, T. (2017). Dans Kavramı ve Dansın İşlevi. *The Journal of Academic Social Science Studies*, *7*(60), 215-226. experience and leisure satisfaction. Journal of ROL Sport Sciences, 544–565

Fong Yan, A., Nicholson, L. L., Ward, R. E., *et al.* (2024). *The effectiveness of dance interventions on psychological and cognitive health outcomes compared with other forms of physical activity: A systematic review with meta-analysis*. Sports Medicine, 54, 1179–1205.

Gençel, Ö. (2006). Müzikle Tedavi. Kastamonu Education Journal, 14(2), 697-706.

Gönülateş, S. (2018). Farklı ülkelerde rekreatif katılımın yaşam kalitesi üzerine etkisi. Akademisyen Kitabevi.

Güler, M., & Akpınar, Ö. (2023). The prediction of physical and mental fatigue level in the use of ergogenic support of adolescent athletes. *Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi, 21*(3), 212-225. https://doi.org/10.33689/spormetre.1316722

Güler, M., & Işıklı, S. (2024). Deconstruction of the Relationship Between Physical Activity Level, Body Mass Index and Multi-Screen Addiction in Middle School Students. Journal of Exercise Science & Physical Activity Reviews (C. 2, Sayı 2, ss. 1-14).

Güler, M., & Işıklı, S. (2024). Deconstruction of the Relationship Between Physical Activity Level, Body Mass Index and Multi-Screen Addiction in Middle School Students. Journal of Exercise Science & Physical Activity Reviews (C. 2, Sayı 2, ss. 1-14).

Güney, G., & Osmanoğlu, H. (2021). Rekreasyon alanlarında inovasyon ve sürdürülebilirlik. M. Dalkılıç & Ö. Özer (Ed.), Rekreasyon alanlarında inovasyon ve sürdürülebilirlik (1. bs.). Duvar Kitabevi. ISBN 978-625-7502-81-8

Hacıoğlu, N., Gökdeniz, A., Dinç, Y., (2017). Boş Zaman ve Rekreasyon Yönetimi (Örnek Animasyon Uygulamaları) Detay Yayıncılık, 4. Baskı

Hanna: Hanna, J. L. (2006). *Dancing for health: Conquering and preventing stress*. AltaMira Press.

https://doi.org/10.33689/spormetre.1259344

Jeong, Y.-J., Hong, S.-C., Lee, M. S., Park, M.-C., Kim, Y.-K., & Suh, C.-M. (2005). Dance movement therapy improves emotional responses and modulates neurohormones in adolescents with mild depression. *International Journal of Neuroscience, 115*(12), 1711–1720.

Karadağ, Ö., Baba Kaya, H., & Hoşver, P. (2023). Spor bilimleri fakültesi öğrencilerinin dijital teknoloji kavramına yönelik algıları: bir metafor çalışması. *Trakya Eğitim Dergisi, 13*(2), 923-942. https://doi.org/10.24315/tred.1100416

Karaküçük, S. (1995). *Rekreasyon: Boş zamanları değerlendirme kavramı, kapsamı ve bir araştırma*. Seren Matbaacılık.

Karaküçük, S. (2014). *Rekreasyon: boş zamanları değerlendirme*. Suat Karaküçük.

Kawase, S., & Eguchi, K. (2025). Impact of group dancing during Japanese festivals on people's sense of community. *Frontiers in Psychology*, *16*, Makale 1469066.

Kaya, N. (2017). Dans ve hareket terapisi. *Arşiv Kaynak Tarama Dergisi*, *26*(3), 406-419.

Kaymaz, E., Ulema, Ş., (2022). Rekreasyon ve Boş Zaman Kavramı. (ss. 3-21). Detay Yayıncılık, 1. Baskı (Rekreasyon Kavram ve Uygulamalar.

Kekeç, H., & Kolukısa, Ş. (2024). Pandemi Sürecinde Üniversite Öğrencilerinin Fiziksel Aktiviteye Katılım Düzeyleri ile Covid-19 Anksiyete Durumları Arasındaki İlişkinin İncelenmesi. Uluslararası Bozok Spor Bilimleri Dergisi, 5(1), 83-102.

Klaperski-van der Wal, S., Skinner, J., Opacka-Juffry, J., & Pfeffer, K. (2025). *Dance and stress regulation: A multidisciplinary narrative review*. Psychology of Sport & Exercise, 78, 102823.

Koch, S. C., Riege, R. F. F., Tisborn, K., Biondo, J., Martin, L., & Beelmann, A. (2019).

Korkutata, A., & Sönmez, M. (2016). *Rekreatif bir faaliyet olarak halk oyunları hareket/kas ilişkisi*. İnsan ve Toplum Bilimleri Araştırmaları Dergisi, 5(8), 2817–2841.

Koutedakis, Y., & Jamurtas, A. (2004). *The dancer as a performing athlete: Physiological considerations*. Sports Medicine, 34(10), 651–661.

Li, R., Yan, Q., Qu, Y., & Wang, Y. (2025). Square dance, loneliness, quality of life, and attitude toward aging in middle-aged and older women in China. *Frontiers in Public Health*, *13*, Makale

Li, X., Wei, X., Soh, K. G., Lu, Y., & Li, R. (2025a). Communal dance and emotional regulation in older adults: A meta-analysis. *Frontiers in Psychology*, *16*, 1733911.

Liu, M. (2025). Social behavior and group psychology: Mechanisms of social cohesion in ethnic dance. *Journal of Social Behaviour and Group Psychology*, *13*(15), 350-365.

Liu, X., Soh, K. G., & Lu, Y. (2025). Effect of dance on social physique anxiety and physical self-esteem among adults: A systematic review. *Frontiers in Psychology*, *16*, Article 1547802.

Liu, X., Wei, X., Soh, K. G., Lu, Y., & Li, R. (2025). The effect of Latin dance on social physique anxiety in middle school girls: A pilot study. *Frontiers in Public Health*, *13*, Article 1564558.

Metin, T. C., Kesici, M., ve Kodaş, D. (2013). *Rekreasyon olgusuna akademisyenlerin yaklaşımları*. Journal of Yaşar University, 8(30), 5021–5048.

Milne, M. J., Williams, S. E., Neely, K. C., & Quinton, M. L. (2025). An interpretive description of the emotions experienced by vocational dance students and their use of emotion regulation strategies. *Journal of Applied Sport Psychology*, *37*(1), 1-20.

Olvhøj, R., Jensen, T. K., Wienecke, J., & Winther, H. (2025). Everyone dances the way they can: Opportunities and challenges in inclusive movement activities for adults with intellectual disabilities. *Journal of Dance Education*, *18*(1), 1-15.

Öktem, T., Kul, M., Karataş, İ., Hazar, E. B., Gök, U. D., Boz, E., Aksoy, Ö.F.,& Aydemir, U. (2025). Comparison of the Effects of 10 Weeks of Fitness and Kettlebell Workouts on Some Physical Parameters of Sedentary Individuals. Journal of Sport Sciences Research, 10(2), 321-340. https://doi.org/10.25307/jssr.1660219

Özdal, H. T. (2023). Psikolojik danışmanlıkta bir müdahale aracı olarak sanatın kullanımı üzerine bir inceleme. *Lokum Sanat ve Tasarım Dergisi*, *1*(2), 136-150.

Özkan, A., Bozkuş, T., Kul, M., Türkmen, M., Öz, Ü., & Cengiz, C. (2013). Halk oyuncularinin fiziksel aktivite düzeyleri ile sağlikli yaşam biçimi davranişlarinin belirlenmesi ve ilişkilendirilmesi. International Journal of Sport Culture and Science, 1(3), 24-38.https://dergipark.org.tr/en/download/article-file/91590

Özkatar Kaya, E., & Kaya, M. (2025). Fiziksel aktivitenin otonom sinir sistemi üzerindeki rolü: Vagus siniri perspektifinden bakış. In M. Altınkök (Ed.), Spor bilimleri alanında uluslararası akademik araştırma ve çalışmalar (pp. 89–102). Serüven Yayınevi

Özlü, M., Gezer, H., & Gezer, E. (2021). Evaluation of physical education and sports candidate teachers' views on distance education. Pakistan Journal of Medical and Health Sciences, 15(11), 3329–3333. https://doi.org/10.53350/pjmhs2115113329

Rokka, S., Mavridis, G., Mavridou, Z., Kelepouris, A., & Filippou, D. A. (2015). Traditional dance as recreational activity: teenagers' motives participation. *Sport science*, *8*(2), 75-81.

Sango, P., & Pickard, A. (2024). Building a sense of belonging in dance with adolescents: A systematic review. *Adolescents*, 4(3), 335-354

Schmidt, E. M., & Christensen, J. F. (2025). The potential of a 'dance break' to regulate mood: A pre-registered study. *British Journal of Psychology*.

Soyer, A. (2020). *Serbest zaman ilgilenimi ile örgütsel bağlılık arasındaki ilişki: Yerel yönetimlerde bir araştırma* (Yüksek lisans tezi). Sakarya Uygulamalı Bilimler Üniversitesi, Lisansüstü Eğitim Enstitüsü.

Sönmemiş, G. (2021). İletişim Aracı Olarak Dans: Ya da dans bir iletişim şekli midir?. *ARTS: Artuklu Sanat ve Beşerî Bilimler Dergisi*, (5), 100-117. study. SPORMETRE Journal of Physical Education and Sport Sciences, 21(2), 48–62.

Şeyhanlı D., Gürbüz, C., & Akman, C. N. (2024). COVID-19 korkusunun normalleşme sürecinde fiziksel aktivite üzerine etkisi. İ. Doğan, Ü. Erbaş, & Z. Çakır (Ed.), Disiplinlerarası spor çalışmaları (ss. 5–16). Duvar Yayınları.

Şakar, M., Güzel, S., & Yel, K. (2024). Dijitalleşmenin spor ve fiziksel aktivite üzerindeki psikolojik yansımaları: Bir inceleme. In F. Çatıkkâş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 43–65). Duvar Yayınları

Şakar, M., & Kızılkaya Namlı, A. (2023). Öznel zindeliğin psikolojik sağlamlık üzerindeki etkisinde zihnin istemli ve istemsiz gezinmesinin aracılık rolü, The Online Journal of Recreation and Sports (TOJRAS), 12(3), 352-361

T.C. Çalışma ve Sosyal Güvenlik Bakanlığı. (t.y.). *Psikososyal faktörler bilgilendirme rehberi.*

Tapşın, F. O., & Alev, A. (2024). Rekreasyon ve toplum: Sosyal etkiler ve katılım.

Terappin. (2023). *Psikososyal ve Psikospiritüel Kavramları: Anlamları ve Önemi*.

Tunçgenç, B., Greig, E. J., & Cohen, E. (2024). Benefits of an online group dance program for adolescents' social bonding and wellbeing. *Journal of Adolescence*, *96*(8), 1917-1928

Türk Dil Kurumu, Genel Türkçe Sözlük, http://www.tdk.gov.tr, 15.03.2012

Uslu, T. (Ed.). (2023). *Özgün zaman etkinliklerine rekreatif katılım ve kampüs rekreasyonu*. Duvar Yayınları. ISBN 978-625-6643-33-8.

Ünlü, Ö. B. (2009). *Dans tiyatrosunun oluşumunda dans antropolojisinden yararlanma yolları ve Anadolu danslarından model önerileri* (Doctoral dissertation, Dokuz Eylul Universitesi (Turkey)).

Yaman, M. S., Bar, M., Sarıkabak, M. & Hergüner, G. (2016). Identification of expectations and encountered problems of the middle-school students participating in the sports activities. Journal of Human Sciences, 13(2), 3044-3056. doi:10.14687/jhs.v13i2.3683

Yang, Z. (2025). Research on the application of dance therapy in the field of mental health. *Journal of Medicine and Health Science*, *3*(1), Article 2378.

Yaşar, Y., & Direkçi, V. (2025). Rekreasyon yönetimi: Türkiye ve dünya perspektifi. In M. Gönen, M. A. Ceyhan, & Z. Çakır (Eds.), Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler (pp. 24–36). Duvar Yayınları.

Yermakhanov, B., & Zorba, E. (2022). Rekreasyonda yaşam kalitesi ve fiziksel aktivitenin yeri ve önemi. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 8(2), 443-459.

Yeşilyurt, H., Çalışkan, C., (2020) Rekreasyon: Etkileşim Alanları. (ss. 39-68). Akademisyen Kitabevi. Turizm İşletmelerinde Rekreasyon ve Animasyon.

Yıldız, M. E., Aslan, H., & Günel, İ. (2024b). Fiziksel aktivite ve yaşam doyumu. C. Yavuz & T. Çelik (Ed.), Spor bilimlerinde yenilikçi yaklaşımlar–2 (ss. 183–194). Duvar Yayınları.

Yıldız, M. E., Günel, İ., & Dalbudak, İ. (2024a). The relationship between physical activity and mindful awareness of university students. Physical Education of Students, 28(4), 234-241.

Zafeiroudi, A. (2023). *Dance and psychological health: Effect of dance participation on social development*. Journal of Social Science Studies, 10(2), 90–100.

CHAPTER 6

Flexibility and Joint Range of Motion in Sports: A Sport-Specific Perspective on Performance and Injury Risk

Sema GÜZEL[1]

Assist. Prof. Menzure Sibel YAMAN[2]

Güzel, S., & Yaman, M. S. (2025). *Flexibility and joint range of motion in sports: A sport-specific perspective on performance and injury risk*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (Chapter 6, pp. 82–96). Duvar Yayınları. ISBN: 978-625-8698-69-5

[1]Bayburt University Graduate Education Institute, Bayburt, Türkiye,
E-mail: semaguzel2019@gmail.com / Orcid: 0009-0009-2761-3273

[2] Istanbul Rumeli University, Faculty of Sport Sciences
Department of Recreation, Recreation Program
ORCID: 0000-0002-0715-3646

1. Introduction

Flexibility has long been regarded as a fundamental component of physical fitness in the sports science literature. It has traditionally been assumed to play a central role in enhancing performance and preventing injury. By increasing joint range of motion, flexibility enables movements to be executed with greater amplitude, control, and safety. It represents a fundamental motor characteristic that interacts with technical performance, force transmission, and motor coordination. However, systematic reviews and theoretical evaluations published over the past two decades have demonstrated that the relationship between flexibility and athletic performance is neither direct, linear, nor universally applicable. In particular, the inconsistency of findings regarding flexibility–performance and flexibility–injury relationships across different sport disciplines suggests that flexibility should be examined within a more contextualised and sport-specific framework (Behm et al., 2016; Magnusson & Renström, 2006).

Contemporary approaches in sport science conceptualise athletic performance not as the sum of isolated motor attributes, but rather as the emergent output of a complex system arising from the interaction between the individual, the task, and the environment. This perspective aligns with the constraints-led model in the motor control literature, which emphasises that performance is shaped not only by an individual's structural characteristics but also by environmental conditions and task demands (Newell, 1986). Within this framework, flexibility is positioned not as an independent determinant of performance, but as an individual constraint that defines the boundaries of an athlete's available movement repertoire.

Sport is widely recognised as a multidimensional construct that supports the physical, psychological, and cognitive development of individuals. At the level of active participation, however, sport also constitutes a holistic process that encompasses performance- and competition-oriented physical, mental, and technical demands (Şakar & Kahraman, 2023; Şakar & Kızılkaya Namlı, 2023; Çelik, 2025; Çetin Sarışık & Şahin; 2021). Modern sporting environments require athletes not only to possess high physical capacity but also to generate effective and adaptable movement solutions under variable, unpredictable, and dynamic conditions. The ecological dynamics and skill acquisition literature underscores that such adaptability cannot be reduced to a single physical attribute; rather, it reflects an integrated structure involving coordination, motor control, and perceptual-environmental processes (Davids et al., 2008; Seifert et al., 2016). Within this integrative framework, flexibility is best understood as a complementary component that enables movement variability, yet does not independently account for athletic performance.

2. Flexibility in Athletic Performance

In contemporary sport science literature, flexibility is no longer conceptualised merely as a physical attribute defined by the passive range of motion of the joints. Instead, it is increasingly framed within a broader motor capacity perspective, associated with an individual's potential to generate movement solutions that are attuned to environmental and task-specific demands (Temur, 2017). This perspective aligns closely with contemporary motor control theories that emphasise the non-linear nature of motor behaviour, particularly the constraints-led approach (Newell, 1986; Latash, 2010). Within this framework, flexibility is categorised under individual constraints, functioning as a structural factor that delineates the potential boundaries of an athlete's movement repertoire.

From an ecological dynamics perspective, the role of flexibility in performance is further elaborated by highlighting that movement capacity operates in conjunction with

environmental interactions and perceptual processes. According to this view, flexibility does not guarantee the "correct" execution of a given movement; instead, it provides a movement landscape that allows athletes to explore multiple coordinative solutions (Davids et al., 2008). However, for this movement landscape to contribute meaningfully to athletic performance, it is not sufficient for movement capacity to merely exist; it must also be controllable and functionally deployable in accordance with task demands.

In support of this functional perspective, static stretching has been shown to acutely impair anaerobic performance, whereas caffeine intake may counterbalance this inhibitory effect by enhancing neural drive, highlighting that increased range of motion alone does not necessarily translate into functional performance benefits (Çabuk et al., 2025).

Within this context, the conceptual value of flexibility lies not in its quantitative maximisation but in its sufficiency and functionality relative to sport-specific requirements. An increasingly robust consensus in the current literature suggests that the contribution of flexibility to performance is non-linear, and that the scientific validity of overly generalised flexibility norms remains limited (Seifert et al., 2016; Magnusson & Renström, 2006; Gleim & McHugh (1997). Collectively, these findings indicate that the role of flexibility within sport science should be evaluated not through quantitative threshold values, but through a qualitative and context-sensitive lens.

3. Flexibility and Motor Performance Characteristics

Athletic performance represents a holistic outcome that emerges from the simultaneous and reciprocal interaction of multiple motor characteristics, including strength, speed, balance, coordination, and agility (Temur et al., 2022). Within this system, flexibility is not regarded as an independent determinant of performance, but rather as a complementary component that facilitates the functional utilisation of other motor abilities in accordance with sport-specific task demands. In a study conducted with children aged 7–9 years, flexibility and other motor characteristics were shown to vary according to age and sex, with boys demonstrating higher outcomes, particularly in performance-based tests (Çelik et al., 2013). This perspective is consistent with contemporary motor control theories that emphasise the non-linear nature of motor behaviour, highlighting that performance cannot be adequately explained through isolated variables (Latash, 2010; Afonso et al., 2021). In a study by Altınkök et al. (2020), preschool children who participated in a diversified movement education program based on coordination methods exhibited higher levels of flexibility and balance compared to those engaged in standard movement education practices.

The relationship between flexibility and motor performance is predominantly indirect, manifesting through movement fluency, intersegmental coordination, and the continuity of technical execution. Adequate movement capacity may enable athletes to perform technical skills with fewer compensatory strategies and more efficient coordinative solutions. Yıldız et al. (2018) reported that the use of a vibrating foam roller in addition to dynamic stretching prior to exercise resulted in an acute and statistically significant increase in flexibility values; however, no adverse effects were observed on speed, agility, or vertical jump performance. Nevertheless, for such changes to translate into meaningful performance outcomes, flexibility must be considered in conjunction with other key determinants, including force production capacity, motor control proficiency, and neuromuscular coordination (Afonso et al., 2021; Behm et al., 2016).

The existing literature does not provide strong evidence that flexibility alone consistently produces predictable improvements in performance outcomes. Rather, these findings support the view that the influence of flexibility on performance is context-dependent and sport-

specific, positioning flexibility not as a central performance target, but as an infrastructural component that enables the emergence of performance (Behm et al., 2016; Gleim & McHugh (1997). This perspective mitigates overly ambitious performance expectations attributed to flexibility within sport science, offering a more realistic and integrative framework for evaluation instead.

3.1. The Relationship Between Flexibility, Agility, and Coordination

Agility is defined in the sport science literature as a multidimensional performance characteristic that extends beyond mere physical change-of-direction speed, encompassing the integration of perceptual cue processing, decision-making processes, and motor execution (Sheppard & Young, 2006). Within this context, agility performance is shaped by the interaction of cognitive and neuromuscular processes rather than by physical capacity alone. Flexibility, in turn, is conceptualised not as a direct determinant of agility but as a structural prerequisite that provides a movement space enabling athletes to implement diverse movement solutions. Karadenizli and Paçalıoğlu (2024) reported significant relationships between vertical and horizontal jump performance, speed, and agility in children aged 4–6 years; however, flexibility values did not exhibit a significant association with these motor characteristics.

In line with this perspective, it has been reported that dynamic stretching exercises applied during the warm-up phase enhance speed and agility performance, whereas static stretching exercises exert more pronounced effects on flexibility (Polat, Edis & Çatıkkaş, 2019).

From a coordination perspective, sufficient movement capacity may contribute to maintaining intersegmental coherence, thereby supporting the consistency of technical execution. In a study involving individuals aged 8–13 years, vertical jump performance was found to be significantly associated with sex, age, height, body mass, and trunk fat mass. In contrast, no significant relationship was identified between flexibility and vertical jump performance. Furthermore, flexibility levels were reported to be higher in females compared to males, and flexibility was observed to decrease with increasing age and trunk fat mass (Temur & Selçuk, 2017).

The ecological dynamics approach emphasises the critical role of movement variability in performance adaptation, positioning flexibility as one of the structural components necessary for the emergence of such variability (Davids et al., 2008; Seifert et al., 2016). From this perspective, flexibility facilitates the diversification of coordinative solutions but does not independently determine their effectiveness.

Nevertheless, the existing literature does not provide strong evidence that flexibility alone yields consistent improvements in agility performance. Agility emerges from the simultaneous interaction of multiple components, including perceptual–cognitive processes, force production, balance, and motor control. Consequently, the relationship between flexibility and agility should be considered not within a direct causal framework, but rather as an indirect, sport-, task-, and context-specific association (Sheppard & Young, 2006).

3.2. The Interaction Between Flexibility, Strength, and Balance

Strength and balance are among the fundamental determinants of performance in many sports, playing a particularly critical role in the effective execution of high-intensity, multidirectional, and complex movement patterns (Şahin et al., 2022). Flexibility interacts with these motor characteristics by indirectly influencing movement feasibility, continuity, and postural organisation. A systematic review examining the flexibility–strength relationship reported that static stretching interventions may reduce strength performance,

whereas dynamic stretching exercises tend to exert a neutral effect on performance outcomes (Işık, Akçakaya, & Şenel, 2020). Especially in multi-joint and asymmetrical movements, adequate movement capacity allows for more adaptable postural adjustments, thereby supporting the safe and controlled execution of motor tasks (Latash, 2010).

Nevertheless, the existing literature does not provide strong evidence for a direct and consistent relationship between flexibility and strength outputs. Systematic reviews and experimental studies indicate that strength performance is primarily associated with neuromuscular adaptations, the level of motor control, and technical proficiency (Behm et al., 2016; Afonso et al., 2021). Investigating the effects of sport-specific training on motor development in children, Şar and Akgün (2025) reported that tennis training particularly enhanced motor characteristics such as strength, jump performance, speed, and agility, while exerting a limited effect on balance development. These findings suggest that flexibility is not a primary determinant of force production capacity; instead, it assumes a supportive role in enabling the functional utilisation of strength.

Similarly, balance performance represents a multidimensional construct that cannot be explained solely by movement capacity, but is shaped by perceptual–cognitive processes and neuromuscular control mechanisms. Within this framework, flexibility should not be considered an independent variable central to strength and balance performance; instead, it should be regarded as a complementary component that facilitates the effective, sustainable, and safe application of these motor characteristics within sport-specific contexts (Gleim & McHugh (1997).

4. Sport-Specific Movement Requirements

Each discipline's unique movement repertoire shapes fundamental differences among sports and the task demands it entails. Within this context, the role of flexibility in performance should be evaluated not as a universal attribute, but within the framework of sport-specific requirements. The same movement capacity may serve different functional purposes across disciplines, and its contribution to performance may vary depending on contextual factors (Gleim & McHugh (1997).

A sport-specific approach demonstrates that treating flexibility as a uniform performance indicator across all sports has limited validity. Instead, the functional role of flexibility should be redefined by considering the movement diversity, modes of technical execution, environmental conditions, and task constraints inherent to each sport. This perspective enhances the theoretical and practical validity of scientific evaluations of flexibility, rendering them more applicable and contextually grounded (Davids et al., 2008).

Accordingly, the functional role of flexibility within performance differs between individual and team sports, and these distinctions are addressed separately in the following sections.

4.1. Individual Sports

Gymnastics

In the literature, gymnastics is defined as one of the fundamental sports disciplines encompassing a broad motor spectrum and requiring high levels of body control, physical conditioning, and technical proficiency (Albuquerque et al., 2007). High technical precision, aesthetic evaluation, and complex movement combinations are the distinguishing characteristics of gymnastics; within this context, flexibility emerges as a prominent performance component, enabling extensive ranges of motion and supporting the visual

quality of technical execution (Bradshaw & Hume, 2012). Nevertheless, successful performance in gymnastics is not solely contingent upon possessing a high degree of movement capacity, but also depends on the controlled, consistent, and coordinated application of this capacity (Yel et al., 2023).

It has been reported that aerobic and coordinative exercises specific to gymnastics exert positive effects on motor skills, balance, flexibility, and overall physical fitness, particularly in children during developmental stages (Güven, 2005; Mitchell, Davis, & Lopez, 2002). Within this framework, flexibility may be regarded as a structural prerequisite that expands an individual's movement repertoire in gymnastics; however, performance outcomes are emphasised to be primarily associated with neuromotor factors such as coordination, timing, balance, and technical accuracy (Seifert et al., 2016). Indeed, Çiçek and Türkeri (2023) reported that gymnastics and taekwondo training administered to primary school students significantly improved flexibility and vertical jump performance. In contrast, the effects of gymnastics training on balance parameters were more pronounced. Collectively, these findings suggest that flexibility in gymnastics does not function as a direct determinant of performance, but rather assumes a contextual and complementary role through its interaction with other motor and technical components.

Pilates

Pilates exercises constitute a holistic training approach that aims to enhance the controlled and functional lengthening and shortening characteristics of muscles, with a primary emphasis on core stability, correct breathing patterns, and postural alignment. This method was initially developed in the 1920s by Joseph Pilates under the name *Contrology* and is defined as an exercise system centred on the harmonious integration of body and mind (Pilates & Miller, 1945). Contemporary literature indicates that Pilates-based training programs, particularly when implemented through low- to moderate-intensity yet continuous practice, effectively increase joint range of motion and produce significant improvements in both static and dynamic flexibility (Latey, 2001; Kloubec, 2010; Cruz-Ferreira et al., 2011).

Moreover, Pilates exercises promote balanced activation among muscle groups, thereby contributing to the concurrent development of flexibility alongside strength, balance, and motor control components. In this regard, Pilates is increasingly recognised as a complementary and sustainable training modality for both athletes and sedentary individuals (Segal et al., 2004; Erbaş, 2018; Wells et al., 2014; Güzel et al., 2024). Additionally, it has been reported that conjugated linoleic acid (CLA) supplementation combined with Pilates exercise produces more pronounced positive effects on resting metabolic rate and waist circumference compared to exercise interventions alone (Ersoy & Temür, 2023).

Taekwondo and Karate

In combat sports such as taekwondo and karate, flexibility serves a functional role in enhancing technical variation and supporting tactical adaptability. An extensive range of motion enables athletes to execute a broader array of technical solutions more safely and effectively, particularly facilitating movement economy during high-kicking techniques and defensive–counterattacking transitions (Bridge et al., 2014).

In this context, Arabacı, Görgülü and Çatıkkaş (2010) emphasised that agility assessments in combat sports should not be limited to physical performance components, but should also incorporate cognitive properties such as anticipation and pattern recognition.

Civan et al. (2025) reported that female taekwondo athletes exhibited higher flexibility levels than their male counterparts. In contrast, a strong and positive relationship was observed between flexibility and vertical jump performance in male athletes.

In a study conducted by Özsoy, Eler, and Eler (2018), elite taekwondo athletes demonstrated superior performance in parameters requiring anaerobic power, speed, and explosive strength compared to poomsae athletes. Nonetheless, performance in these disciplines is understood to be based on the integrated interaction of speed, timing, balance, force production, and perceptual–cognitive processes. Within this integrated framework, flexibility is emphasised not as a direct determinant of performance, but as a complementary component that supports technical diversity and tactical adaptability.

Consistent with this perspective, Alp, Çatıkkaş and Kurt (2019) reported that elite taekwondo athletes accustomed to static and dynamic stretching practices may be less susceptible to stretching-induced strength deficits.

Similarly, the study by Reyhan, Enişte, and Özoruç revealed that children who regularly engaged in karate-do training exhibited significantly better performance in motor characteristics, such as speed, flexibility, balance, reaction time, and strength, compared to their non-athletic peers. Collectively, these findings support the view that flexibility in combat sports should be developed in a balanced manner alongside other motor and cognitive attributes, in accordance with sport-specific demands.

Athletics

Athletics is one of the sports in which the role of flexibility in performance varies most markedly due to the diversity of disciplines it encompasses. Sprinting, jumping, and throwing events differ in their specific movement demands, rendering flexibility a context-dependent variable in performance. In general terms, flexibility in athletics is regarded as a structural characteristic that delineates the boundaries of technical execution and influences the feasibility of movement (Haugen et al., 2019). Bayram, Şam, and Zepak (2020) reported that elite male athletes exhibited higher levels of flexibility and endurance compared to alpine skiers. In contrast, skiers demonstrated superiority in strength, grip strength, and anaerobic power parameters. In endurance-based athletic events, critical velocity (CV) models have been shown to effectively predict 10,000 m running performance, with the linear 1/velocity model exhibiting lower prediction error and effect size compared to alternative approaches (Çabuk et al., 2023).

In sprinting and jumping events, performance is primarily based on force production, speed, elastic energy utilisation, and reactive capabilities. Within this context, the role of flexibility is confined mainly to supporting range of motion and does not demonstrate direct or consistent associations with performance enhancement. The current literature suggests that athletic performance is more closely related to neuromuscular and biomechanical variables than to flexibility itself (Gleim & McHugh (1997).

Supporting this perspective, high-intensity interval training interventions focusing on neuromuscular and metabolic adaptations have been shown to elicit significant improvements in endurance and strength, independent of flexibility-oriented components (Cin & Çabuk, 2025).

From an injury risk perspective, flexibility in athletics is not considered a protective factor when evaluated in isolation. Training load, repetition volume, and recovery processes are emphasised as primary determinants of injury occurrence, with flexibility occupying a secondary position within this multifactorial structure (Bahr & Krosshaug, 2005; Fleming, 2011). Consequently, assessments of flexibility in athletics should be conducted in

conjunction with other physiological and biomechanical factors that influence both performance and risk of injury.

Swimming

Swimming performance involves movement requirements that differ markedly from those of terrestrial sports due to the physical properties of the aquatic environment. Within this context, flexibility is not considered a direct determinant of performance in swimming; rather, it is regarded as a complementary component associated with technical efficiency, movement economy, and the maintenance of hydrodynamic body positions. Particularly in swimming disciplines that require rhythmic and continuous use of the upper extremities and trunk segments, adequate movement capacity may support the fluency and continuity of technical execution (Seifert et al., 2014).

Current literature indicates that swimming performance is more strongly related to anthropometric characteristics, coordination, rhythm, and motor control processes than to flexibility. Pehlivan and Karadenizli (2019) reported that anthropometric and motor characteristics were decisive factors in 50 m swimming performance among short-distance swimmers. In contrast, Atabaş and Kumartaşlı (2025) found that although functional training enhanced strength development, its effects on swimming performance and flexibility remained limited. These findings suggest that flexibility alone does not play a direct determining role in speed or endurance outcomes in swimming (Barbosa et al., 2010; Gleim & McHugh (1997).

Göksu and Yüksek (2003) reported that an eight-week dynamic stretching program implemented in female swimmers aged 10–12 years resulted in significant improvements in flexibility values of the shoulder, hip, and ankle joints. However, from an injury risk perspective, flexibility in swimming is not considered a variable that independently explains overuse injuries; instead, injuries are emphasised to be primarily associated with factors such as training volume, frequency of technical repetition, and load management (Swimmer et al., 2019). Accordingly, flexibility should be positioned as a supportive yet limited component within injury prevention strategies in swimming.

Skiing

In alpine and Nordic skiing disciplines, performance is primarily based on balance, coordination, and the ability to adapt to environmental stimuli rapidly. Given the variable terrain structure and high-speed conditions inherent to skiing, flexibility is not considered a direct determinant of performance; rather, it is regarded as a complementary component that supports movement coordination and the sustainability of technical execution (Spörri et al., 2017). Demirel et al. (2023) reported significant differences in motor characteristics between female track athletes and skiers, with athletes demonstrating higher flexibility levels, while skiers exhibited superior back strength, agility, and reaction performance.

Skiing contributes to the development of parameters such as balance, agility, and proprioception. It has been reported that well-developed balance and proprioceptive function may reduce injuries resulting from falls and collisions (Raschner et al., 2017; Irrgang, Whitney, & Cox, 2010; Çetin Sarışık & Şahin, 2024). However, the execution of movements at high speeds and under unpredictable surface conditions renders performance largely dependent on neuromuscular control, postural balance, and motor coordination. Within this context, the role of flexibility is limited to providing the necessary range of motion to support the feasibility of technical execution, and the literature does not offer substantial evidence

linking flexibility directly and consistently to performance enhancement in skiing (Supej et al., 2018).

From an injury risk perspective, injury occurrence in skiing disciplines is primarily associated with speed, terrain characteristics, and external environmental factors. Within this multifactorial structure, flexibility is not viewed as an independent determinant of injury risk; rather, it is considered a complementary and secondary component within injury prevention strategies (Bahr & Krosshaug, 2005; Spörri et al., 2017).

4.2. Team Sports

Basketball and Volleyball

Basketball and volleyball are team sports characterised by high demands for jumping, landing, and rapid changes of direction, with performance emerging from the integrated interaction of force production, timing, technical execution, and decision-making processes (Ziv & Lidor, 2010). Within this context, flexibility functions as an infrastructural component that supports the feasibility and continuity of movement execution. Çon et al. (2012) reported that flexibility exerted a positive effect on vertical jump performance in volleyball players.

Nevertheless, the primary determinants of performance outcomes in these sports are technical skill proficiency, tactical decision-making, and sport-specific motor control processes. Arslan et al. (2009) found significant relationships between specific body composition parameters and flexibility in elite female basketball players; however, this association was not observed among women who participated in regular recreational sports. In light of these findings, flexibility in basketball and volleyball is best conceptualised not as a direct determinant of performance, but as a complementary component that supports the underlying movement infrastructure (Ziv & Lidor, 2010; Gleim & McHugh (1997).

Football

Football is a complex team sport characterised by multidirectional movements, frequent physical contact, and high-intensity repetitive actions (Gıdık & Çelik, 2024). Within this context, flexibility is regarded as an indirect factor that supports an athlete's capacity to adapt to variable task demands and in-game situations (Bangsbo et al., 2018).

In football, both performance outcomes and injury risk are shaped by the interaction of multiple variables, including training load, fatigue, movement quality, and recovery processes. The role of flexibility within this multifactorial structure is limited; rather than exerting a direct determining effect on performance or injury risk, flexibility assumes a contextual and complementary function (Bahr & Krosshaug, 2005).

Handball

Handball is a team sport characterised by high-intensity physical contact, abrupt changes of direction, and pronounced upper-extremity involvement. Within this context, flexibility is not considered a direct determinant of performance; rather, it is regarded as a complementary component that supports athletes' ability to adapt to complex and variable movement demands. The requirement for rapid decision-making and robust motor control in technical execution suggests that flexibility provides a foundational movement infrastructure for these processes (Wagner et al., 2014).

Performance outcomes in handball, particularly in relation to throwing velocity, jumping ability, and change-of-direction skills, are primarily associated with force production and coordination. In a study involving male handball players aged 15–17 years, plyometric

training was reported to improve biomotor characteristics such as vertical jump performance and flexibility, while exerting no significant effect on overhand shooting accuracy (Ürer & Kılınç, 2014). Although flexibility is not identified as a factor that directly enhances these performance indicators, it contributes indirectly by supporting movement continuity and the feasibility of technical execution (Michalsik et al., 2015). From an injury risk perspective, it is emphasised that injuries in handball are primarily determined by contact intensity, training load, and fatigue, with flexibility not serving as an explanatory variable in isolation within this multifactorial structure (Bahr et al., 2018).

Boxing

Boxing is a combat sport characterised by high-intensity contact and continuous movement, in which performance is predominantly based on timing, reaction speed, coordination, and perceptual–cognitive processes (Slimani et al., 2017). Within this context, flexibility is not positioned as a central performance attribute; rather, it is regarded as a complementary component that supports movement variability and the feasibility of technical execution. Indeed, the literature indicates that boxing performance is more strongly associated with force production, speed, and cognitive proficiency than with flexibility (Chaabène et al., 2015). The finding that rope skipping and agility ladder exercises improve agility performance in elite male boxers further supports the view that performance is shaped primarily by neuromuscular and coordinative characteristics rather than by flexibility per se (Elidemir, Bilge, & Yıldırım, 2022).

From an injury risk perspective, boxing is a discipline in which traumatic injuries are relatively common, with risk associated mainly with the frequency and intensity of contact as well as exposure duration. Consequently, flexibility should not be considered a standalone preventive factor for injuries; instead, it should be positioned as a secondary and supportive component within sport-specific risk management and injury prevention strategies (Bahr et al., 2018).

Wrestling

Wrestling is a sport characterised by a high degree of physical contact and force production, in which performance emerges through direct interaction with an opponent. Within this context, flexibility is not regarded as a direct determinant of performance; instead, it is conceptualised as an indirect factor that supports technical variability and positional adaptability (Mirzaei et al., 2019). Performance outcomes in wrestling are primarily associated with maximal strength, strength endurance, and motor control. Indeed, a study conducted on elite wrestlers and judokas reported that reductions in body mass of 3–7% did not produce a significant effect on flexibility, while exerting detrimental effects on aerobic and anaerobic power capacities (Yamak, 2019). These findings support the view that success in wrestling is grounded in a multidimensional performance structure that operates largely independently of flexibility (Mirzaei et al., 2017).

From an injury risk perspective, injuries in wrestling are primarily determined by the intensity of contact, training load, and repetition volume. Within this multifactorial structure, flexibility is not considered an independent determinant of injury risk; however, it should be addressed as a supportive component within holistic injury prevention and load management strategies (Bahr & Krosshaug, 2005; Mirzaei et al., 2019).

5. Flexibility in Sport, Warm-Up Protocols, and Functional Movement Capacity

Although flexibility has long been regarded in the sport science literature as a fundamental physical attribute that enhances performance and reduces injury risk, contemporary evidence indicates that these effects are neither direct nor universal. The contribution of flexibility to performance is best understood as a complementary motor characteristic whose relevance emerges when evaluated in conjunction with sport-specific movement requirements, neuromuscular control, and task demands (Behm et al., 2016; Gleim & McHugh (1997). This perspective repositions flexibility from an independent target to a component of functional movement capacity.

Modern sport science conceptualises athletic performance as the output of a complex system arising from the interaction between the individual, the task, and the environment. Within this framework, flexibility is defined as an individual constraint that delineates the boundaries of an athlete's movement repertoire (Newell, 1986; Davids et al., 2008; Seifert et al., 2016). Performance outcomes, in turn, are shaped by the interaction of this capacity with other determinants such as strength, motor control, and timing.

In line with this systems-based perspective, eight weeks of TABATA-type calisthenic and cycling-based high-intensity interval training have been shown to elicit comparable improvements in aerobic endurance and critical power, highlighting that performance adaptations are driven primarily by neuromuscular and metabolic factors rather than flexibility-oriented interventions alone (Kul et al., 2022).

In the context of warm-up protocols, although active warm-up strategies have been reported to exert more favourable effects on flexibility values, the primary function of warm-up is emphasised to be not the enhancement of flexibility per se, but rather the controlled and effective utilisation of existing movement capacity in sport-specific tasks (Behm et al., 2016; Hazar et al., 2018). The differentiation of warm-up objectives across preseason, in-season, and pre-competition periods further highlights the necessity of addressing flexibility within a contextual framework (Lloyd et al., 2015; Afonso et al., 2021).

Post-training flexibility interventions are reported to be more closely associated with recovery, perceived fatigue, and movement comfort than with performance enhancement. Rather than producing lasting increases in flexibility, such practices are suggested to contribute to the maintenance of functional movement capacity (Magnusson & Renström, 2006). Similarly, the injury risk–reducing effects of the FIFA 11+ program are attributed not primarily to flexibility, but to neuromuscular adaptations targeting balance, strength, coordination, and motor control (Soligard et al., 2008; Al Attar et al., 2017; Bahr & Krosshaug, 2005).

Accordingly, flexibility should not be considered an independent variable at the centre of athletic performance. Instead, it should be evaluated as a complementary performance component that must be integrated with warm-up protocols, training planning, load management, and recovery strategies (Afonso et al., 2021; Gleim & McHugh (1997).

6. Conclusion

The findings synthesized in this review indicate that flexibility is neither a direct nor a universal determinant of athletic performance; rather, it should be conceptualized as a complementary motor characteristic that supports the effective, controlled, and sustainable execution of sport-specific movements. Across different sport disciplines, the functional role

of flexibility varies substantially depending on technical, tactical, and environmental requirements.

The available scientific evidence demonstrates that the relationship between flexibility and both performance outcomes and injury risk is non-linear. This relationship acquires meaning only within a multifactorial framework in which variables such as neuromuscular control, force production, load management, motor coordination, and environmental interactions are considered collectively. Accordingly, positioning flexibility as a standalone performance-enhancing or injury-preventive factor represents a limited and reductive approach (Gleim & McHugh (1997).

Within this framework, flexibility should be regarded in modern sport science as a limited yet indispensable component of holistic performance and injury management models. Future research is expected to adopt longitudinal and theory-driven approaches that examine flexibility in conjunction with motor control, loading dynamics, and environmental constraints. In particular, studies grounded in ecological dynamics and motor control theories are likely to further clarify the contextual role of flexibility within athletic performance (Davids et al., 2008; Seifert et al., 2016).

— — — — — — — — — — — — — —

References

Afonso, J., Ramirez-Campillo, R., Moscão, J., Rocha, T., Zacca, R., Martins, A., Milheiro, A., & Sarmento, H. (2021). Strength training, flexibility, and mobility: An integrative perspective. *Sports Medicine, 51*(5), 933–948. https://doi.org/10.1007/s40279-020-01394-1

Al Attar, W. S. A., Soomro, N., Pappas, E., Sinclair, P. J., & Sanders, R. H. (2017). How effective are FIFA 11+ injury prevention programs for soccer players? A systematic review and meta-analysis. *Sports Medicine, 47*(10), 2059–2073. https://doi.org/10.1007/s40279-017-0693-9

Albuquerque, P. A. D., ve Farinatti, P. D. T. V. (2007). Development and validation of a new system for talent selection in female artistic gymnastics: The PDGO Battery. Revista Brasileira de Medicina do Esporte, 3(13), 157-164. https://doi.org/10.1590/S1517-86922007000300006

Alp, M., Çatıkkaş, F., & Kurt, C. (2018). Acute effects of static and dynamic stretching exercises on lower extremity isokinetic strength in taekwondo athletes. *Isokinetics and Exercise Science*, *26*(4), 307-311. https://dergipark.org.tr/en/pub/tsbd/article/527549

Altınkök, M., Esen, H. T., Eraslan, M., Gürbüz, C., Şeran, B., Kurnaz, M., & Eravşar, H. (2020). Farklı hareket eğitimi alan okulöncesi çocukların denge ve esneklik kapasitelerinin incelenmesi. *Sportive*, *3*(1), 42–53. https://dergipark.org.tr/tr/pub/sportive/article/694597

Arabacı, R., Görgülü, R., & Çatıkkaş, F. (2010). Relationship between agility and reaction time, speed and body mass index in taekwondo athletes. *Sport Sciences, 5*(2), 71-77. https://dergipark.org.tr/en/pub/nwsaspor/article/213818

Arslan, E., Yılmaz, İ., & Aras, Ö. Z. G. E. N. (2009). Elit kadın basketbol oyuncularında ve düzenli spor yapan kadınlarda vücut kompozisyonu ve esneklik ilişkisi: pilot çalışma. *Fizyoter Rehabil*, *20*(2), 83-88. https://dergipark.org.tr/en/download/article-file/138133

Atabaş, E. G., & Kumartaşlı, M. 8 Haftalık Fonksiyonel Antrenman Yaklaşımının Genç Erkek Yüzücülerin Kuvvet, Esneklik ve Yüzme Performansına Etkisi. *Sportive*, *8*(1), 59-71. https://dergipark.org.tr/tr/pub/sportive/article/1596913

Bahr, R., & Krosshaug, T. (2005). Understanding injury mechanisms: A key component of preventing injuries in sport. *British Journal of Sports Medicine, 39*(6), 324–329. https://doi.org/10.1136/bjsm.2005.018341

Bangsbo, J., Mohr, M., & Krustrup, P. (2018). Physical and metabolic demands of training and match-play in the elite football player. *Journal of Sports Sciences, 36*(5), 1–10. https://doi.org/10.1080/02640414.2017.1349853

Barbosa, T. M., Bragada, J. A., Reis, V. M., Marinho, D. A., Carvalho, C., & Silva, A. J. (2010). Energetics and biomechanics as determining factors of swimming performance. *Journal of Human Kinetics, 24*, 5–14. https://doi.org/10.1016/j.jsams.2009.01.003

Bayram, M., Şam, C., & Zepak, M. (2020). *Elit düzeydeki kayak ve atletizm sporcularının fiziksel, fizyolojik ve motorik özelliklerinin karşılaştırılması*. Beden Eğitimi ve Spor Bilimleri Dergisi, **22**(3), 65–74. https://dergipark.org.tr/en/pub/ataunibesyo/article/746423

Behm, D. G., Blazevich, A. J., Kay, A. D., & McHugh, M. (2016). Acute effects of muscle stretching on physical performance, range of motion, and injury incidence in healthy active individuals: A systematic review. *Applied Physiology, Nutrition, and Metabolism, 41*(1), 1–11. https://doi.org/10.1139/apnm-2015-0235

Bostancı, Ö., Mayda, M. H., Tosun, M. İ., & Kabadayı, M. (2019). Yüksek Şiddetli İnterval Antrenman Programinin Fizyolojik Parametreler ve Solunum Kas Kuvveti Üzerine Etkisi. *SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi*, *17*(4), 211-219.

Bradshaw, E. J., & Hume, P. A. (2012). Biomechanical approaches to identify and quantify injury mechanisms and risk factors in women's artistic gymnastics. *Sports Biomechanics*, 11(3), 324–341. https://doi.org/10.1080/14763141.2011.650186

Bridge, C. A., Ferreira da Silva Santos, J., Chaabène, H., Pieter, W., & Franchini, E. (2014). Physical and physiological profiles of taekwondo athletes. *Sports Medicine*, *44*(6), 713–733. https://doi.org/10.1007/s40279-014-0169-5

Chaabène, H., Tabben, M., Mkaouer, B., Franchini, E., Negra, Y., Hammami, M., Amara, S., Chaabène, R. B., & Hachana, Y. (2015). Amateur boxing: Physical and physiological attributes. *Sports Medicine, 45*(3), 337–352. https://doi.org/10.1007/s40279-014-0274-7

Cin, M., & Cabuk, R. (2025). Effects of Running vs. Calisthenics-Based High-Intensity Interval Training Using the Tabata Protocol on Endurance, Strength, and Power in Gendarmerie Cadets. *The Journal of Strength & Conditioning Research*, *39*(7), e916-e923.

Civan, A. H., Uzun, M. E., Bezci, Ş., Yayvan, E., Şahin, M., Köktaş, E., & Doğan, İ. (2025). Taekwondo Sporcularının Esneklik Dikey Sıçrama ve Denge Performanslarının İncelenmesi. *Mediterranean Journal of Sport Science*, *8*(3), 465-477.

Close, G. L., Sale, C., Baar, K., & Bermon, S. (2019). Nutrition for the prevention and treatment of injuries in track and field athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, *29*(2), 189–197. https://doi.org/10.1123/ijsnem.2018-0290

Cruz-Ferreira, A., Fernandes, J., Laranjo, L., Bernardo, L. M., & Silva, A. (2011). A systematic review of the effects of Pilates method of exercise in healthy people. *Archives of Physical Medicine and Rehabilitation*, *92*(12), 2071–2081. https://doi.org/10.1016/j.apmr.2011.06.018

Çabuk, B., Demirarar, O., Cin, M., Çabuk, R., & Özçaldıran, B. (2023). The success of critical velocity protocol on predicting 10000 meters running performance. *Physical Education of Students*, *27*(4), 162-168.

Çabuk, R., Demirarar, O., Arslan, H., Cin, M., Ozcaldiran, B., & Karsten, B. (2025). Counteracting static stretching-induced anaerobic performance impairment: the role of caffeine. *Journal of Human Kinetics*.

Çelik, A., Günay, E., & Aksu, F. (2013). 7–9 yaş grubu ilköğretim öğrencilerinin fiziksel ve motorik özelliklerinin değerlendirilmesi. *Dokuz Eylül Üniversitesi Tıp Fakültesi Dergisi*, *27*(1), 7–13.

Çelik, H. (2025). Fiziksel aktivitenin mental sağlık üzerindeki koruyucu etkileri. M. Gönen, M. A. Ceyhan & Z. Çakır (Ed.), Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler içinde (ss. 37–50). Duvar Yayınları.

Çetin Sarışık, D., & Şahin, F. N. (2021). Polifenollerin Sağlık Ve Spor Performansına Etkileri. SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi, 19(3), 14-29. https://doi.org/10.33689/spormetre.901644

Çetin Sarışık, D., & Şahin, F. N. (2024). Effects of a comprehensive warm-up program on performance parameters of elite and sub-elite male skiers. *SPORT TK-EuroAmerican Journal of Sport Sciences*, *13*, 38. https://doi.org/10.6018/sportk.529251

Çiçek, İ., & Türkeri, C. (2023). İlkokul öğrencilerine uygulanan cimnastik ve taekwondo antrenmanlarının denge, esneklik ve sıçrama parametrelerine etkisi. *Spor Bilimleri Araştırmaları Dergisi*, *8*(3), 399-414.

Çon, M., Akyol, P., Tural, E., & Taşmektepligil, M. Y. (2012). Voleybolcuların esneklik ve vücut yağ yüzdesi değerlerinin dikey sıçrama performansına etkisi. *Selçuk Üniversitesi Beden Eğitimi ve Spor Bilim Dergisi*, *14*(2), 202-207. https://www.ajindex.com/dosyalar/makale/acarindex-1423931800.pdf

Davids, K., Button, C., & Bennett, S. (2008). *Dynamics of skill acquisition: A constraints-led approach*. Human Kinetics.

Demirel, N., Bayram, M., Zepak, M., Şam, C. T. (2023). Kadın Atlet ve Kayak Sporcuların Bazı Motorik Özelliklerinin Karşılaştırılması. Research in Sport Education and Sciences, 25(3), 56-60. https://doi.org/10.5152/JPESS.2023.22048

Durukan, H., Koyuncuoğlu, K., & Şentürk, U. (2016). Okul öncesi çocuklarda temel cimnastik programının motor gelişim açısından incelenmesi. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi*, *11*(2), 131–140.

Elidemir, S., Bilge, M., & Yıldırım, D. S. (2022). Boksörlerde İp Atlama ve Çeviklik Merdiveni Egzersiz Programının Çeviklik Performansına Etkisinin Karşılaştırılması. *Aksaray University Journal of Sport and Health Researches*, *3*(2), 239-251.

Erbaş, Ü. (2018). *Pilates egzersizlerinin fiziksel uygunluk ve postür üzerine etkileri*. Akademisyen Kitabevi.

Gıdık, O., & Çelik, H. (2024). Üniversite futbol takımı seçmelerine katılan futbolcuların yapay zekâ kaygı düzeylerinin incelenmesi. U. Erbaş, M. Gönen & M. A. Ceyhan (Eds.), *Sporda disiplinler arası bilimsel araştırmalar* içinde (Bölüm 6). Duvar Yayınları

Gilgien M, Kröll J, Spörri J, Crivelli P and Müller E (2018) Application of dGNSS in Alpine Ski Racing: Basis for Evaluating Physical Demands and Safety. Front. Physiol. 9:145. doi: 10.3389/fphys.2018.00145

Gleim, G. W., & McHugh, M. P. (1997). Flexibility and its effects on sports injury and performance. *Sports Medicine*, *24*(5), 289–299.

Göksu, Ö. (2003). 10-12 Yaş bayan yüzücülere uygulanan sekiz haftalık dinamik germe egzersizlerinin esneklik gelişimi üzerine etkisi. *İstanbul Üniversitesi Spor Bilimleri Dergisi*, *3*.

Gür, O., Yılmaz, G., & Şengür, E. (2024). Artistik cimnastik sporcularında pliometrik antrenmanın seçilmiş bazı motorik özellikler üzerine etkisinin incelenmesi. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, *9*(2), 126-141. https://doi.org/10.31680/gaunjss.1447383

Güven, N.M. (2005). Okul öncesi ve ilköğretimde beden eğitimi. Kök Yayıncılık. s.192

Güzel, S., Yel, K., Kurcan, K., & Erkılıç, A. O. (2024). An Evaluation of Postgraduate Theses on the Pilates Exercise Discipline. *Dede Korkut Spor Bilimleri Dergisi*, *2*(1), 32-46. https://dergipark.org.tr/en/pub/dksbd/article/1490308

Haugen TA, Breitschädel F, Seiler S. Sprint mechanical variables in elite athletes: Are force-velocity profiles sport specific or individual? PLoS One. 2019 Jul 24;14(7):e0215551. doi: 10.1371/journal.pone.0215551. PMID: 31339890; PMCID: PMC6655540.

Hazar, S., Polat, M., Hazar, K., Kaya, Ç., & Cansu, G. (2018). Aktif ve Pasif Isınmanın Esneklik, Anaerobik Güç ve Kuvvete Etkisi. *Ulusal Spor Bilimleri Dergisi*, *2*(1), 20-30.

Işık, M., Akçakaya, M. C., & Şenel, Ö. (2020). Esneklik performansının kuvvet ile ilişkisi. *International Journal of Social and Humanities Sciences Research*, *7*(63), 3894–3904.

Karadenizli, Z. İ., & Paçalıoğlu, B. (2024). 4–6 yaş grubu çocuklarda sürat, çeviklik, esneklik ve sıçrama performansı arasındaki ilişkilerin incelenmesi. *Düzce Üniversitesi Spor Bilimleri Dergisi*, *4*(2), 86–95.

Kloubec, J. A. (2010). Pilates for improvement of muscle endurance, flexibility, balance, and posture. *Journal of Strength and Conditioning Research, 24*(3), 661–667. *DOI:* 10.1519/JSC.0b013e3181c277a6

Kul, M., Turkmen, M., Yildirim, U., Ceylan, R., Sipal, O., Cabuk, R., ... & Adatepe, E. (2022). High-Intensity Interval Training with Cycling and Calisthenics: Effects on Aerobic Endurance, Critical Power, Sprint and Maximal Strength Performance in Sedentary Males. *Retos: nuevas tendencias en educación física, deporte y recreación*, (46), 538-544.

Latash, M. L., Levin, M. F., Scholz, J. P., & Schöner, G. (2010). Motor control theories and their applications. Medicina, 46(6), 382. https://doi.org/10.3390/medicina46060054

Lloyd, R. S., Oliver, J. L., Faigenbaum, A. D., Myer, G. D., & De Ste Croix, M. B. A. (2015). Long-term athletic development: Part 1. A pathway for all youth. *British Journal of Sports Medicine*, *49*(23), 1439–1443. Doi: 10.1519/JSC.0000000000000756

Magnusson, S. P., & Renström, P. (2006). The European College of Sports Sciences position statement on stretching. *European Journal of Sport Science*, *19*(1), 1–13. https://doi.org/10.1080/17461390600617865

Michalsik, L. B., Aagaard, P., & Madsen, K. (2015). Physical demands in male elite team handball: Comparisons between matches, players' positions and specific playing actions. *Journal of Sports Sciences, 33*(8), 763–775. https://doi.org/10.1080/02640414.2014.975205

Mirzaei, B., Curby, D. G., Rahmani-Nia, F., & Moghadasi, M. (2009). Physiological profile of elite Iranian junior freestyle wrestlers. *The Journal of Strength & Conditioning Research*, *23*(8), 2339-2344.

Mirzaei, B., Curby, D. G., Rahmani-Nia, F., & Moghadasi, M. (2017). Physiological profile of elite Iranian junior freestyle wrestlers. *Journal of Strength and Conditioning Research, 25*(8), 2339–2344. Doi: 10.1519/JSC.0b013e3181bb7350

Mitchell, D., Davis, B., & Lopez, R. (2002). Teaching fundamental gymnastics skills. Human Kinetics

Morin, J.-B., & Samozino, P. (2016). Interpreting power–force–velocity profiles for individualized sprint training. *International Journal of Sports Physiology and Performance*, *11*(2), 267–272. https://doi.org/10.1123/ijspp.2015-0638

Nasirzade, A., Ehsanbakhsh, A., Ilbeygi, S., Sobhkhiz, A., Argavani, H., & Aliakbari, M. (2014). Relationship between sprint performance of front crawl swimming and muscle fascicle length in young swimmers.Journal of Sports Science and Medicine, 13(3), 550–556

Newell, K. M. (1986). Constraints on the development of coordination. In M. G. Wade & H. T. A. Whiting (Eds.), *Motor development in children: Aspects of coordination and control* (pp. 341–360). Martinus Nijhoff.

Özsoy, O. Ş., Eler, S., & Eler, N. (2018). Elit Taekwondo ve Poomse Oyuncularinin Fiziksel ve Fizyolojik Parametrelerinin Incelenmesi. *Beden Eğitimi ve Spor Bilimleri Dergisi*, *20*(1), 46-53.

Pehlivan, S., & Karadenizli, Z. İ. (2019). 9-13 yaş grubu yüzücülerde 50 m serbest teknik yüzme performansı ile antropometrik ve motorik özellikler arasındaki ilişki. *Beden Eğitimi ve Spor Araştırmaları Dergisi*, *11*(2), 118-129. https://doi.org/10.30655/besad.2019.21

Phillips, S. M., & Van Loon, L. J. C. (2011). Dietary protein for athletes: From requirements to optimum adaptation. *Journal of Sports Sciences*, *29*(S1), S29–S38.

Pilates, J. H., & Miller, W. J. (1945). *Return to life through Contrology*. J. J. Augustin.

Polat, S., Edis, Ç., & Çatıkkaş, F. (2019). Isınma seansında uygulanan dinamik ve statik germe egzersizlerinin performans üzerine etkileri. *Türk Spor Bilimleri Dergisi*, *2*(1), 31-38. https://dergipark.org.tr/en/pub/tsbd/article/527549

Price, T., et al. (2024). Physical performance determinants in competitive youth swimmers: A systematic review. *BMC Sports Science, Medicine and Rehabilitation*, *16*(1), 1–18. https://doi.org/10.1186/s13102-023-00767-4

Pueo, B., Rojas, F. J., & García-Pallarés, J. (2015). Relationship between physical performance and throwing velocity in elite handball players. *Journal of Strength and Conditioning Research, 29*(7), 1738–1746. https://doi.org/10.1519/JSC.0000000000000848

Reyhan, S., Enişte, F., & Özoruç, S. (2025). Karate-Do Sporu Yapan Çocukların Motorik Özelliklerinin İncelenmesi. *AXIS World–Journal of Applied Cross-disciplinary Insights*, *1*(1).

Savaş, S., & Uğraş, A. (2004). Sekiz haftalık sezon öncesi antrenman programının üniversiteli erkek boks, taekwondo ve karate sporcularının fiziksel ve fizyolojik özellikleri üzerine olan etkileri. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, *24*(3).

Segal, N. A., Hein, J., & Basford, J. R. (2004). The effects of Pilates training on flexibility and body composition: An observational study. *Archives of Physical Medicine and Rehabilitation*, *85*(12), 1977–1981. https://doi.org/10.1016/j.apmr.2004.01.036

Seifert, L., Button, C., & Davids, K. (2013). Key properties of expert movement systems in sport: An ecological dynamics perspective. *Sports Medicine, 43*(3), 167–178. https://doi.org/10.1007/s40279-012-0011-z

Sheppard, J. M., & Young, W. B. (2006). Agility literature review: Classifications, training and testing. *Journal of Sports Sciences, 24*(9), 919–932. https://doi.org/10.1080/02640410500457109

Slimani, M., Chaabène, H., Davis, P., Franchini, E., Cheour, F., & Chamari, K. (2017). Performance aspects and physiological responses in combat sports. *Journal of Strength and Conditioning Research, 31*(10), 1–12. *DOI:* 10.1519/JSC.0000000000001643

Soligard, T., Myklebust, G., Steffen, K., Holme, I., Silvers, H., Bizzini, M., Junge, A., Dvorak, J., Bahr, R., & Andersen, T. E. (2008). Comprehensive warm-up programme to prevent injuries in young female footballers: Cluster randomised controlled trial. *British Journal of Sports Medicine, 42*(7), 566–571. https://doi.org/10.1136/bmj.a2469

Spörri, J., Kröll, J., Gilgien, M., & Müller, E. (2017). How to prevent injuries in alpine ski racing: What do we know and where do we go from here? *Sports Medicine, 47*(4), 599–614. https://doi.org/10.1007/s40279-016-0601-2

Şahin, F. N., Ceylan, L., Küçük, H., Ceylan, T., Arıkan, G., Yiğit, S., ... & Güler, Ö. (2022). Examining the relationship between pes planus degree, balance and jump performances in athletes. *International journal of environmental research and public health, 19*(18), 11602.

Şakar, M. & Kahraman, A. (2023). Beden Eğitimi ve Spor Öğretmenlerinin Pozitif Algılarının Çok Yönlü ve Sınırsız Kariyer Yönelimlerine Etkisi. Journal of History School, 62, 285-309. http://dx.doi.org/10.29228/Joh.65018

Şakar, M., & Kızılkaya Namlı, A. (2023). Öznel zindeliğin psikolojik sağlamlık üzerindeki etkisinde zihnin istemli ve istemsiz gezinmesinin aracılık rolü, The Online Journal of Recreation and Sports (TOJRAS), 12(3), 352-361 https://doi.org/10.22282/tojras.1296627

Şar, H., & Akgün, S. (2025). Tenis antrenmanlarının 7–11 yaş çocukların motor becerilerine etkisi. *Spor ve Rekreasyon Araştırmaları Dergisi, 7*(1), 38–49.

Temur, H. B. (2016). Alt ve üst ekstremite çevre ölçüm değerleri ile el kavrama kuvveti ve sıçrama mesafesi arasındaki ilişkinin incelenmesi. Spor Ve Performans Araştırmaları Dergisi, 8(1), 1-9. https://dergipark.org.tr/en/pub/omuspd/article/284743

Temur, H. B. (2023). Egzersiz türleri ve kardiyovasküler sisteme etkileri. H. Eroğlu (Ed.), *Sporda güncel konulara farklı bakış I* içinde (Bölüm VII). BİDGE Yayınları. ISBN: 978-625-6488-93-9

Temur, H. B., & Selçuk, M. (2024). 8–13 yaş arası bireylerde esneklik ve dikey sıçrama değerlerinin farklı değişkenlere göre incelenmesi. *The Journal of Academic Social Science, 39*(39), 200–209. http://dx.doi.org/10.16992/ASOS.11883

Temur, H. B., Gürbüz, C., Karakulaklı, H., & Doğan, R. (2022). *The relationship of medial arc height with speed, dynamic balance and jump distance in sports training individuals*. International Journal of Early Childhood Special Education, 14(5), 6561–6568. https://doi.org/10.9756/INTJECSE/V14I5.816

Tipton, K. D. (2015). Nutritional support for exercise-induced injuries. *Sports Medicine, 45*(S1), 93–104. https://doi.org/10.1007/s40279-015-0398-8

Ürer, S., & Kılınç, F. (2014). 15-17 Yaş grubu erkek hentbolculara uygulanan üst ve alt ekstremiteye yönelik pliometrik antrenmanların dikey sıçrama performansına ve blok üstü şut atışı isabetlilik oranına etkisinin araştırılması. *İnönü Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi, 1*(2), 16-38.

Wagner H, Finkenzeller T, Würth S, von Duvillard SP. Individual and team performance in team-handball: a review. J Sports Sci Med. 2014 Dec 1;13(4):808-16. PMID: 25435773; PMCID: PMC4234950.

Wells, C., Kolt, G. S., & Bialocerkowski, A. (2014). Defining Pilates exercise: A systematic review. *Complementary Therapies in Medicine, 22*(2), 273–282. https://doi.org/10.1016/j.ctim.2012.02.005

Yel, K., Güzel, S., Kurcan, K., & Çakır, Z. (2023). Cimnastik branşı ile ilgili lisansüstü tezlere yönelik bir içerik analizi. *Ulusal Spor Bilimleri Dergisi, 7*(1), 22-36. https://doi.org/10.30769/usbd.1295113

Yıldız, M., Başpınar, S. G., Ocak, Y., Akyıldız, Z., & Bozdemir, M. (2018). Egzersiz öncesi titreşimli foam roller uygulamasının sürat, çeviklik, dikey sıçrama ve esneklik üzerine etkisi. *Spor ve Performans Araştırmaları Dergisi, 9*(3), 216–225.

Ziv, G., & Lidor, R. (2010). Vertical jump in female and male basketball players: A review of observational and experimental studies. *Journal of Strength and Conditioning Research, 24*(7), 1963–1968. https://doi.org/10.1016/j.jsams.2009.02.009

CHAPTER 7

Promoting Health Through Lifelong Active Living: Exercise, Recreation, and Preventive Strategies

Assoc. Prof. Murat ŞAKAR[1]

Şakar, M.(2025). *Promoting Health Through Lifelong Active Living: Exercise, Recreation, and Preventive Strategies*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (pp. 97–111). Duvar Yayınları

[1] Faculty of Sport Sciences, Munzur University,
Department of Physical Education and Sports, Division of Physical Education and Sports
ORCID: 0000-0001-9853-5879 E-mail: muratsakar@munzur.edu.tr

Introduction

The technological transformation process, extending from the Industrial Revolution to the present day, has profoundly reshaped not only modes of production and economic systems, but also individuals' daily life practices, working patterns, and physical movement behaviours (Konur Tekeş, 2022). While the First and Second Industrial Revolutions—characterised by mechanisation, electrification, and the expansion of mass production—shifted working life toward factory-centred structures, the Third Industrial Revolution introduced automation and digitalisation, significantly enhancing production efficiency and essentially eliminating spatial and temporal barriers to information access (Kaczynski, 1996).

The current Fourth Industrial Revolution, driven by artificial intelligence, big data, the Internet of Things, cloud computing, and cyber-physical systems, has rendered working life increasingly independent of time and place. This transformation has led to a marked decline in individuals' daily movement levels and has accelerated the widespread adoption of sedentary lifestyles (Brynjolfsson & McAfee, 2017; OECD, 2021).

The intensive integration of digital technologies into everyday life has given rise to new forms of work, such as platform economies, automation, robotisation, and the gig economy, thereby reshaping both the nature of work and social security systems (Degryse, 2016; Poutanen et al., 2019; Er & Cengiz, 2023; 2025; Çakır et al., 2022). As work has become predominantly screen-based and cognitively oriented, combined with reduced opportunities for active transportation and the proliferation of digital work models, physical activity has ceased to be a natural component of daily life. It has instead become a planned—and often neglected—behaviour.

Global foresight studies indicate that the expansion of digitalisation and remote working models is likely to increase sedentary working time further, thereby creating new risk domains for physical activity behaviours (McKinsey Global Institute, 2020; Şakar et al., 2024; Şarvan Cengiz & Delen, 2019). As a consequence of this transformation, physical inactivity has emerged as a significant global public health concern. The World Health Organisation (WHO, 2020) ranks physical inactivity among the leading preventable causes of mortality worldwide.

The adverse health effects of physical inactivity and sedentary behaviour have been extensively addressed in the academic literature in recent years (Bozkuş et al., 2013). In particular, low levels of physical activity during childhood and adolescence have been associated with obesity, cardiometabolic risks, and psychosocial problems, while sedentary working patterns in adulthood have been shown to increase the burden of chronic diseases (Church et al., 2011; Tremblay et al., 2017; Coşkuntürk et al., 2023; Kul et al., 2022). Regular participation in sports has been shown to have a positive effect on body mass index (BMI) (Temur et al., 2017).

Beyond its physical health benefits, physical activity is also recognised as a critical determinant of mental health, subjective well-being, and cognitive functioning. Evidence suggests that mental health indicators such as depression, anxiety, self-esteem, and cognitive performance are significantly associated with levels of physical activity (Biddle et al., 2019; Lindwall & Åslund, 2014; Davis & Lambourne, 2009).

Epidemiological evidence from developed countries indicates that, particularly among children and adolescents, mental health status across the population falls short of desired levels. In European countries, the prevalence of chronic depression among individuals aged 15 years and older exceeds 10%, while increases in health service utilisation related to anxiety and depression have been reported among young populations in countries such as the United Kingdom and Australia (Eurostat Statistics Explained, 2018; Davis et al., 2020; Australian Institute of Health and Welfare, 2011; Lawrence et al., 2015). These findings clearly underscore the need for low-cost, accessible, and sustainable interventions aimed at improving the mental health of young people.

In this context, physical activity has emerged as one of the most frequently recommended intervention strategies (Ekkekakis, 2012). Although the relationship between physical activity and psychological well-being can be traced back historically to antiquity, early academic work often relied on limited empirical evidence. It was characterised by overgeneralisations (Layman, 1974, as cited in Biddle & Vergeer, 2018). While the field has advanced substantially over the past 30–40 years, the effects of physical activity on mental health must be evaluated with careful consideration of contextual, experiential, and individual differences. The existing literature suggests that these effects arise from the interaction of neurobiological, psychological, and social mechanisms (Biddle & Mutrie, 2008).

Nevertheless, it is emphasised that the issue of causality should be addressed with caution when interpreting the relationship between physical activity and mental health. Criteria such as the strength and consistency of associations, as well as temporal sequencing, provide an important analytical framework for evaluating findings in this field (Hill, 1965).

This book chapter deliberately departs from prevailing approaches by conceptualising lifelong active living not merely as the absence of physical inactivity, but as a multidimensional public health paradigm in which exercise, recreation, and preventive health strategies are integratively embedded. Within this framework, physical activity is viewed as a sustainable lifestyle that enables individuals to maintain their physical, psychological, and social well-being in increasingly digitalised and artificial intelligence–driven work and living environments (Sallis et al., 2015; Topol, 2019; Gıdık & Çelik, 2024).

Recreational physical activities, in particular, are regarded as a fundamental component supporting the continuity of active living, and are closely associated with individuals' life satisfaction, social participation, and functional independence (Pretty et al., 2017; Gönülateş, 2018). The sustained engagement in recreational physical activities is not only linked to physical capacities but is also closely related to mental regulation strategies. In this context, empirical evidence indicates a positive and significant relationship between athletes' levels of self-talk and their mental resilience, with this relationship varying across different sports disciplines (Adatepe et al., 2025).

Accordingly, the purpose of this chapter is to examine the lifelong active living approach through the lenses of exercise, recreation, and preventive health strategies, and to discuss the multidimensional effects of physical activity on individual and societal health in light of the current literature. Furthermore, the chapter aims to propose feasible active living approaches tailored to different stages of the life course, particularly for children and adolescents, and to present a holistic perspective on sustainable active living models in the digital age.

Conceptual and Theoretical Foundations of Lifelong Active Living

The concept of lifelong active living refers to the adoption of physical activity as a sustainable behavioural pattern maintained throughout the life course, without reducing it to a specific age group, health status, or performance-oriented objectives. This approach does not confine physical activity solely to planned and structured exercise programs; instead, it offers a holistic framework that also encompasses movement behaviours occurring naturally in daily life, recreational activities, and active transportation practices (Bull et al., 2020). In this respect, lifelong active living seeks to transform physical activity from a temporary health intervention into an integral component of everyday life.

Although the terms physical activity, exercise, and active living are frequently used interchangeably in the literature, distinguishing among these concepts is essential for a clear understanding of the lifelong active living approach. Physical activity refers to any bodily movement produced by skeletal muscle contraction that results in increased energy expenditure. Exercise, on the other hand, denotes planned, structured, and repetitive physical activities performed with a specific objective. Active living, in contrast, represents a broader pattern of behaviour that involves the conscious, voluntary, and sustainable incorporation of movement into daily life (Caspersen et al., 1985). This distinction underscores that active living is not solely concerned with "how much" individuals move, but rather with "how movement is integrated into everyday life."

At the core of the lifelong active living approach lies the understanding that the health effects of physical activity cannot be explained solely through a dose–response relationship, but must also be interpreted in terms of behavioural continuity and the

extent to which physical activity is integrated into an individual's lifestyle (Özkan et al., 2013). Research indicates that short-term and high-intensity physical activity interventions may produce transient effects on health indicators; by contrast, long-term, moderate-intensity, and sustainable physical activity habits are more effective in reducing morbidity and mortality risks (Warburton & Bredin, 2017). These findings suggest that, alongside the quantitative dimensions of physical activity, its qualitative characteristics must also be considered.

From a theoretical perspective, the lifelong active living approach is closely linked to behaviour change models. Social Cognitive Theory explains physical activity behaviour through constructs such as self-efficacy, outcome expectations, and environmental reinforcements, emphasising that an individual's capacity to maintain behaviour is shaped by the interaction of these factors (Bandura, 2004). Similarly, the Theory of Planned Behaviour conceptualises physical activity behaviour in terms of attitudes, subjective norms, and perceived behavioural control, emphasising the significant role of social and environmental factors in translating individual intentions into actual behaviour (Ajzen, 1991).

These theoretical frameworks demonstrate that lifelong active living is not a process driven solely by individual motivation, but rather one that develops through continuous interaction with social relationships, the physical environment, and structural conditions. In this regard, ecological models provide an important conceptual framework by addressing active living behaviour within a multilevel system. According to the ecological approach, physical activity is shaped by the reciprocal interaction of individual characteristics, interpersonal relationships, organisational structures, community environments, and policy-level factors (Sallis et al., 2015).

Reframing Exercise as a Lifestyle Component Rather Than a Clinical Intervention

Exercise has traditionally been regarded as an effective intervention tool in the prevention and treatment of diseases. Strong scientific evidence supports the therapeutic effects of exercise across a wide range of chronic conditions, including cardiovascular diseases, diabetes, obesity, and certain types of cancer (Piercy et al., 2018; Turğut et al., 2021; Doğan & Ceylan, 2025). However, evaluating exercise solely within a clinical context presents important limitations in terms of the long-term sustainability of physical activity behavior (Ceylan, 2021).

Clinically oriented exercise approaches are often implemented after the onset of a health condition and are delivered within the confines of standardised protocols. This framing may lead individuals to perceive exercise as a temporary obligation, thereby increasing the likelihood that physical activity behaviours will be abandoned once the intervention concludes. In contrast, the lifelong active living perspective seeks to

reposition exercise from a post-disease therapeutic tool to a natural and enduring component of everyday life (Rhodes et al., 2017).

The adoption of exercise as a lifestyle component fundamentally transforms the quality of the relationship individuals establish with physical activity. Within this framework, exercise extends beyond performance-or appearance-oriented goals to offer multidimensional benefits, including the maintenance of physical functioning, the promotion of psychological well-being, and the enhancement of social participation. Empirical evidence indicates that regular, moderate-intensity exercise yields more durable health benefits over the long term than high-intensity programs that lack continuity (Ekelund et al., 2019; Geri et al., 2015; Özaltaş, 2019).

A lifestyle-based exercise approach structures individuals' engagement in physical activity according to principles of flexibility, accessibility, and personal preference. In this model, exercise is no longer confined to specific settings or time slots; instead, it can be seamlessly integrated into various contexts of daily life. Activities such as stair use, active transportation, brief movement breaks, and recreational pursuits constitute tangible examples of this holistic approach (Bauman et al., 2012).

Within this perspective, framing exercise as a lifestyle component is regarded as a key strategy for enhancing the effectiveness of preventive health interventions. The adoption of regular physical activity from early life not only contributes to the reduction of disease risk but also supports the preservation of quality of life and promotes healthy ageing (Paterson & Warburton, 2010; WHO, 2020).

The Role of Recreation in Sustaining Lifelong Active Living

One of the fundamental challenges of the lifelong active living approach is ensuring the long-term sustainability of physical activity behaviour. Although the positive effects of exercise on physical and psychological health are supported by robust scientific evidence, a substantial proportion of individuals struggle to maintain such behaviours over extended periods (Rhodes et al., 2017; Bauman et al., 2012). In this context, recreational physical activities are considered a critical component in supporting the continuity of active living by integrating physical activity into individuals' lives more naturally and voluntarily. Recreation encompasses activities voluntarily undertaken during leisure time that provide enjoyment, pleasure, and satisfaction, thereby transforming physical activity from an obligatory task into an integral part of everyday life (Iso-Ahola, 1980).

The significance of recreational physical activities for lifelong active living stems from their capacity to transform the quality of individuals' relationship with physical activity. While planned and structured exercise programs often emphasise performance, aesthetic, or health-related outcomes, recreational activities foreground intrinsic motivation, social interaction, and emotional gratification. Particularly when examined

through the lens of Self-Determination Theory, physical activities characterised by high levels of intrinsic motivation are reported to be more effective in sustaining behaviour over the long term (Teixeira et al., 2012; Ryan & Deci, 2017). In this respect, recreation functions as a psychosocial catalyst that supports the sustainability of active living (Aydemir et al., 2024).

Nature-based recreational activities constitute prominent examples within this process. A substantial body of research highlights that physical activities conducted in natural environments—such as hiking, cycling, swimming, and other outdoor pursuits—are associated with reduced stress levels, improved mood, and enhanced subjective well-being (Pretty et al., 2017; Twohig-Bennett & Jones, 2018; Yaşar & Direkçi, 2025). Walking and running exercises have also been reported to exert positive effects on specific physiological and biochemical parameters in adult populations (Othman & Temur, 2018). Moreover, due to their low cost and high accessibility, nature-based activities have the potential to reduce socioeconomic barriers to participation in physical activity and to contribute to the widespread adoption of active living behaviours across populations.

The role of recreation in lifelong active living extends beyond the individual level. Community-based recreational programs transform physical activity into a shared social experience, thereby strengthening social participation and a sense of belonging. Physical activities delivered through sports clubs, recreational initiatives offered by local governments, and community centres have been shown to enhance individuals' perceptions of social support and to facilitate the maintenance of active living behaviours (Holt et al., 2017; Eime et al., 2013). These findings indicate that recreation serves not only physical health, but also plays a critical role in promoting social health and social cohesion.

Within the lifelong active living perspective, recreation is regarded not as a secondary element that merely complements exercise, but as a supportive component that facilitates the integration of physical activity into everyday life. Aligning physical activity with individuals' life satisfaction, social relationships, and daily routines appears more attainable when recreational approaches are systematically promoted. In this context, the preventive health approach offers a comprehensive framework aimed at reducing risk factors and protecting health before the onset of disease, positioning physical activity as an effective intervention across primary, secondary, and tertiary levels of prevention (Warburton & Bredin, 2017; World Health Organisation [WHO], 2020). The lifelong active living perspective, in turn, renders more visible the potential contributions of recreational physical activities within this preventive health system.

At the level of primary prevention, physical activity aims to foster healthy behaviours before the onset of disease. Evidence suggests that adopting regular physical activity habits at an early age reduces key risk factors for obesity, cardiovascular diseases, type

2 diabetes, and certain types of cancer (Piercy et al., 2018; Lee et al., 2012; Yel et al., 2024). In this context, school-based physical activity programs, active play environments, and the promotion of recreational activities during childhood represent critical strategies that form the foundation of lifelong active living (Uskan & Bozkuş, 2019).

At the level of secondary prevention, physical activity is utilised as a means of slowing disease progression among individuals who have received an early diagnosis or who belong to at-risk populations. Moderate-intensity and regular physical activity are effective in managing conditions such as hypertension, metabolic syndrome, and depression (Ekelund et al., 2019; Schuch et al., 2016). At this stage, however, the sustainability of physical activity effects is closely linked to the extent to which the behaviour is integrated into the individual's lifestyle. The incorporation of recreational approaches at this point may support the long-term maintenance of physical activity behaviours.

At the level of tertiary prevention, physical activity is implemented to preserve functional capacity and enhance quality of life among individuals living with chronic conditions. In older adults, in particular, regular physical activity has been shown to reduce the risk of falls, support independent living skills, and limit dependence on healthcare services (Paterson & Warburton, 2010; Bauman et al., 2012). In this regard, the lifelong active living approach emphasises that physical activity should not be confined solely to the rehabilitation process, but rather adapted and integrated into individuals' daily lives.

The effectiveness of preventive health strategies depends not only on individual behaviour change but also on environmental and policy support mechanisms. Urban planning initiatives that promote active transportation, safe pedestrian and cycling infrastructure, accessible green spaces, and community-based physical activity programs represent key determinants in the widespread adoption of lifelong active living behaviours (Giles-Corti et al., 2016; Sallis et al., 2015). Within this context, physical activity is regarded not merely as a matter of individual responsibility but as a priority that must also be addressed at societal and policy levels.

From a preventive health perspective, lifelong active living is conceptualised as a comprehensive public health approach that extends beyond disease prevention to encompass the promotion of quality of life, preservation of functional independence, and strengthening of population health. The systematic support of exercise and recreation, along with the integration of physical activity across all stages of the life course, is viewed as a key factor capable of enhancing the effectiveness of this approach.

Active Living Strategies Across the Life Course

The lifelong active living approach requires physical activity to be adapted to individuals' age, physical capacity, health status, and living conditions. Rather than relying on uniform exercise recommendations, the adoption of life stage–specific, flexible, and sustainable strategies is regarded as a critical factor in maintaining physical activity behaviours over the long term (World Health Organisation [WHO], 2020; Bull et al., 2020). This approach provides a holistic framework that takes into account individuals' evolving needs across the life course.

During childhood and adolescence, physical activity plays a fundamental role in motor development, bone mineralisation, cardiorespiratory fitness, and psychosocial adjustment. In these stages, promoting play-based, enjoyable, and recreational activities helps prevent physical activity from being perceived as an obligatory task, thereby contributing to the development of positive behavioural patterns that may persist throughout the lifespan (Janssen & LeBlanc, 2010; Timmons et al., 2012). Additionally, regular physical activity has been shown to have beneficial effects on self-esteem and mental health in children and adolescents (Biddle et al., 2019).

During adulthood, work-related demands, time constraints, and sedentary working conditions may adversely affect levels of physical activity. For this reason, short-duration yet regular exercise, active transportation behaviours, and recreational activities integrated into daily life take centre stage. Research indicates that regular physical activity maintained during adulthood provides protective effects against cardiovascular diseases, metabolic disorders, and mental health problems (Piercy et al., 2018; Lear et al., 2017). Forms of physical activity embedded within daily routines are therefore regarded as a key strategy for enhancing feasibility and long-term adherence among adult populations.

In older adulthood, physical activities that emphasise balance, muscular strength, and flexibility are particularly important for preserving functional independence, reducing the risk of falls, and maintaining daily activities. Moreover, socially oriented and recreational activities have been reported to support older adults' participation in physical activity and to reduce the risk of social isolation (Paterson & Warburton, 2010; Bauman et al., 2016). In this context, active living approaches tailored to later life should be conceptualized as holistic strategies that support not only physical capacity, but also psychosocial well-being.

The Role of Environmental and Policy Support in Active Living

The sustainability of lifelong active living behaviours is closely associated not only with individual motivation but also with environmental and policy-related conditions. Environmental arrangements that support physical activity facilitate individuals' adoption and maintenance of active lifestyles. In this context, safe pedestrian pathways,

well-developed cycling infrastructure, access to green spaces, and publicly available sports and recreation facilities constitute critical environmental determinants (Giles-Corti et al., 2016).

At the policy level, national health strategies that promote active living, school- and workplace-based physical activity programs, and recreational opportunities provided by local governments contribute significantly to increasing population-wide levels of physical activity. Such an approach enables physical activity to be conceptualised not merely as an individual choice, but as a shared societal responsibility embedded within broader public health and urban planning frameworks (Sallis et al., 2015).

If you'd like, I can continue the chapter seamlessly (e.g., by linking to exercise adherence, recreation across the lifespan, or preventive health strategies) or adapt this translation to match a specific publisher's style (e.g., Springer, Routledge, APA 7, etc.).

Digitalization, Artificial Intelligence, and the Future of Active Living

Although digitalisation and artificial intelligence–based technologies are often associated with an increase in sedentary behaviours, they simultaneously offer novel opportunities to support lifelong active living. Research indicates that the attitudes of sports science students toward globalisation are closely linked to learning environments and technological infrastructures, providing important insights for future frameworks in sports education (Adatepe, 2023). Wearable technologies, mobile health applications, and online exercise platforms enable individuals to monitor their physical activity levels, receive real-time feedback, and manage behaviour change processes in a more informed and self-regulated manner (Rhodes et al., 2017; Uluca et al., 2024).

Artificial intelligence–supported systems are capable of analysing individuals' physical activity patterns and physiological responses to deliver personalised recommendations. Compared with standardised exercise approaches, these systems allow for the development of active living models that more effectively account for individual differences (Kerner & Goodyear, 2017; Çakır et al., 2013). Furthermore, digital coaching and feedback mechanisms facilitate the monitoring of not only the quantitative but also the qualitative dimensions of physical activity, thereby enhancing the overall effectiveness and sustainability of active living behaviours (Bangsbo et al., 2019).

Nevertheless, it is emphasised that the impact of digital solutions on active living must extend beyond individual use and be integrated into health systems and community-based interventions. Otherwise, there is a risk that such technologies may remain confined to specific population groups, thereby limiting their broader public health impact. From this perspective, digitalisation and artificial intelligence should not be regarded as substitutes for individual agency in lifelong active living, but rather as

complementary tools that support and facilitate individuals' engagement in sustained active lifestyle behaviours.

Conclusion

The findings discussed in this chapter demonstrate that the lifelong active living approach is supported by robust scientific evidence regarding its positive effects on physical, psychological, and social health. While the existing literature predominantly emphasizes studies focused on specific age groups or particular risk factors, this chapter distinguishes itself by conceptualizing active living as a sustainable lifestyle practice across the lifespan. The integrated evaluation of exercise, recreation, and preventive health strategies emerges as a fundamental requirement for ensuring the long-term maintenance of active living behaviors.

Lifelong active living represents a multidimensional public health approach in which exercise, recreation, and preventive health strategies are cohesively integrated. The incorporation of physical activity into all stages of life contributes not only to the reduction of disease risk but also to the enhancement of quality of life and the promotion of healthy aging. The broader dissemination and implementation of this approach hold strategic importance for improving population health and alleviating the burden on health care systems.

References

Adatepe, E. (2023). Spor Bilimleri Öğrencilerinin Küreselleşmeye Yönelik Tutumlarının İncelenmesi. Mediterranean Journal of Sport Science, 6(1-Cumhuriyet'in 100. Yılı Özel Sayısı), 906-920. https://doi.org/10.38021/asbid.1373589

Adatepe, E., Şipal, O., & Aksoy, Ö. F. (2025). Sporcuların zihinsel dayanıklılığını şekillendiren kendinle konuşma süreci: Boks ve halter örneği. The Journal of Academic Social Science Studies, 18(104), 581–598.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Australian Institute of Health and Welfare. (2011). Young Australians: Their health and wellbeing 2011. https://www.aihw.gov.au/getmedia/8e0cf278-e107-434c-b4e2-b42dc5458eba/ayp99.pdf

Aydemir, U., Hazar, K., & Çelik, H. (2024). Fiziksel aktivitenin sağlık ve yaşam kalitesi üzerindeki etkisi. In F. Çatıkkaş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 78–95). Duvar Yayınları

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143–164. https://doi.org/10.1177/1090198104263660

Bangsbo, J., Blackwell, J., Boraxbekk, C. J., Caserotti, P., Dela, F., Evans, A. B., … Viña, J. (2019). Copenhagen consensus statement 2019: Physical activity and ageing. *British Journal of Sports Medicine*, *53*(14), 856–858. https://doi.org/10.1136/bjsports-2018-100451

Bauman, A. E., Merom, D., Bull, F. C., Buchner, D. M., & Fiatarone Singh, M. A. (2016). Updating the evidence for physical activity: Summative reviews of the epidemiological evidence, prevalence, and interventions to promote "active aging". *The Gerontologist*, *56*(Suppl_2), S268–S280. https://doi.org/10.1093/geront/gnw031

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, *380*(9838), 258–271. https://doi.org/10.1016/S0140-6736(12)60735-1

Biddle, S. J. H., & Mutrie, N. (2008). Psychology of physical activity: Determinants, well-being, and interventions (2nd ed.). Routledge.

Biddle, S. J. H., & Vergeer, I. (2018). Physical activity and mental health in children and adolescents. In A. Papaioannou & D. Hackfort (Eds.), *Routledge companion to sport and exercise psychology* (pp. 593–606). Routledge.

Biddle, S. J. H., Ciaccioni, S., Thomas, G., & Vergeer, I. (2019). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of Sport and Exercise, 42*, 146–155. https://doi.org/10.1016/j.psychsport.2018.08.011

Bozkuş, T., Türkmen, M., Kul, M., Özkan, A., Öz, Ü., & Cengiz, C. (2013). Beden eğitimi ve spor yüksekokulu'nda öğrenim gören öğrencilerin fiziksel aktivite düzeyleri ile sağlikli yaşam biçimi davranişlarinin belirlenmesi ve ilişkilendirilmesi. International Journal of Sport Culture and Science, 1(3), 49-65.

Brynjolfsson, E., & McAfee, A. (2017). *Machine, platform, crowd: Harnessing our digital future*. W. W. Norton & Company.

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., … Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine, 54*(24), 1451–1462. https://doi.org/10.1136/bjsports-2020-102955

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126–131.

Ceylan, R. (2021). Comparison of oxygen consumption of football players in different positions of the game. *Pakistan Journal of Medical and Health Sciences. 15*(7), 2193-2196.

Church, T. S., Thomas, D. M., Tudor-Locke, C., Katzmarzyk, P. T., Earnest, C. P., Rodarte, R. Q., … Bouchard, C. (2011). Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity. *PLoS ONE, 6*(5), e19657. https://doi.org/10.1371/journal.pone.0019657

Coşkuntürk, O. S., Kurcan, K., Yel, K., & Güzel, S. (2023). Teknolojik gelişmelerin hareketsiz yaşama ve çocuklarda psiko-motor gelişime etkileri. *Dede Korkut Spor Bilimleri Dergisi, 1*(1), 48-59. https://dergipark.org.tr/en/pub/dksbd/article/1309808

Çakır, Z., Ceyhan, M. A., Gönen, M., & Erbaş, Ü. (2023). Yapay Zeka Teknolojilerindeki Gelişmeler ile Eğitim ve Spor Bilimlerinde Paradigma Değişimi. *Dede Korkut Spor Bilimleri Dergisi, 1*(2), 56-71.

Çakır, Z., Gönen, M., & Ceyhan, M. A. (2022). Spor bilimleri fakültesi öğrencilerinin metaverse farkındalıklarının incelenmesi. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi, 17*(2), 406-418.

Davis KAS, Coleman JRI, Adams M, et al. Mental health in UK Biobank – development, implementation and results from an online questionnaire completed by 157 366 participants: a reanalysis. BJPsych Open. 2020;6(2):e18. doi:10.1192/bjo.2019.100

Davis, C. L., & Lambourne, K. (2009). Exercise and cognition in children. *Sports Medicine, 39*(1), 59–72. https://doi.org/10.2165/00007256-200939010-00005

Degryse, Christophe, Digitalisation of the Economy and its Impact on Labour Markets (February 10, 2016). ETUI Research Paper - Working Paper 2016.02, Available at SSRN: https://ssrn.com/abstract=2730550 or http://dx.doi.org/10.2139/ssrn.2730550

Doğan, Ö., & Ceylan, R. (2025). Fonksiyonel hareket taraması skorlarını geliştirmede Theraband egzersizlerinin rolü. In **R.** Ceylan & B. Tatlısu (Eds.)**,** *Beden eğitimi ve spor eğitiminde akademik perspektifler* (pp. 3–34). Duvar Yayınevi.

Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for adults. *International Journal of Behavioral Nutrition and Physical Activity, 10*, 135. https://doi.org/10.1186/1479-5868-10-135

Ekelund, U., Tarp, J., Steene-Johannessen, J., Hansen, B. H., Jefferis, B., Fagerland, M. W., … Lee, I. M. (2019). Dose-response associations between accelerometry measured physical activity and sedentary time and all cause mortality. *BMJ, 366*, l4570. https://doi.org/10.1136/bmj.l4570

Ekkekakis, P. (2012). Affect, mood, and emotion. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Measurement in sport and exercise psychology* (pp. 321–332). Human Kinetics. https://doi.org/10.5040/9781492596332.ch-028

Er, B., & Cengiz, R. (2023b). Digital leisure flow experience: A scale development study. SPORMETRE Journal of Physical Education and Sport Sciences, 21(2), 48–62.

Er, B., & Cengiz, R. (2025). The form of happiness in the digital age: examining the effect of ınternet usage in digital leisure on flow Experience. International Journal of Recreation and Sports Science, 9(1), 29-44. https://doi.org/10.46463/ijrss.1608338

Eurostat Statistics Explained. (2018). *Mental health and related issues statistics*. European Commission.

Geri, S., Çelik, K. C., Demirhan, B., Canuzakov, K., Gönülateş, S., Abdirahmanova, D., Tillabaev, A., & Geri, R. (2015).Düzenli fitness egzersizlerinin antropometrik ve deri altı yağ ölçüm değerlerine etkisi. MANAS Sosyal Araştırmalar Dergisi, 4(5), 294–309.

Gıdık, O., & Çelik, H. (2024). Üniversite futbol takımı seçmelerine katılan futbolcuların yapay zekâ kaygı düzeylerinin incelenmesi. U. Erbaş, M. Gönen & M. A. Ceyhan (Eds.), Sporda disiplinler arası bilimsel araştırmalar içinde (Bölüm 6). Duvar Yayınları

Giles-Corti, B., Vernez-Moudon, A., Reis, R., Turrell, G., Dannenberg, A. L., Badland, H., … Owen, N. (2016). City planning and population health: A global challenge. *The Lancet, 388*(10062), 2912–2924. https://doi.org/10.1016/S0140-6736(16)30066-6

Gönülateş, S. (2018). Farklı ülkelerde rekreatif katılımın yaşam kalitesi üzerine etkisi. Akademisyen Kitabevi.

Hill AB(1965). The Environment and Disease: Association or Causation? Proceedings of the Royal Society of Medicine. 58(5):295-300. doi:10.1177/003591576505800503

Holt, N. L., Neely, K. C., Slater, L. G., Camiré, M., Côté, J., Fraser-Thomas, J., … Tamminen, K. A. (2017). A grounded theory of positive youth development through sport based on results from a qualitative meta-study. *International Review of Sport and Exercise Psychology, 10*(1), 1–49. https://doi.org/10.1080/1750984X.2016.1180704

Iso-Ahola, S. E. (1980). The social psychology of leisure and recreation. W. C. Brown Company Publishers.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity, 7*, 40. https://doi.org/10.1186/1479-5868-7-40

Kaczynski, T. J. (1996). Sanayi toplumu ve geleceği. *İstanbul: Kaos Yayınları*.

Kerner, C., & Goodyear, V. A. (2017). The motivational impact of wearable healthy lifestyle technologies: A self-determination perspective on Fitbits with adolescents. *American Journal of Health Education, 48*(5), 287–297. https://doi.org/10.1080/19325037.2017.1343161

Konur Tekeş, F. (2022). Küreselleşmenin spor üzerine etkisi. H. Osmanoğlu (Ed.), Sporda özgün çalışmalar-1 (ss. 8–26). İKSAD Publishing House.

Kul, M., Turkmen, M., Yildirim, U., Ceylan, R., Sipal, O., Cabuk, R., ... & Adatepe, E. (2022). High-Intensity Interval Training with Cycling and Calisthenics: Effects on Aerobic Endurance, Critical Power, Sprint and Maximal Strength Performance in Sedentary Males. *Retos: nuevas tendencias en educación fisica, deporte y recreación*, (46), 538-544.

Lawrence, D., Johnson, S., Hafekost, J., de Haan, K. B., Sawyer, M., Ainley, J., & Zubrick, S. R. (2015). *The mental health of children and adolescents: Report on the second Australian child and adolescent survey of mental health and wellbeing*. Australian Government.

Layman, E. M. (1974). Exercise and mental health. *Journal of Health, Physical Education, Recreation, 45*(5), 32–35.

Lear, S. A., Hu, W., Rangarajan, S., Gasevic, D., Leong, D., Iqbal, R., … Yusuf, S. (2017). The effect of physical activity on mortality and cardiovascular disease in 130,000 people from 17 high-income, middle-income, and low-income countries. *The Lancet, 390*(10113), 2643–2654. https://doi.org/10.1016/S0140-6736(17)31634-3

Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide. *The Lancet, 380*(9838), 219–229. https://doi.org/10.1016/S0140-6736(12)61031-9

Lindwall, M., & Åslund, C. (2014). Body image and self-esteem in adolescents. *Scandinavian Journal of Psychology, 55*(6), 563–570. https://doi.org/10.1111/sjop.12160

McKinsey Global Institute. (2021). *The future of work after COVID-19*. https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19

OECD. (2021). *OECD employment outlook 2021: Navigating the COVID-19 crisis and recovery*. OECD Publishing.

Othman, S. T., & Temur, H. B. (2018). Investigation of the effect of walking and running exercises on some blood parameters in adults. *Universal Journal of Educational Research, 6*(10), 2125–2132. https://doi.org/10.13189/ujer.2018.061009

Özaltaş, H. N. (2019). Egzersiz ve immün sistem. S. Şahin & H. N. Özaltaş (Ed.), Farklı alanlarda sporda bilimsel çalışmalar (1. bs., ss. 179–196). Akademisyen Kitabevi. ISBN 978-605-258-540-5

Özkan, A., Bozkuş, T., Kul, M., Türkmen, M., Öz, Ü., & Cengiz, C. (2013). Halk oyuncularinin fiziksel aktivite düzeyleri ile sağlikli yaşam biçimi davranişlarinin belirlenmesi ve ilişkilendirilmesi. International Journal of Sport Culture and Science, 1(3), 24-38.https://dergipark.org.tr/en/download/article-file/91590

Paterson, D. H., & Warburton, D. E. R. (2010). Physical activity and functional limitations in older adults: A systematic review related to Canada's Physical Activity Guidelines. *International Journal of Behavioral Nutrition and Physical Activity, 7*, 38. https://doi.org/10.1186/1479-5868-7-38

Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., … Olson, R. D. (2018). The physical activity guidelines for Americans. *JAMA, 320*(19), 2020–2028. https://doi.org/10.1001/jama.2018.14854

Poutanen, S., Kovalainen, A., & Rouvinen, P. (2019). Digital work in the platform economy. In *Digital work and the platform economy* (pp. 3-9). Routledge.

Pretty, J., Rogerson, M., & Barton, J. (2017). Green mind theory: How brain-body-behaviour links into natural and social environments for healthy habits. *International Journal of Environmental Research and Public Health, 14*(7), 706. https://doi.org/10.3390/ijerph14070706

Rhodes, R. E., Janssen, I., Bredin, S. S. D., Warburton, D. E. R., & Bauman, A. (2017). Physical activity: Health impact, prevalence, correlates and interventions. *Psychology & Health, 32*(8), 942–975. https://doi.org/10.1080/08870446.2017.1325486

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.

Sallis, J. F., Bull, F., Guthold, R., Heath, G. W., Inoue, S., Kelly, P., … Hallal, P. C. (2016). Progress in physical activity over the Olympic quadrennium. *The Lancet, 388*(10051), 1325–1336. https://doi.org/10.1016/S0140-6736(16)30581-5

Schuch, F. B., Vancampfort, D., Richards, J., Rosenbaum, S., Ward, P. B., & Stubbs, B. (2016). Exercise as a treatment for depression: A meta-analysis. *Journal of Psychiatric Research, 77*, 42–51. https://doi.org/10.1016/j.jpsychires.2016.02.023

Şakar, M., Güzel, S., & Yel, K. (2024). Dijitalleşmenin spor ve fiziksel aktivite üzerindeki psikolojik yansımaları: Bir inceleme. In F. Çatıkkâş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 43–65). Duvar Yayınları.

Şarvan Cengiz. Ş., & Delen, B. (2019). Gençlerde Fiziksel Aktivite Düzeyi.

Temur, H. B., Selçuk, M., Pala, R., & Sarikaya, M. (2017). Determination of obesity levels of Van living individuals. European Journal of Physical Education and Sport Science, 3(12), 396. https://doi.org/10.5281/zenodo.1120239

Timmons, B. W., LeBlanc, A. G., Carson, V., Connor Gorber, S., Dillman, C., Janssen, I., … Tremblay, M. S. (2012). Systematic review of physical activity and health in the early years. *Applied Physiology, Nutrition, and Metabolism, 37*(4), 773–792. https://doi.org/10.1139/h2012-070

Topol, E. (2019). *Deep medicine: How artificial intelligence can make healthcare human again*. Basic Books.

Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., … Chinapaw, M. J. M. (2017). Sedentary behavior research network (SBRN) – Terminology consensus project. *International Journal of Behavioral Nutrition and Physical Activity, 14*, 75. https://doi.org/10.1186/s12966-017-0525-8

Turğut, M., Bozkuş, T., Özmekik, M., & Kocakulak, Ş. (2021). Examination of nutritional knowledge levels and nutritional attitudes of badminton athletes. Pakistan Journal of Medical & Health Sciences, 15(12), December 2021

Twohig-Bennett, C., & Jones, A. (2018). The health benefits of the great outdoors: A systematic review and meta-analysis. *Environmental Research, 166*, 628–637. https://doi.org/10.1016/j.envres.2018.06.030

Uluca, M., Yel, K., Güzel, S., & Çakır, Z. (2024). Yapay Zeka ve Drone Teknolojileri ile Spor Etkinlikleri Gözlem ve Analizinde Güncel Yaklaşımlar. *Dede Korkut Spor Bilimleri Dergisi, 2*(2), 47-70. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 5(2), 110-122. https://dergipark.org.tr/en/pub/intjces/article/667989

Uskan, S. B., & Bozkuş, T. (2019). Eğitimde Oyunun Yeri. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 5(2), 123-131.

Warburton, D. E. R., & Bredin, S. S. D. (2017). Health benefits of physical activity: A systematic review of current systematic reviews. *Current Opinion in Cardiology, 32*(5), 541–556. https://doi.org/10.1097/HCO.0000000000000437

World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. WHO.

Yaşar, Y., & Direkçi, V. (2025). Rekreasyon yönetimi: Türkiye ve dünya perspektifi. In M. Gönen, M. A. Ceyhan, & Z. Çakır (Eds.), Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler (pp. 24–36). Duvar Yayınları.

Yel, K., Şencan, D., Güzel, S., & Erkılıç, A. O. (2024). Physical activity, nutrition, and healthy living. *International Journal of Health, Exercise, and Sport Sciences (IJOSS), 1*(3), 15-28. https://www.ijoss.org/Archive/ijoss-Volume1-issue3-02.pdf

CHAPTER 8

The Multidimensional Effects of Physical Activity and Sport: A Physical, Psychological, and Functional Framework

Assist. Prof. Ahmet Naci DİLEK[1]

Dilek, A. N. (2025). The multidimensional effects of physical activity and sport: A physical, psychological, and functional framework. Ü. Erbaş, C. Cengiz & H. Osmanoğlu (Ed.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* içinde (ss. 111–123). Duvar Yayınları.

[1] Bartın University / Faculty of Sport Sciences / Department of Recreation / Recreation Discipline
E-mail: adilek@bartin.edu.tr ORCID: 0000-0002-9805-8694

1. Introduction

Physical activity and sport are regarded as multidimensional phenomena that influence not only individuals' physical health but also their psychological well-being, cognitive functioning, social interactions, and professional performance. The World Health Organisation (WHO) defines physical activity as any bodily movement that requires energy expenditure and emphasises that regular physical activity constitutes a fundamental protective factor in the prevention of numerous chronic diseases, particularly cardiovascular disorders (World Health Organisation [WHO], 2020).

Contemporary literature indicates that evaluating the effects of physical activity and sport solely from the perspective of physiological adaptations is insufficient. A growing body of evidence demonstrates that these activities play a pivotal role in psychological health, cognitive performance, social adjustment, and overall quality of life; consequently, interdisciplinary and holistic approaches have gained increasing prominence within the field of sport sciences (Biddle et al., 2019). In this context, physical activity is conceptualised not merely as a health-related behaviour but as a comprehensive lifestyle component that supports both individual and societal functioning (Yıldız, 2024a).

The purpose of this section is to examine the multidimensional effects of physical activity and sport in light of current international literature and to discuss their physical, psychological, and functional dimensions within an integrated and holistic framework.

This broad spectrum of effects has become increasingly critical in modern societies due to the rising prevalence of physical inactivity and sedentary behaviours (Yaşartürk, 2017; Şeyhanlı, 2021; Yıldız, 2024b; Aydemir, 2024). Technological advancements, urbanisation, and evolving work patterns have substantially reduced individuals' daily levels of physical activity (Şakar et al., 2024; Coşkuntürk et al., 2023; Er & Cengiz, 2023, 2025; Yaman, 2021). This reduction adversely affects not only physical health indicators but also psychological well-being, cognitive functioning, and societal productivity (Karadağ et al., 2023; Güler & Akpınar, 2023; Baba Kaya et al., 2021; World Health Organisation [WHO], 2020; Ekelund et al., 2019).

Within this framework, physical activity and sport should be considered not merely as individual health behaviours but as strategic domains of societal intervention with significant implications for lifelong health, academic achievement, and professional sustainability.

2. Conceptual Foundations of Physical Activity and Sport

Physical activity encompasses all forms of bodily movement performed in daily life. In contrast, sport is defined as a structured form of physical activity organised within specific rules and characterised by performance and competitive elements (Caspersen et al., 1985). Although both concepts elicit similar physiological effects on energy metabolism, the musculoskeletal system, and the cardiovascular system, the psychological, social, and behavioural dimensions of sport are more prominently manifested.

The American College of Sports Medicine (ACSM, 2022) states that regular physical activity not only enhances physical fitness but also improves functional capacity and overall quality of life. In this respect, physical activity transcends the boundaries of a purely health-related behaviour and becomes a lifestyle component directly associated with performance and functional efficiency.

This conceptual framework necessitates a multidimensional examination of the effects of physical activity and sport, providing a foundation for a holistic analysis that extends from physiological mechanisms to psychological and functional outcomes.

Such a conceptual distinction is essential for accurately interpreting the effects of physical activity and sport on individuals (Caspersen et al., 1985; Biddle et al., 2019). While physical activities performed in daily life serve a fundamental protective role in terms of health-related outcomes (Şeyhanlı, 2021), sport offers a unique learning environment for the development of psychological, cognitive, and social skills through its structured goals, performance feedback mechanisms, and competitive context (Weinberg & Gould, 2015; Gucciardi et al., 2015; Cotterill & Fransen, 2016). Therefore, evaluations of the effects of physical activity and sport should not be limited to physiological adaptations alone; cognitive processes, mental resilience, and functional gains must also be considered (Biddle et al., 2019; Ekelund et al., 2019).

3. Physical and Physiological Effects

3.1. Cardiovascular and Metabolic Adaptations

Regular physical activity has been shown to support psychological, physical, and cognitive development, while exerting beneficial effects on cardiovascular health, the musculoskeletal system, and overall endurance (Yaşar & Yılmaz, 2021; Özavci et al., 2023). The positive effects of regular physical activity on the cardiovascular system have been demonstrated by strong and consistent evidence within the sport sciences and public health literature. In particular, aerobic exercise enhances myocardial function, resulting in increased cardiac output, a reduced resting heart

rate, and improved vascular elasticity (Warburton & Bredin, 2017; American College of Sports Medicine [ACSM], 2022). These physiological adaptations contribute to the regulation of blood pressure and represent key mechanisms in reducing the risk of cardiovascular diseases by decelerating atherosclerotic processes. Indeed, long-term observational and interventional studies have reported that participation in regular physical activity significantly lowers the risk of coronary heart disease, stroke, and cardiovascular mortality (Lear et al., 2017).

In addition to cardiovascular adaptations, physical activity plays a decisive role in metabolic health. Regular exercise enhances glucose uptake in skeletal muscle tissue, thereby improving insulin sensitivity and supporting glycemic control (Yel et al., 2024). This mechanism is of critical importance, particularly in the prevention and management of type 2 diabetes mellitus (Colberg et al., 2016). However, the effects of short-term psychological interventions on cardiovascular recovery may be limited. For instance, a study conducted with elite female basketball players reported that a brief body-scan mindfulness intervention did not yield a significant effect on heart rate variability (Aras et al., 2023). Furthermore, the favourable effects of physical activity on lipid metabolism are associated with increased levels of high-density lipoprotein (HDL) and reduced triglyceride concentrations. These metabolic adaptations contribute to the improvement of the cardiometabolic risk profile (Warburton & Bredin, 2017).

From a holistic perspective, the effects of physical activity on the cardiovascular and metabolic systems extend beyond mere reductions in disease risk. Physical activity also enhances individuals' functional capacity, enabling them to perform activities of daily living with lower physiological cost. For this reason, the World Health Organisation (WHO, 2020) identifies regular physical activity as one of the primary prevention strategies for cardiovascular and metabolic diseases. Collectively, these findings clearly demonstrate that physical activity constitutes an indispensable component of a healthy lifestyle for maintaining metabolic health and should occupy a central position within community-based public health policies.

3.2. Musculoskeletal Health and Functional Capacity

Physical activity and sports play a fundamental role in maintaining and enhancing musculoskeletal health. Regular exercise supports the preservation of muscle strength and muscle mass, while also contributing to increased bone mineral density and improved joint stability. In particular, activities involving mechanical loading stimulate osteogenic responses within bone tissue, thereby promoting bone health and reducing the risk of osteoporosis (Kohrt et al., 2004; Weaver et al., 2016). These structural and functional adaptations are crucial for preserving individuals' mobility.

Resistance exercise occupies a distinctive position among musculoskeletal adaptations. Age-related losses in muscle mass and strength (sarcopenia) are closely associated with declines in functional independence and an increased risk of falls. The literature suggests that regularly performed and appropriately prescribed resistance training enhances muscle protein synthesis, representing an effective strategy for preventing sarcopenia and maintaining functional capacity (Fragala et al., 2019; Peterson et al., 2010). In this context, resistance training should be regarded not only as a means of improving athletic performance but also as a key intervention for sustaining lifelong mobility.

These beneficial effects on the musculoskeletal system support individuals' ability to perform activities of daily living independently, safely, and with a reduced risk of injury. Increases in muscle strength and joint stability improve balance and postural control, thereby lowering the risk of falls and musculoskeletal injuries. Accordingly, the American College of Sports Medicine (ACSM, 2022) identifies physical activity as an indispensable component for preserving functional capacity and enhancing quality of life. Collectively, these findings demonstrate that the effects of physical activity on musculoskeletal health extend beyond purely physiological outcomes and encompass functional and quality-of-life–related benefits.

3.3. Immune Functions and Overall Health Status

The effects of regular physical activity on the immune system have been extensively examined within the exercise immunology literature. In particular, moderate-intensity physical activity performed regularly has been shown to support innate immune responses by enhancing the circulation of immune cells, thereby strengthening the body's defence capacity against infections (Nieman & Wentz, 2019). In this context, physical activity exhibits a protective effect against various infectious diseases, most notably upper respiratory tract infections, and contributes to maintaining overall health status.

These beneficial effects on immune function are further explained through exercise-induced adaptations associated with anti-inflammatory mechanisms. Regular physical activity reduces low-grade systemic inflammation and lowers the risk of inflammation-related chronic diseases by regulating cytokine balance. In this process, exercise is emphasised as playing a significant role in attenuating the inflammatory burden associated particularly with metabolic and cardiovascular diseases (Gleeson et al., 2011; Pedersen & Saltin, 2015). Accordingly, physical activity is conceptualised as a holistic health behaviour that supports immune

function not only in the context of protection against infections but also in the prevention of chronic diseases.

Nevertheless, the literature highlights that the effects of exercise on the immune system should be interpreted within a dose–response framework. Excessively intense, prolonged exercise performed with insufficient recovery has been reported to induce transient immunosuppression and increase susceptibility to infections (Nieman & Wentz, 2019). Interactions among the endocrine system, immune system, autonomic nervous system, and central nervous system provide critical indicators reflecting an athlete's physical and psychological state (Özaltaş, 2019). This highlights the importance of closely monitoring immune function, especially in elite athletes and during periods of intense training. For this reason, the World Health Organisation (WHO, 2020) emphasises that physical activity should be planned in accordance with individual capacity and recovery requirements as a fundamental principle for maintaining overall health.

4. Psychological Effects and Mental Health

The effects of physical activity and sport on psychological health have been extensively examined within the sport psychology and clinical psychology literature. Meta-analytic studies indicate that regular physical activity significantly reduces levels of depression, anxiety, and stress, while simultaneously enhancing psychological well-being and life satisfaction (Schuch et al., 2016; Öktem et al., 2025; Özlü et al., 2021). In this context, physical activity is increasingly regarded as a complementary intervention in the prevention and management of psychological disorders.

During exercise, the release of endorphins and monoamine neurotransmitters, such as serotonin and dopamine, contributes to the regulation of mood. This process, in turn, strengthens individuals' perceptions of self-efficacy and self-esteem (Craft & Perna, 2004; Aras et al., 2023). Moreover, regular physical activity has been shown to exert regulatory effects on the hypothalamic–pituitary–adrenal (HPA) axis, leading to a more balanced stress response and reduced psychological reactivity. These physiological mechanisms constitute key biological pathways underlying the protective effects of exercise on mental health.

In addition, the psychological effects of physical activity are not limited to biochemical mechanisms alone. Sport and exercise environments provide opportunities for social interaction, a sense of belonging, and social support, thereby supporting psychological well-being in a multidimensional manner (Toprak & Gezer, 2025; Uğurlu & Şakar, 2015). Group-based physical activities have been shown to reduce social isolation, alleviate feelings of loneliness, and enhance

positive affect (Lubans et al., 2016). Furthermore, participation in regular physical activity has been linked to the development of more effective stress-coping strategies and enhanced psychological resilience (Biddle & Asare, 2011; Çakır, 2025a, 2025b; Yaman et al., 2016). Collectively, these findings demonstrate that the effects of physical activity on mental health operate within a holistic framework encompassing both individual and social dimensions.

5. Cognitive Processes and Mental Resilience

Physical activity and sport exert significant effects on cognitive functioning and mental resilience. Mental resilience is defined as an individual's capacity to sustain performance and maintain psychological equilibrium under stressful and demanding conditions. In athletic contexts, success is determined not solely by physical competencies but also by mental processes; physical activity contributes substantially to this process by supporting psychological well-being (Karademir et al., 2025). Sport environments provide a natural learning context for the development of mental resilience and related cognitive capacities (Gucciardi et al., 2015).

5.1. Physical Activity and Cognitive Functions

Research consistently demonstrates that regular physical activity has a significant and robust positive effect on core cognitive processes, including attention, executive functions, and working memory. In particular, aerobic exercise has been reported to induce both structural and functional changes in brain regions critically involved in executive functioning—most notably the prefrontal cortex—as well as in the hippocampus, which plays a central role in learning and memory processes. Enhanced neuroplasticity, increased synaptic connectivity, and augmented cerebral blood flow constitute key neurobiological mechanisms through which physical activity supports cognitive performance (Hillman et al., 2008; Erickson et al., 2011). These findings indicate that the effects of physical activity on cognitive functions occur not only at the behavioural level but also at the level of brain structure and function.

Studies examining different age groups reveal that the cognitive benefits of physical activity manifest in distinct ways across the lifespan. Among children and adolescents, regular physical activity has been shown to extend attentional capacity, enhance executive functions, and support cognitive outcomes related to academic performance (Donnelly et al., 2016). In older adults, substantial evidence indicates that physical activity slows cognitive decline, preserves memory performance, and reduces the risk of dementia (Erickson et al., 2011; Sofi et al., 2011). Collectively,

these findings suggest that the effects of physical activity on cognitive functions represent a lifelong and protective process that spans from early development to older adulthood.

5.2. The Role of Sport in the Development of Mental Resilience

Among the determinants of athletic performance, athletes' physical conditioning and technical skills occupy an important place; however, the primary factor shaping competitive outcomes is the sustainability of performance and the quality of behaviour under pressure. Particularly in situations where opponents are comparable in terms of physical capacity and technical proficiency, it has been reported that the winning side is often composed of athletes who possess more advanced mental skills (Weinberg & Gould, 2015). In this regard, mental resilience emerges as a critical psychological factor influencing athletic success (Holland et al., 2010; Sørensen et al., 2016).

In recent years, mental resilience has become a focal concept within sports science, attracting increasing attention from researchers, coaches, athletes, and sport administrators, and has come to be regarded as one of the fundamental prerequisites for sustainable athletic success (Jones et al., 2007; Sheard, 2010). Contemporary perspectives suggest that competitive outcomes are increasingly perceived as being shaped by the level of mental resilience, as reflected in the growing number of athletes, coaches, and sport psychologists who emphasise its importance (Pehlivan, 2014). Indeed, Weinberg et al. (2011) reported that mental resilience is perceived as a distinguishing personality characteristic for success in sport and that many coaches believe this psychological construct should be taken into account when planning athletes' physical and technical development.

Competitive sport environments inherently involve stress, pressure, uncertainty, failure, and intense evaluative processes. Athletes' ability to sustain performance under such conditions and to recover rapidly from adverse experiences requires a high level of mental resilience (Crust, 2008; Jones et al., 2007; Sheard, 2013). This clearly demonstrates that physical capacity alone is insufficient for achieving athletic success and that psychological factors—particularly mental resilience—play a decisive role in performance outcomes (Morali & Tiryaki, 1990).

Although the literature offers numerous definitions of mental resilience (Yardımcı et al., 2017), scholars emphasise the need to conceptualise this construct in a concrete, measurable, and functionally meaningful manner (Gucciardi et al., 2015). According to a consensus, mentally resilient athletes are characterised as individuals who can maintain goal focus, possess strong self-confidence, effectively regulate their emotions and behaviours, and demonstrate rapid recovery in the face

of adversity (Jones et al., 2007; Gucciardi et al., 2015). In other words, such athletes tend to preserve determination in highly competitive environments, sustain concentration under pressure, self-motivate effectively, and retain self-belief even following failure (Crust & Clough, 2011).

Sport environments provide a natural context for learning and adaptation in the development of mental resilience (Şakar & Kızılkaya Namlı, 2023). The physical and psychological challenges encountered during training and competition processes facilitate the development of problem-solving, self-regulation, and emotional control skills (Clough et al., 2002). In this regard, Nicholls et al. (2011; 2009) reported that mental resilience is closely associated with athletes' stress-coping strategies, emotional regulation capacities, and consistency in performance.

Similarly, Gucciardi et al. (2015) conceptualise mental resilience as an athlete's capacity to maintain goal focus under pressure, effectively employ self-regulatory skills, and sustain performance stability, emphasising that this attribute represents a critical psychological construct that distinguishes success in both elite and amateur athletes. Furthermore, Cowden (2017) demonstrated that athletes with higher levels of mental resilience exhibit more stable motivational patterns and are more resistant to psychological burnout.

Early research on the development of mental resilience has emphasised that this construct encompasses skills that are learnable and amenable to improvement. In particular, athletes' abilities to enhance positive energy flow during critical situations and to develop functional cognitive appraisals in response to pressure, errors, and competitive demands have been identified as key factors that strengthen mental resilience (Loehr, 1982; Jones, 2002). These findings indicate that mental resilience is not merely an innate trait but rather a dynamic construct that can be cultivated through systematic training and experiential learning.

Sport provides a powerful context for developing mental resilience by regularly exposing individuals to controlled stressors (Çelik, 2025). Through this process, sport not only enhances athletes' competitive performance but also fosters transferable psychological gains that support their capacity to cope with challenges encountered in academic, professional, and everyday life contexts.

6. Physical Activity, Academic Functioning, and Learning Processes

The effects of physical activity and sport are also evident in the domains of academic functioning and professional performance. Academic performance is shaped by the interaction of multiple components, including attention, learning capacity, motivation, and cognitive flexibility. Evidence indicates that physically active students demonstrate higher levels of classroom engagement and experience

more efficient learning processes (Singh et al., 2012). Moreover, school-based physical activity programs have been shown not to impair academic achievement; on the contrary, they exert positive effects on cognitive performance and classroom behaviour (Donnelly et al., 2016).

Similarly, physical activity provides substantial functional benefits within professional contexts. Individuals who engage in regular and leisure-time physical activity have been reported to exhibit higher energy levels, enhanced stress-coping abilities, and increased job satisfaction (Proper et al., 2003; Gönülateş, 2018; Yaşartürk et al., 2017; Yaşar & Direkçi, 2025). In addition, participation in team sports and sustained sport experience are emphasised as factors that foster leadership, decision-making, and self-regulation skills, with these competencies being transferable to occupational settings (Cotterill & Fransen,2016)

7. General Evaluation and Conclusion

The findings discussed in this section clearly demonstrate that the effects of physical activity and sport on individuals cannot be confined to a unidimensional health-oriented perspective; instead, they encompass a multidimensional structure that includes physiological, psychological, cognitive, academic, and occupational functioning (Biddle et al., 2019; World Health Organisation [WHO], 2020). The protective and enhancing effects of regular physical activity on the cardiovascular, metabolic, musculoskeletal, and immune systems support individuals' physical capacity and functional independence (Warburton & Bredin, 2017; Nieman & Wentz, 2019), while its positive influences on psychological health, cognitive functioning, and mental resilience offer critical benefits in terms of stress management, emotional regulation, and performance sustainability (Schuch et al., 2016; Gucciardi et al., 2015).

Furthermore, physically active individuals have been reported to demonstrate higher levels of engagement, attention, and learning efficiency in academic contexts (Singh et al., 2012; Donnelly et al., 2016), as well as a more advantageous profile in professional life with respect to energy levels, job satisfaction, leadership, and self-regulation skills (Proper et al., 2003; Cotterill & Fransen, 2016). This holistic pattern of effects suggests that physical activity is not merely a tool for disease prevention but a fundamental component of lifestyle that supports lifelong functionality, productivity, and quality of life.

Accordingly, beyond the promotion of exercise habits at the individual level, the development of sustainable policies and practices that support physical activity across educational, healthcare, and occupational settings should be regarded as a strategic necessity for strengthening public health, as emphasised within

contemporary public health frameworks (WHO, 2020; Pedersen & Saltin, 2015). In this context, the adoption of innovative approaches in planning physical activity– and sport-based recreational environments plays a critical role in facilitating sustainable and accessible participation opportunities. Such approaches not only enhance population-level engagement in physical activity but also contribute to the long-term integration of active lifestyles into everyday living, thereby reinforcing the societal value of physical activity as a cornerstone of lifelong health and functional well-being (Güney & Osmanoğlu, 2021).

References

Aras, D., Durmus, T., Cengiz, C., Guler, D., Guler, Y., Ugurlu, A., ... & Gülü, M. (2023). A brief body scan mindfulness practice has no positive effect on the recovery of heart rate variability and cognitive tasks in female professional basketball players. Frontiers in Psychology, 14, 1196066-1196066.

Aydemir, U., Hazar, K., & Çelik, H. (2024). Fiziksel aktivitenin sağlık ve yaşam kalitesi üzerindeki etkisi. In F. Çatıkkaş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 78–95). Duvar Yayınları

Baba Kaya, H., Tiryaki, K., & Akpınar, S. (2021). Spor Bilimleri Fakültesi Öğrencilerinin Akıllı Telefon Bağımlılık Düzeylerinin Sosyal-Duygusal Yalnızlıkları Üzerinde Etkisi. Düzce Üniversitesi Spor Bilimleri Dergisi, 1(1), 9-16.

Bar, M., Yaman, M. S., & Hergüner, G. (2016). Problems Encountered by Religious Vocational Secondary School and Other Secondary School Students in Physical Education and Sports Activities. Universal Journal of Educational Research, 4(4),664-674.https://doi.org/10.13189/ujer.2016.040402

Biddle, S., & Mutrie, N. (2007). *Psychology Of Physical Activity: Determinants, Well-Being And İnterventions*. Routledge. Https://Doi.Org/10.4324/9780203019320

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical Activity, Exercise, And Physical Fitness: Definitions And Distinctions For Health-Related Research. *Public Health Reports, 100*(2), 126.

Clough, P., Earle, K., & Sewell, D. (2002). Mental toughness: The concept and its measurement. In I. Cockerill (Ed.), *Solutions in sport psychology* (pp. 32–45). Thomson.

Colberg, S. R., Sigal, R. J., Yardley, J. E., Riddell, M. C., Dunstan, D. W., Dempsey, P. C., Horton, E. S., Castorino, K., & Tate, D. F. (2016). Physical activity/exercise and diabetes: A position statement of the American Diabetes Association. *Diabetes Care, 39*(11), 2065–2079. https://doi.org/10.2337/dc16-1728

Coşkuntürk, O. S., Kurcan, K., Yel, K., & Güzel, S. (2023). Teknolojik gelişmelerin hareketsiz yaşama ve çocuklarda psiko-motor gelişime etkileri. *Dede Korkut Spor Bilimleri Dergisi, 1*(1), 48-59. https://dergipark.org.tr/en/pub/dksbd/article/1309808

Yaman, M. S. (2021). Technology addiction in physical education and sports teacher candidates. The Turkish Online Journal of Educational Technology (TOJET), 20(3), 85–91

Cowden, R. G. (2017). Mental toughness and success in sport: A review and prospect. *Open Sports Sciences Journal, 10*, 1–14. https://doi.org/10.2174/1875399X01710010001

Craft LL, Perna FM. The Benefits Of Exercise For The Clinically Depressed. Prim Care Companion J Clin Psychiatry. 2004;6(3):104-111. Doi: 10.4088/Pcc.V06n0301. PMID: 15361924; PMCID: PMC474733.

Crust, L. (2008). A review and conceptual re-examination of mental toughness: Implications for future researchers. *Personality and Individual Differences, 45*(7), 576–583. https://doi.org/10.1016/j.paid.2008.07.005

Crust, L., & Clough, P. J. (2011). Developing mental toughness: From research to practice. *Journal of Sport Psychology in Action, 2*(1), 21–32. https://doi.org/10.1080/21520704.2011.563436

Çakır, Z., Çatıkkaş, F., Türkmen, M., Şengönül, A., Yaman, M. S., Öktem, T., Gönen, M., Güzel, S., & Yel, K. (2025b). Preservice teachers' attitudes toward pedagogical humour: The role of physical activity, sociodemographic factors, and academic discipline. BMC Psychology, 13, 1423. https://doi.org/10.1186/s40359-025-03751-4

Çakır, Z., Erbaş, Ü., Gönen, M., Ceyhan, M. A., Öktem, T., Kul, M., Dilek, A. N., & Güzel, S. (2025a). Examination of trauma levels and earthquake stress coping strategies of university students who exercise and do not exercise after an earthquake. BMC Psychology, 13, 867. https://doi.org/10.1186/s40359-025-03108-x

Çelik, H. (2025). Fiziksel aktivitenin mental sağlık üzerindeki koruyucu etkileri. M. Gönen, M. A. Ceyhan & Z. Çakır (Ed.), *Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler* içinde (ss. 37–50). Duvar Yayınları.

Donnelly JE, Hillman CH, Castelli D, Etnier JL, Lee S, Tomporowski P, Lambourne K, Szabo-Reed AN. Physical Activity, Fitness, Cognitive Function, And Academic Achievement İn Children: A Systematic Review. Med Sci Sports Exerc. 2016 Jun;48(6):1197-222. Doi: 10.1249/MSS.0000000000000901. PMID: 27182986; PMCID: PMC4874515.

Er, B., & Cengiz, R. (2023). The effect of digital leisure participation purposes on flow experience and leisure satisfaction. *Journal of ROL Sport Sciences, Specıal Issue (1),* 544-565.

Er, B., & Cengiz, R. (2025). The form of happiness in the digital age: examining the effect of ınternet usage in digital leisure on flow Experience. International Journal of Recreation and Sports Science, 9(1), 29-44. https://doi.org/10.46463/ijrss.1608338

Fragala, M. S., Cadore, E. L., Dorgo, S., Izquierdo, M., Kraemer, W. J., Peterson, M. D., & Ryan, E. D. (2019). Resistance training for older adults: Position statement from the National Strength and Conditioning Association. *Journal of Strength and Conditioning Research, 33*(8), 2019–2052. https://doi.org/10.1519/JSC.0000000000003230

Gleeson, M., Bishop, N. C., Stensel, D. J., Lindley, M. R., Mastana, S. S., & Nimmo, M. A. (2011). The anti-inflammatory effects of exercise: Mechanisms and implications for the prevention and treatment of disease. *Nature Reviews Immunology*, *11*(9), 607–615. https://doi.org/10.1038/nri3041

Gönülateş, S. (2018). Farklı ülkelerde rekreatif katılımın yaşam kalitesi üzerine etkisi. Akademisyen Kitabevi.

Gucciardi, D. F., Gordon, S., & Dimmock, J. A. (2009). Development and preliminary validation of a mental toughness inventory for Australian football. *Psychology of Sport and Exercise*, *10*(1), 201–209. https://doi.org/10.1016/j.psychsport.2008.07.001

Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2015). The Concept Of Mental Toughness: Tests Of Dimensionality, Nomological Network, And Traitness. *Journal Of Personality*, *83*(1), 26–44. Https://Doi.Org/10.1111/Jopy.12079

Güler, M., & Akpınar, Ö. (2023). The Prediction Of Physical And Mental Fatigue Level In The Use Of Ergogenıc Support Of Adolescent Athletes. *SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi, 21*(3), 212-225.https://doi.org/10.33689/spormetre.1316722

Güney, G., & Osmanoğlu, H. (2021). Rekreasyon alanlarında inovasyon ve sürdürülebilirlik. M. Dalkılıç & Ö. Özer (Ed.), Rekreasyon alanlarında inovasyon ve sürdürülebilirlik (1. bs.). Duvar Kitabevi. ISBN 978-625-7502-81-8

Hillman, C. H., Erickson, K. I., & Kramer, A. F. (2008). Be Smart, Exercise Your Heart: Exercise Effects On Brain And Cognition. *Nature Reviews Neuroscience*, *9*(1), 58–65. Https://Doi.Org/10.1038/Nrn2298

Holland, M. J. G., Woodcock, C., Cumming, J., & Duda, J. L. (2010). Mental qualities and employed mental techniques of young elite team sport athletes. *Journal of Sports Sciences*, *28*(10), 1093–1104. https://doi.org/10.1080/02640414.2010.495993

Jones, G. (2002). What is this thing called mental toughness? *Journal of Applied Sport Psychology*, *14*(3), 205–218. https://doi.org/10.1080/10413200290103509

Jones, G., Hanton, S., & Connaughton, D. (2007). A framework of mental toughness in the world's best performers. *The Sport Psychologist*, *21*(2), 243–264. https://doi.org/10.1123/tsp.21.2.243

Karadağ, Ö., Baba Kaya, H., & Hoşver, P. (2023). Spor Bilimleri Fakültesi Öğrencilerinin Dijital Teknoloji Kavramına Yönelik Algıları: Bir Metafor Çalışması. Trakya Eğitim Dergisi, 13(2), 923-942. https://doi.org/10.24315/tred.1100416

Karademir, İ., Gezer, H., & Gezer, E. (2025). Aktif Olarak Spor Yapan Üniversite Öğrencilerinin Müsabaka Esnasındaki Üst Bilişsel Süreçleri ile Algılanan Öğrenme Düzeyleri Arasındaki İlişki. *Spor ve Bilim Dergisi*, *3*(2), 113-126. https://dergipark.org.tr/en/download/article-file/4925459

Kohrt, W. M., Bloomfield, S. A., Little, K. D., Nelson, M. E., & Yingling, V. R. (2004). Physical activity and bone health. *Medicine & Science in Sports & Exercise*, *36*(11), 1985–1996. https://doi.org/10.1249/01.MSS.0000142662.21767.58

Lear, S. A., Hu, W., Rangarajan, S., Gasevic, D., Leong, D., Iqbal, R., Casanova, A., Swaminathan, S., Anjana, R. M., Kumar, R., Rosengren, A., Wei, L., Yang, W., Chuangshi, W., Huaxing, L., Nair, S., Diaz, R., Rahman, O., Gupta, R., … Yusuf, S. (2017). The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: The PURE study. *The Lancet*, *390*(10113), 2643–2654. https://doi.org/10.1016/S0140-6736(17)31634-3

Loehr, J. E. (1982). *Mental toughness training for sports*. Stephen Greene Press.

Lubans, D. R., Richards, J., Hillman, C. H., Faulkner, G., Beauchamp, M. R., Nilsson, M., Kelly, P., Smith, J. J., Raine, L. B., & Biddle, S. J. H. (2016). Physical activity for cognitive and mental health in youth: A systematic review of mechanisms. *Preventive Medicine*, *89*, 35–52. https://doi.org/10.1016/j.ypmed.2016.05.013

Morali, S., & Tiryaki, Ş. (1990). Spor psikolojisi: Sporcu davranışları. *Bağırgan Yayımevi*.

Nicholls, A. R., Levy, A. R., Polman, R. C. J., & Crust, L. (2011). Mental toughness, coping self-efficacy, and coping effectiveness among athletes. *International Journal of Sport Psychology*, *42*(6), 513–524.

Nicholls, A. R., Polman, R. C. J., Levy, A. R., & Backhouse, S. H. (2009). Mental toughness in sport: Achievement level, gender, age, experience, and sport type differences. *Personality and Individual Differences*, *47*(1), 73–75. https://doi.org/10.1016/j.paid.2009.02.006

Nieman, D. C., & Wentz, L. M. (2019). The compelling link between physical activity and the body's defense system. *Journal of Sport and Health Science*, *8*(3), 201–217. https://doi.org/10.1016/j.jshs.2018.09.009

Öktem, T., Kul, M., Karataş, İ., Hazar, E. B., Gök, U. D., Boz, E., Aksoy, Ö.F.,& Aydemir, U. (2025). Comparison of the Effects of 10 Weeks of Fitness and KettlebellWorkouts on Some Physical Parameters of Sedentary Individuals. Journal of Sport Sciences Research, 10(2), 321-340. https://doi.org/10.25307/jssr.1660219

Özaltaş, H. N. (2019). Egzersiz ve immün sistem. S. Şahin & H. N. Özaltaş (Ed.), Farklı alanlarda sporda bilimsel çalışmalar (1. bs., ss. 179–196). Akademisyen Kitabevi. ISBN 978-605-258-540-5

Özavci, R., Korkutata, A., Gözaydın, G., & Çakır, Z.(2023). Üniversite öğrencilerinde algılanan stresin yaşam doyumu ve rekreasyonel sağlık algısına etkisi. The Online Journal of Recreation and Sports (TOJRAS), 12(3), 454-461. https://doi.org/10.22282/tojras.1314763

Özlü, M., Gezer, H., & Gezer, E. (2021). Evaluation of physical education and sports candidate teachers' views on distance education. Pakistan Journal of Medical and Health Sciences, 15(11), 3329–3333. https://doi.org/10.53350/pjmhs2115113329

Pedersen, B. K., & Saltin, B. (2015). Exercise as medicine – Evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scandinavian Journal of Medicine & Science in Sports*, *25*(S3), 1–72. https://doi.org/10.1111/sms.12581

Pehlivan, Z. (2014). Spor psikolojisinde zihinsel dayanıklılık. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi, 9*(1), 11–21.

Peterson, M. D., Rhea, M. R., Sen, A., & Gordon, P. M. (2010). Resistance exercise for muscular strength in older adults: A meta-analysis. *Ageing Research Reviews*, *9*(3), 226–237. https://doi.org/10.1016/j.arr.2010.03.004

Proper, K. I., Koning, M., Van Der Beek, A. J., Hildebrandt, V. H., Bosscher, R. J., & Van Mechelen, W. (2003). The Effectiveness Of Worksite Physical Activity Programs On Physical Activity, Physical Fitness, And Health. *Clinical Journal Of Sport Medicine*, *13*(2), 106–117. Https://Doi.Org/10.1097/00042752-200303000-00008

Riebe, D., Ehrman, J. K., Liguori, G., & Magal, M. (2018). *ACSM's Guidelines For Exercise Testing And Prescription*. American College Of Sports Medicine.

Schuch, F. B., Vancampfort, D., Richards, J., Rosenbaum, S., Ward, P. B., & Stubbs, B. (2016). Exercise As A Treatment For Depression: A Meta-Analysis Adjusting For Publication Bias. *Journal Of Psychiatric Research, 77*, 42–51. Https://Doi.Org/10.1016/J.Jpsychires.2016.02.023

Sheard, M. (2010). *Mental toughness: The mindset behind sporting achievement* (2nd ed.). Routledge.

Sheard, M. (2013). *Mental toughness: The mindset behind sporting achievement* (2nd ed.). Routledge.

Singh, A., Uijtdewilligen, L., Twisk, J. W. R., Van Mechelen, W., & Chinapaw, M. J. M. (2012). Physical Activity And Performance At School: A Systematic Review Of The Literature. *Archives Of Pediatrics & Adolescent Medicine, 166*(1), 49–55. Https://Doi.Org/10.1001/Archpediatrics.2011.716

Sørensen, J. K., Thomsen, D. K., & Bennedsen, B. E. (2016). Mental toughness in elite athletes: A narrative review. *Journal of Sport Behavior, 39*(4), 423–447.

Şakar, M., & Kızılkaya Namlı, A. (2023). Öznel zindeliğin psikolojik sağlamlık üzerindeki etkisinde zihnin istemli ve istemsiz gezinmesinin aracılık rolü, *The Online Journal of Recreation and Sports (TOJRAS), 12*(3), 352-361

Şakar, M., Güzel, S., & Yel, K. (2024). Dijitalleşmenin spor ve fiziksel aktivite üzerindeki psikolojik yansımaları: Bir inceleme. In F. Çatıkkâş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 43–65). Duvar Yayınları.

Şeyhanlı D., Gürbüz, C., & Akman, C. N. (2024). COVID-19 korkusunun normalleşme sürecinde fiziksel aktivite üzerine etkisi. İ. Doğan, Ü. Erbaş, & Z. Çakır (Ed.), Disiplinlerarası spor çalışmaları (ss. 5–16). Duvar Yayınları.

Toprak, Y. P., & Gezer, E. (2025). Lisanslı Badminton Sporcularının, Spora Başlama Nedenlerinin, Bazı Değişkenler Açısından Değerlendirilmesi (Kars ili örneği). Uluslararası Bozok Spor Bilimleri Dergisi, 6(1), 239-250.

Uğurlu, F. M., & Şakar, M. (2015). Spor yapan ve spor yapmayan üniversite öğrencilerinin duygusal zekâ ve mutluluk düzeylerinin karşılaştırılması. Akademik Sosyal Araştırmalar Dergisi, 3(17), 461-469.

Warburton, D. E. R., & Bredin, S. S. D. (2017). Health Benefits Of Physical Activity: A Systematic Review Of Current Systematic Reviews. *Current Opinion İn Cardiology, 32*(5), 541–556. Https://Doi.Org/10.1097/HCO.0000000000000437

Weaver, C. M., Gordon, C. M., Janz, K. F., Kalkwarf, H. J., Lappe, J. M., Lewis, R., O'Karma, M., Wallace, T. C., & Zemel, B. S. (2016). The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors. *Osteoporosis International, 27*(4), 1281–1386. https://doi.org/10.1007/s00198-015-3440-3

Weinberg, R. S., & Gould, D. (2015). *Foundations of sport and exercise psychology* (6th ed.). Human Kinetics.

Weinberg, R. S., Butt, J., & Culp, B. (2011). Coaches' views of mental toughness and how it is built. *International Journal of Sport and Exercise Psychology, 9*(2), 156–172. https://doi.org/10.1080/1612197X.2011.567106

World Health Organization. (2020). *WHO Guidelines On Physical Activity And Sedentary Behaviour*. World Health Organization. Https://Www.Who.İnt/Publications/İ/İtem/9789240015128

Yaman, M. S.., Bar, M., Sarıkabak, M. & Hergüner, G. (2016). Identification of expectations and encountered problems of the middle-school students participating in the sports activities. Journal of Human

Yardımcı, H., Göde, O., & Şentürk, A. (2017). Zihinsel dayanıklılık kavramının spor bilimleri açısından değerlendirilmesi. *Spor Bilimleri Dergisi, 28*(4), 165–175.

Yaşar, Y., & Direkçi, V. (2025). Rekreasyon yönetimi: Türkiye ve dünya perspektifi. In M. Gönen, M. A. Ceyhan, & Z. Çakır (Eds.), Sporda güncel araştırmalar*: Fiziksel, psikolojik ve sosyal perspektifler* (pp. 24–36). Duvar Yayınları.

Yaşar, Y., & Yılmaz, U. (2021). Ortopedik engellilerde beden eğitimi ve spor uygulamaları. In M. Uzun (Ed.), Engelsiz yaşamlar: Özel gereksinimli bireylerde fiziksel aktivite ve spor (1. baskı, ss. 79-88). İzmir: Efe Akademi

Yaşartürk, F., Akyüz, H., & Karataş, İ. (2017). Rekreatif etkinliklere katılan üniversite öğrencilerinin serbest zamanda sıkılma algısı ile yaşam doyum düzeyleri arasındaki ilişkinin incelenmesi. International Journal of Cultural and Social Studies, 3, 239-252

Yel, K., Şencan, D., Güzel, S., & Erkılıç, A. O. (2024). Physical activity, nutrition, and healthy living. *International Journal of Health, Exercise, and Sport Sciences (IJOSS), 1*(3), 15-28. https://www.ijoss.org/Archive/ijoss-Volume1-issue3-02.pdf

Yıldız, M. E., Aslan, H., & Günel, İ. (2024b). Fiziksel aktivite ve yaşam doyumu. C. Yavuz & T. Çelik (Ed.), Spor bilimlerinde yenilikçi yaklaşımlar–2 (ss. 183–194). Duvar Yayınları.

Yıldız, M. E., Günel, İ., & Dalbudak, İ. (2024a). The relationship between physical activity and mindful awareness of university students. Physical Education of Students, 28(4), 234-241.

— — — — — — — — — — — — — —

CHAPTER 9

Physical Inactivity and Sedentary Behaviors in Modern Life: A Multidimensional Review of Child and Adolescent Health

Assoc. Prof. Murat ŞAKAR[1]

Sema GÜZEL[2]

Şakar, M., & **Güzel**, S. (2025). *Physical inactivity and sedentary behaviors in modern life: A multidimensional review of child and adolescent health*. In Ü. Erbaş, C. Cengiz, & H. Osmanoğlu (Eds.), *Exercise-based health approaches: Sports, recreation, and preventive perspectives* (pp. 124–140). Duvar Yayınları

[1] Munzur Üniversitesii Spor Bilimleri Fakültesi.
Beden Eğitimi Ve Spor Bölümü, Beden Eğitimi Ve Spor Anabilim Dalı
Orcid:0000-0001-9853-5879, muratsakar@munzur.edu.tr

[2] Bayburt University Graduate Education Institute, Bayburt, Türkiye,
E-mail: semaguzel2019@gmail.com / Orcid: 0009-0009-2761-3273

Introduction

Modern living conditions have led to a significant decline in physical activity levels among children and adolescents, while also contributing to the widespread prevalence of sedentary behaviours. The centralisation of digital technologies in everyday life, the increased engagement in screen-based activities, urbanisation, the reduction of safe play areas, and the intensification of academic demands have collectively resulted in the replacement of movement-oriented lifestyles with physically passive habits, particularly during childhood and adolescence (World Health Organization [WHO], 2020; Ekelund et al., 2019; Er & Cengiz, 2021; 2023; 2025).

Childhood and adolescence represent critical developmental periods characterised by rapid physical, physiological, motor, and psychosocial maturation, during which behavioural patterns and personality-related interaction styles that persist throughout the lifespan are established (Yaşar & Direkçi, 2025). Physical activity habits acquired during these stages, together with balanced nutrition, play a decisive role not only in current health status but also in determining the risk of chronic diseases, functional capacity, mental health, and overall quality of life in adulthood (Akyol et al., 2008; Açıkada & Ergen, 1990; Çelik, 2025; Aydemir et al., 2024).

Moreover, recent evidence indicates that a substantial proportion of children and adolescents fail to meet the recommended levels of physical activity, exhibit unbalanced dietary patterns, and are exposed to high levels of sedentary behaviours (Guthold et al., 2020; Sarışık & Şahin, 2021; Samar, 2021, 2022; Şarvan Cengiz et al., 2022, 2023).

Epidemiological findings further demonstrate that the decline in physical activity levels becomes particularly pronounced between the ages of 10 and 16 years, with a more marked decrease observed among girls (Farooq et al., 2020). According to data from the United States, only approximately one-third of individuals aged 10–24 years engage in at least 60 minutes of moderate-to-vigorous physical activity per day (Centres for Disease Control and Prevention [CDC], 2012). Similarly, across Europe, it has been reported that only about one-third of school-aged children meet current physical activity recommendations (Cavill et al., 2006). In Türkiye, national reports indicate that more than half of children and adolescents aged 6–18 years do not participate in regular physical activity, and that this proportion increases progressively with advancing age (Republic of Türkiye Ministry of Health, 2014).

In parallel with physical inactivity, the increasing prevalence of sedentary behaviours constitutes a distinct and independent risk domain for child and

adolescent health (Yıldız et al., 2024a, 2024b; Özaltaş, 2019; Şarvan Cengiz & Delen, 2019). Increases in daily screen time, prolonged sitting, and uninterrupted sedentary bouts have been consistently associated with adverse cardiometabolic risk factors, obesity, reduced cardiorespiratory fitness, and unfavourable body composition (Carson et al., 2016; Chinapaw et al., 2018; Coşkuntürk et al., 2023; Yel et al., 2024; Yaman et al., 2016). Importantly, not only the total duration of sedentary behaviour but also its temporal patterning—namely the frequency and length of sedentary bouts and the extent to which these periods are interrupted by physical activity—plays a decisive role in shaping health outcomes (Boerema et al., 2020; Liao et al., 2021; Biddle et al., 2010).

The consequences of physical inactivity and sedentary lifestyles for children and adolescents extend well beyond physiological dimensions. These behavioural patterns exert multifaceted adverse effects on musculoskeletal development, motor competence, cognitive functioning, academic achievement, and mental health (Strong et al., 2005; Donnelly et al., 2016; Özlü et al., 2021; Ceviz & Gözaydın, 2023). Children and adolescents who do not engage in regular physical activity are more likely to exhibit elevated levels of depression, anxiety, and perceived stress, alongside diminished self-esteem. Concurrently, sedentary lifestyles tend to exacerbate social isolation, thereby undermining psychosocial development (Biddle & Asare, 2011; Lubans et al., 2016; Çakır et al., 2025a, 2025b).

During adolescence, biological maturation processes constitute a critical variable influencing patterns of physical activity and sedentary behaviour. Evidence suggests that physical activity levels may vary according to the timing of biological maturation; in particular, girls who mature earlier tend to experience declines in physical activity at younger ages, accompanied by increases in sedentary behaviours (Bacil et al., 2015; Moore et al., 2020). In boys, by contrast, increases in muscle mass and strength during the period of peak height velocity may serve as facilitators of physical activity participation (Brown et al., 2017). Nevertheless, the relationship between biological maturation and sedentary behaviour patterns remains underexplored, with only a limited number of studies addressing this association to date.

In light of these findings, it is evident that physical inactivity and sedentary behaviours among children and adolescents cannot be explained solely by individual choice. Instead, they reflect a complex and dynamic interplay of environmental, biological, psychological, and socio-cultural factors. Accordingly, effective interventions must be conceptualised within multi-dimensional, school-, family-, and community-based frameworks. School-based physical activity programs, active

recess initiatives, the promotion of movement-oriented play cultures, and the regulation of screen time are core strategies for protecting and promoting child and adolescent health (World Health Organisation [WHO], 2020).

Physical Activity and Developmental Foundations in Childhood and Adolescence

Childhood and adolescence are widely recognised as critical developmental stages characterised by the most rapid rates of growth and maturation, during which biological systems mature, and the foundations of lifelong behavioural patterns are established. During these periods, physical activity extends beyond its role in regulating energy balance and functions as a fundamental determinant of development, exerting direct influences on motor development, musculoskeletal maturation, neurological organisation, and psychosocial adaptation processes (Gallahue et al., 2014; Santrock, 2019).

Regular participation in physical activity throughout childhood and adolescence supports the development of muscular strength, bone mineral density, cardiorespiratory fitness, and fundamental motor skills. In particular, weight-bearing and dynamic activities performed during growth generate osteogenic stimuli within bone tissue, thereby contributing to optimal skeletal development and reducing the risk of osteoporosis in later life (Weaver et al., 2016). Conversely, insufficient development of motor skills may diminish children's motivation to engage in physical activity, predisposing them to withdraw from movement-based play and sport activities and increasing their tendency toward sedentary behaviours (Stodden et al., 2007).

Hormonal and physical changes accompanying biological maturation during adolescence exert a substantial influence on physical activity behaviours. In boys, increases in muscle mass and muscular strength tend to act as facilitating factors that encourage participation in physical activity. In girls, however, increases in adipose tissue, alterations in body image perception, and social influences may contribute to marked declines in physical activity levels. Saunders et al. (2016) reported that when physical activity, sedentary behaviour, and sleep are considered jointly in children and adolescents, higher levels of physical activity are consistently associated with more favourable cardiometabolic health, body composition, and psychosocial outcomes. In this context, these findings provide an important biological and psychosocial framework for understanding the pronounced decline in physical activity observed during adolescence, particularly among girls (Bacil et al., 2015; Moore et al., 2020).

Understanding the sustainability of physical activity participation during childhood and adolescence requires that motor skill development be considered a fundamental foundation for physical activity. A substantial portion of the physical activity literature has focused primarily on measuring children's physical activity levels; however, the process of learning to move—an essential prerequisite for adopting and maintaining physically active behaviours—has often been insufficiently emphasised. However, the capacity to sustain an active lifestyle presupposes that individuals possess the ability to move effectively and competently.

Fundamental motor skills acquired during early childhood serve as the building blocks for physical activity participation in later life. Locomotor skills such as running, jumping, and hopping, together with object control skills including throwing, catching, and striking, provide the motor foundation necessary for the development of more complex movements used in sport, play, and recreational activities (Haywood & Getchell, 2005). From this perspective, fundamental motor skills are regarded as core components of lifelong physical activity competence (Clark & Metcalfe, 2002).

Developmental motor theories emphasise that achieving proficiency in fundamental motor skills plays a decisive role in the acquisition of advanced movement skills and the establishment of sustained physical activity behaviours. Seefeldt (1980) proposed that when adequate proficiency in fundamental motor skills is not attained, individuals may encounter a substantial "proficiency barrier" that hinders their transition into organised sports and broader physical activity participation. Similarly, the motor development model proposed by Clark and Metcalfe (2002) conceptualises fundamental motor skills as precursors to context-specific and skill-demanding movements, asserting that progression to higher levels of motor development is contingent upon the early acquisition of these foundational competencies.

Although social-cognitive and motivation-based models have made significant theoretical contributions to explaining physical activity behaviours (Eccles & Harold, 1991; Harter, 1978; Trost et al., 1997), these frameworks predominantly focus on psychological processes and tend to address developmental foundations such as motor competence at a secondary level. This emphasis creates an important gap in explaining the continuity and sustainability of physical activity across childhood and adolescence (Barnett et al., 2016).

In conclusion, promoting physical activity during childhood and adolescence should not be confined solely to motivational or behavioural approaches; instead, it must be addressed through a holistic and developmental perspective that places

fundamental motor skill development at its core. Given that children who fail to acquire adequate motor skill experiences at an early age may face diminished opportunities for physical activity participation in later stages of life, the development of fundamental motor skills should be regarded as an indispensable prerequisite for sustaining an active, healthy, and functional lifestyle across the lifespan.

Modern Life, Physical İnactivity, and Sedentary Behavior Patterns

Modern living conditions have profoundly transformed the daily movement behaviours of children and adolescents, leading to a marked shift in the balance between physical activity and sedentary behaviour in favour of a sedentary lifestyle. The centrality of digital technologies in everyday life—including the widespread adoption of online education, smartphones, tablets, and video games—has resulted in children spending a substantial proportion of their leisure time in sedentary activities characterised by low energy expenditure (Şeyhanlı & Gürbüz, 2024; Reyhan, 2020). Contemporary epidemiological evidence indicates that, worldwide, a large proportion of children and adolescents exceed recommended limits for daily screen time and exhibit insufficient levels of physical activity (CDC, 2012; WHO, 2020).

Sedentary behaviour is defined not merely as the absence of physical activity but as a distinct set of behaviours occurring in sitting, reclining, or screen-based contexts and characterised by an energy expenditure of ≤1.5 METs (Ainsworth, 2011). Recent research has demonstrated that the health effects of sedentary behaviour are associated not only with its total duration but also with its temporal pattern throughout the day. In particular, prolonged and uninterrupted sedentary bouts have been shown to exert more detrimental effects on cardiometabolic risk factors than shorter, more frequently interrupted sedentary periods (Chinapaw et al., 2018; Liao et al., 2021).

Sedentary behaviour patterns established during childhood are known to have a strong tendency to track into adolescence and adulthood, gradually becoming entrenched as persistent lifestyle behaviours. This pattern underscores that physical inactivity cannot be adequately explained by individual choice alone; instead, it should be conceptualised as a multidimensional public health issue shaped by the interaction of environmental, structural, and socio-cultural factors (Sallis et al., 2015).

International guidelines recommend that children and adolescents engage in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) daily to protect

and promote health (WHO, 2010; Tremblay et al., 2011). These recommendations are grounded in robust evidence demonstrating the protective effects of physical activity on body composition, cardiovascular health, skeletal development, metabolic regulation, and psychological well-being (Janssen & LeBlanc, 2010). However, the predominant focus on MVPA—which typically accounts for only approximately 5% of the waking day—has led to the relative neglect of light-intensity physical activities and sedentary behaviours that occupy the remainder of the day.

Recent evidence suggests that light-intensity physical activities (e.g., walking, standing, and routine daily movements) play a significant role in reducing sedentary behaviour and enhancing overall health profiles. Studies employing objective measurement methods (accelerometers) demonstrate that children and adolescents spend a considerable proportion of their day (approximately 4–6 hours) engaged in light-intensity physical activity, and that increasing time spent at this intensity level is associated with more favorable health outcomes compared with sedentary behaviors (Matthews et al., 2008; Troiano et al., 2008; Colley et al., 2011).

Within this context, physical activity should be evaluated not solely in terms of intensity, but also with consideration of its total volume, duration, frequency, and temporal distribution throughout the day. Contemporary literature suggests that even short, sporadic bouts of accumulated physical activity (incidental physical activity) can attenuate the adverse effects of sedentary behaviour and yield meaningful health benefits for children and adolescents (Tremblay et al., 2010a; Carson et al., 2013).

Comprehensive evaluations conducted by multidisciplinary expert panels in the field of child and adolescent health have demonstrated that physical activity exerts beneficial effects on adiposity, cardiovascular health, musculoskeletal development, mental health, and academic achievement. In contrast, increased engagement in sedentary behaviours has been associated with obesity, reduced physical fitness, psychological difficulties, and impairments in cognitive functioning (Güler & Işıklı, 2024; Aras et al., 2023). Collectively, these findings clearly indicate that physical activity and sedentary behaviour should be examined concurrently and within an integrated conceptual framework.

Contemporary living conditions constitute a powerful environmental context that constrains the movement behaviours of children and adolescents. Consequently, interventions aimed at protecting and promoting child and adolescent health should not be confined solely to approaches focused on achieving recommended levels of physical activity. Instead, they should be structured around multidimensional strategies that also aim to reduce sedentary behaviour patterns, promote light-

intensity physical activities, and implement environmental modifications to enhance movement throughout the day. Such an approach is likely to support the adoption of physical activity as a sustainable lifestyle behaviour during childhood and adolescence, thereby playing a critical role in achieving long-term public health benefits.

Physical Inactivity and the Physical and Biological Effects of Sedentary Behaviours

Physical inactivity constitutes a fundamental biological risk factor for the development of overweight and obesity in children and adolescents by disrupting the balance between energy intake and energy expenditure. Obesity emerging at early ages has a high likelihood of persisting into adolescence and adulthood, thereby predisposing individuals to the earlier onset of chronic metabolic disorders such as type 2 diabetes, hypertension, dyslipidemia, and cardiovascular diseases (Sahoo et al., 2015; Guthold et al., 2020; World Health Organisation [WHO], 2020). Indeed, epidemiological evidence consistently demonstrates that low levels of physical activity during childhood are strongly linked to adverse health outcomes throughout the lifespan.

A decline in regular physical activity is closely linked to impairments in glucose metabolism, increased insulin resistance, and unfavourable alterations in lipid metabolism. Prolonged sedentary behaviours, in particular, have been shown to negatively affect cardiometabolic risk profiles, independent of engagement in moderate- to vigorous-intensity physical activity. Studies employing objective measurement methods indicate that extended and uninterrupted sitting time is associated with increased waist circumference, impaired insulin sensitivity, and reduced cardiorespiratory fitness among children and adolescents (Ekelund et al., 2016; Carson et al., 2016; Wijndaele et al., 2019). Collectively, these findings suggest that sedentary behaviour should be conceptualised not merely as the absence of physical activity, but as an independent biological risk factor.

From a musculoskeletal development perspective, physical inactivity hurts bone mineralisation and muscle strength acquisition, both of which are of critical importance during childhood and adolescence. In children who are not exposed to adequate mechanical loading during growth, bone mineral density may fail to reach optimal levels, thereby increasing the risk of osteoporosis and fractures later in life (Weaver et al., 2016; Strong et al., 2005). Concurrently, physically inactive individuals tend to exhibit lower levels of muscle strength, muscular endurance, and neuromuscular coordination, which in turn contribute to deficiencies in fundamental

motor skills and impairments in movement economy (Poitras et al., 2016; Robinson et al., 2015).

During childhood and adolescence—periods characterised by rapid growth and development—insufficient physical activity not only constrains current health indicators but also affects future biological reserves. In this context, physical activity should not be regarded as a complementary component, but rather as a fundamental and indispensable biological requirement for the healthy development of cardiometabolic systems, the preservation of musculoskeletal integrity, and the enhancement of biological resilience. Accumulating evidence clearly demonstrates that reducing sedentary time and promoting movement patterns distributed throughout the day are of strategic importance for protecting and promoting child and adolescent health (Tremblay et al., 2017; WHO, 2020).

Psychological and Cognitive Effects

The effects of physical activity and sedentary behaviour on the psychological and cognitive development of children and adolescents have become a central focus of interdisciplinary research in recent years. Accumulating scientific evidence indicates that regular participation in physical activity plays a protective and restorative role in mental health outcomes, whereas a sedentary lifestyle markedly increases psychological risk profiles (Biddle & Asare, 2011; Lubans et al., 2016; Yaşartürk, 2017; Toprak, 2025).

From a psychological perspective, physical activity is significantly associated with reductions in depressive and anxiety symptoms, as well as with enhanced self-esteem and increased perceptions of self-efficacy among children and adolescents. Particularly during adolescence—a developmental period characterised by heightened emotional volatility and stress sensitivity—physical activity is regarded as a crucial coping mechanism that supports emotional regulation skills (Biddle & Asare, 2011; Özavci et al., 2023). In contrast, prolonged sedentary behaviours have been linked to increased social isolation, reinforced negative affect, and decreased levels of psychological well-being (Tremblay et al., 2017; Carson et al., 2016).

Within the context of cognitive development, strong evidence suggests that physical activity supports higher-order cognitive processes, including attention, executive functions, working memory, and cognitive flexibility. Aerobic exercise has been shown to enhance cerebral blood flow, promote synaptic plasticity, and induce structural and functional changes in brain regions associated with learning and memory, particularly the prefrontal cortex and hippocampus (Hillman et al., 2008; Erickson et al., 2015). These neurobiological adaptations are considered

among the fundamental mechanisms underlying the beneficial effects of physical activity on cognitive performance.

Research conducted among school-aged children suggests that physically active individuals exhibit longer in-class attention spans, demonstrate greater cognitive control during academic tasks, and engage more effectively in learning processes. Evidence consistently shows that school-based physical activity programs do not undermine academic achievement; on the contrary, they exert beneficial effects on academic performance, classroom behaviour, and cognitive functioning (Donnelly et al., 2016; Singh et al., 2012). These findings suggest that physical activity should not be viewed as a competing demand on instructional time, but rather as a complementary component that facilitates learning processes.

From the perspective of sedentary behaviour, increases in screen-based passive activities have been associated with heightened attentional difficulties, cognitive fatigue, and reduced academic motivation (Konur Tekeş, 2023). Prolonged and uninterrupted sitting has been emphasised as a factor that may diminish levels of cognitive arousal and adversely affect executive function performance (Carson et al., 2016; Carter et al., 2018). Accordingly, contemporary approaches advocate not only for increasing moderate- to vigorous-intensity physical activity, but also for interrupting sedentary time with light-intensity activities distributed throughout the day (Uzun & Gözaydın, 2017).

In conclusion, physical activity represents a multidimensional developmental resource that supports not only the physical health of children and adolescents, but also their psychological resilience, cognitive functioning, and academic performance. Therefore, interventions targeting child and adolescent health should conceptualise physical activity as a fundamental lifestyle behaviour that promotes psychological and cognitive development. In contrast, strategies aimed at reducing sedentary behaviours should be planned within a holistic developmental framework.

Preventive Approaches to Sedentary Behaviours and Strategic Recommendations

The effectiveness of interventions aimed at reducing physical inactivity and sedentary behaviours among children and adolescents depends on recognising that these behaviours are shaped not only by individual choices, but also by multiple interacting determinants operating at the family, school, environmental, and policy levels. Accordingly, contemporary approaches emphasise that strategies to promote physical activity should not be confined to unidimensional exercise prescriptions,

but must instead adopt multilevel and sustainable frameworks (Sallis et al., 2015; Chaput et al., 2014).

The school setting is widely regarded as one of the most critical contexts for shaping the daily movement behaviours of children and adolescents. Evidence suggests that school-based physical activity programs are effective not only in increasing students' daily levels of moderate-to-vigorous intensity physical activity, but also in reducing sedentary time. In particular, interventions such as active recess initiatives, movement breaks during classroom instruction, and enhancements in the quality of physical education lessons have been identified as effective strategies that can be implemented without compromising academic outcomes (Donnelly et al., 2016; Álvarez-Bueno et al., 2017).

The family environment and parental attitudes play a decisive role in children's engagement in physical activity. Supportive parental behaviours, including acting as role models, encouraging active lifestyles, and limiting sedentary behaviours within the home, emerge as key protective factors in the development of movement-oriented habits among children. Research further suggests that family-based interventions tend to produce stronger and more enduring effects, particularly during early childhood (Leech et al., 2014; Rollo et al., 2020).

Environmental and structural factors are integral components of prevention strategies. The availability and accessibility of safe playgrounds, parks, and recreational facilities increase the likelihood that children will engage in physical activity during their leisure time. Moreover, urban designs that promote walkability, the encouragement of active transportation options (e.g., walking and cycling), and the transformation of school surroundings into movement-friendly environments represent structural interventions that integrate physical activity into daily life as a natural and sustainable behaviour (Sallis et al., 2015; Güney & Osmanoğlu, 2021).

From a behavioural pattern perspective, it is emphasised that interventions aimed at reducing sedentary behaviour are insufficient when they focus solely on limiting screen time. Contemporary literature suggests that interrupting prolonged and uninterrupted sedentary periods with brief episodes of physical activity yields significant benefits for both cardiometabolic and cognitive health. Accordingly, prevention strategies increasingly highlight the importance of promoting light-intensity physical activities and incidental physical activity embedded within daily life (Chinapaw et al., 2018; Carter et al., 2018).

For children and adolescents, ensuring that physical activity is enjoyable, age-appropriate, and diverse is crucial for sustaining long-term participation. Particularly during adolescence, creating environments that prioritise inclusion, enjoyment, and

perceptions of self-efficacy, rather than competition-oriented approaches, helps prevent the development of negative attitudes toward physical activity. In this context, prevention strategies should aim not only to elicit short-term behavioural change, but also to foster lifelong, sustainable, and active lifestyle habits among children and adolescents.

Conclusion

The findings reviewed in this article indicate that the effects of physical inactivity and sedentary behaviours on child and adolescent health cannot be explained within a unidimensional risk framework. Instead, they reflect a multilayered and interactive structure encompassing biological, physiological, motor, psychological, cognitive, and academic domains. During childhood and adolescence, insufficient levels of physical activity and increasing patterns of sedentary behaviour not only adversely affect current health indicators but also establish a strong foundation for elevated risk of chronic diseases in adulthood, reduced functional capacity, weakened psychological resilience, and diminished quality of life.

Within this context, physical activity should not be regarded as a complementary lifestyle choice for children and adolescents, but as a fundamental biological and behavioural necessity essential to the sustainability of healthy growth and development. Accordingly, effective interventions must extend beyond approaches focused solely on individual behaviour change and instead be structured around multidimensional strategies that are integrated across school, family, environmental, and policy levels, with the explicit aim of reducing sedentary behaviours and promoting movement throughout the day. Such holistic and sustainable approaches are likely to facilitate the adoption of physical activity as a lifelong habit among children and adolescents, thereby playing a critical role in strengthening population health outcomes over the long term.

.

References

Aras, D., Durmus, T., Cengiz, C., Guler, D., Guler, Y., Ugurlu, A., ... & Gülü, M. (2023). A brief body scan mindfulness practice has no positive effect on the recovery of heart rate variability and cognitive tasks in female professional basketball players. Frontiers in Psychology, 14, 1196066-1196066.

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett, D. R., Tudor-Locke, C., … Leon, A. S. (2011). *2011 Compendium of Physical Activities: A second update of codes and MET values*. Medicine & Science in Sports & Exercise, 43(8), 1575–1581.

Álvarez-Bueno, C., Pesce, C., Cavero-Redondo, I., Sánchez-López, M., Garrido-Miguel, M., & Martínez-Vizcaíno, V. (2017). Academic achievement and physical activity: A meta-analysis.

Pediatrics, 140(6), e20171498. https://doi.org/10.1542/peds.2017-1498

Aydemir, U., Hazar, K., & Çelik, H. (2024). Fiziksel aktivitenin sağlık ve yaşam kalitesi üzerindeki etkisi. In F. Çatıkkaş & T. Bozkuş (Eds.), Spor araştırmaları: Teorik ve uygulamalı yaklaşımlar (pp. 78–95). Duvar Yayınları

Bacil, E. D. A., Júnior, O. M., Rech, C. R., dos Santos Legnani, R. F., & de Campos, W. (2015). Physical activity and biological maturation: a systematic review. *Revista Paulista de Pediatria (English Edition), 33*(1), 114-121. https://doi.org/10.1016/S2359-3482(15)30037-3

Bar, M., Yaman, M. S., & Hergüner, G. (2016). Problems Encountered by Religious Vocational Secondary School and Other Secondary School Students in Physical Education and Sports Activities. Universal Journal of Educational Research, 4(4),664-674.https://doi.org/10.13189/ujer.2016.040402

Barnett, L. M., Lai, S. K., Veldman, S. L. C., Hardy, L. L., Cliff, D. P., Morgan, P. J., … Okely, A. D. (2016). Correlates of gross motor competence in children and adolescents: A systematic review and meta-analysis. *Sports Medicine, 46*(11), 1663–1688. https://doi.org/10.1007/s40279-016-0495-z

Biddle, S. J. H., & Asare, M. (2011). *Physical activity and mental health in children and adolescents: A review of reviews*. British Journal of Sports Medicine, 45(11), 886–895. https://doi.org/10.1136/bjsports-2011-090185

Biddle, S. J. H., Pearson, N., Ross, G. M., & Braithwaite, R. (2010). Tracking of sedentary behaviours of young people: A systematic review. *Preventive Medicine, 51*(5), 345–351. https://doi.org/10.1016/j.ypmed.2010.07.018

Bucksch, J., Sigmundova, D., Hamrik, Z., Troped, P. J., Melkevik, O., Ahluwalia, N., & Inchley, J. (2016). International trends in adolescent screen-time behaviors from 2002 to 2010. *Journal of Adolescent Health, 58*(4), 417–425. https://doi.org/10.1016/j.jadohealth.2015.11.014

Carson, V., Hunter, S., Kuzik, N., Gray, C. E., Poitras, V. J., Chaput, J. P., ... & Tremblay, M. S. (2016). Systematic review of sedentary behaviour and health indicators in school-aged children and youth: an update. *Applied physiology, nutrition, and metabolism, 41*(6), S240-S265.

Carter, S. E., Draijer, R., Holder, S. M., Brown, L., Thijssen, D. H., & Hopkins, N. D. (2018). Regular walking breaks prevent the decline in cerebral blood flow associated with prolonged sitting. *Journal of applied physiology*.

Ceviz, E., & Gözaydın, G. (2023). E-spor ve omurga sağlığı. In M. Güçlü, F. Çatıkkâş, & Z. Çakır (Eds.), Farklı boyutlarıyla spor araştırmaları 2 (pp. 22–40). Duvar Yayınları.

Chaput, J. P., Carson, V., Gray, C. E., & Tremblay, M. S. (2014). Importance of all movement behaviors in a 24 hour period for overall health. *International Journal of Environmental Research and Public Health, 11*(12), 12575–12581.https://doi.org/10.3390/ijerph111212575

Chinapaw, M. J. M., Proper, K. I., Brug, J., Van Mechelen, W., & Singh, A. S. (2011). Relationship between young peoples' sedentary behaviour and biomedical health indicators: a systematic review of prospective studies. *Obesity reviews, 12*(7), e621-e632. https://doi.org/10.1111/j.1467-789X.2011.00865.x

Coşkuntürk, O. S., Kurcan, K., Yel, K., & Güzel, S. (2023). Teknolojik gelişmelerin hareketsiz yaşama ve çocuklarda psiko-motor gelişime etkileri. *Dede Korkut Spor Bilimleri Dergisi*, *1*(1), 48-59. https://dergipark.org.tr/en/pub/dksbd/article/1309808

Çakır, Z., Çatıkkaş, F., Türkmen, M., Şengönül, A., Yaman, M. S., Öktem, T., Gönen, M., Güzel, S., & Yel, K. (2025b). Preservice teachers' attitudes toward pedagogical humour: The role of physical activity, sociodemographic factors, and academic discipline. BMC Psychology, 13, 1423. https://doi.org/10.1186/s40359-025-03751-4

Çakır, Z., Erbaş, Ü., Gönen, M., Ceyhan, M. A., Öktem, T., Kul, M., Dilek, A. N., & Güzel, S. (2025a). Examination of trauma levels and earthquake stress coping strategies of university students who exercise and do not exercise after an earthquake. BMC Psychology, 13, 867. https://doi.org/10.1186/s40359-025-03108-x

Çelik, H. (2025). Fiziksel aktivitenin mental sağlık üzerindeki koruyucu etkileri. M. Gönen, M. A. Ceyhan & Z. Çakır (Ed.), *Sporda güncel araştırmalar: Fiziksel, psikolojik ve sosyal perspektifler* içinde (ss. 37–50). Duvar Yayınları.

Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., … Szabo-Reed, A. N. (2016). *Physical activity, fitness, cognitive function, and academic achievement in children*. Medicine & Science in Sports & Exercise, 48(6), 1197–1222. https://doi.org/10.1249/MSS.0000000000000901

Dumith, S. C., Gigante, D. P., Domingues, M. R., & Kohl, H. W. (2011). Physical activity change during adolescence: A systematic review and a pooled analysis. *International Journal of Epidemiology, 40*(3), 685–698. https://doi.org/10.1093/ije/dyq272

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., … Lancet Physical Activity Series 2 Executive Committee. (2016). *Does physical activity attenuate the detrimental association of sitting time with mortality?* The Lancet, 388, 1302–1310.

Ekelund, U., Ward, H. A., Norat, T., Luan, J. A., May, A. M., Weiderpass, E., ... & Riboli, E. (2015). Physical activity and all-cause mortality across levels of overall and abdominal adiposity in European men and women: the European Prospective Investigation into Cancer and Nutrition Study (EPIC). *The American journal of clinical nutrition*, *101*(3), 613-621. https://doi.org/10.3945/ajcn.114.100065

Er, B., & Cengiz, R. (2023). The effect of digital leisure participation purposes on flow experience and leisure satisfaction. *Journal of ROL Sport Sciences, Specıal Issue (1),* 544-565.

Er, B., & Cengiz, R. (2025). The form of happiness in the digital age: examining the effect of ınternet usage in digital leisure on flow Experience. International Journal of Recreation and Sports Science, 9(1), 29-44. https://doi.org/10.46463/ijrss.1608338

Erickson, K. I., Hillman, C. H., & Kramer, A. F. (2015). Physical activity, brain, and cognition. *Current opinion in behavioral sciences*, *4*, 27-32. https://doi.org/10.1016/j.cobeha.2015.01.005

Farooq, A., Martin, A., Janssen, X., Wilson, M. G., Gibson, A. M., Hughes, A., & Reilly, J. J. (2020). Longitudinal changes in moderate-to-vigorous physical activity in children and adolescents: A systematic review and meta-analysis. *Obesity Reviews*, *21*(1), e12953. https://doi.org/10.1111/obr.12953

Fedewa, A. L., & Ahn, S. (2011). The effects of physical activity and physical fitness on children's achievement and cognitive outcomes. *Research Quarterly for Exercise and Sport, 82*(3), 521–535. https://doi.org/10.1080/02701367.2011.10599785

Gallahue, D. L., Ozmun, J. C., & Goodway, J. D. (2014). *Understanding motor development: Infants, children, adolescents, adults* (7th ed.). McGraw-Hill.

Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2020). *Global trends in insufficient physical activity among adolescents*. The Lancet Child & Adolescent Health, 4, 23–35.

Güler, M., & Işıklı, S. (2024). Deconstruction of the Relationship Between Physical Activity Level, Body Mass Index and Multi-Screen Addiction in Middle School Students. Journal of Exercise Science & Physical Activity Reviews (C. 2, Sayı 2, ss. 1-14)

Güney, G., & Osmanoğlu, H. (2021). Rekreasyon alanlarında inovasyon ve sürdürülebilirlik. M. Dalkılıç & Ö. Özer (Ed.), Rekreasyon alanlarında inovasyon ve sürdürülebilirlik (1. bs.). Duvar Kitabevi. ISBN 978-625-7502-81-8

Hillman, C., Erickson, K. & Kramer, A. Be smart, exercise your heart: exercise effects on brain and cognition. *Nat Rev Neurosci* 9, 58–65 (2008). https://doi.org/10.1038/nrn2298

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *7*, 40. https://doi.org/10.1186/1479-5868-7-40

Konur Tekeş, F. (2023). Teknolojik gelişmelerin spor alanı üzerindeki etkisi. H. Osmanoğlu & N. Uygur (Ed.), Spor bilimlerinde multidisipliner güncel araştırmalar (ss. 5–14). Eğitim Yayınevi.

Leech, R. M., McNaughton, S. A., & Timperio, A. (2014). The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. *International journal of behavioral nutrition and physical activity*, *11*(1), 4.

Liao, Y., et al. (2021). *Prolonged sedentary time and cardiometabolic risk in children and adolescents*. Journal of Pediatrics, 229, 94–101.

Logan, S. W., Webster, E. K., Getchell, N., Pfeiffer, K. A., & Robinson, L. E. (2015). Relationship between fundamental motor skill competence and physical activity during childhood and adolescence: A systematic review. *Kinesiology Review*, *4*(4), 416–426. https://doi.org/10.1123/kr.2013-0012

Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., ... & Biddle, S. (2016). Physical activity for cognitive and mental health in youth: a systematic review of mechanisms. *Pediatrics*, *138*(3), e20161642. https://doi.org/10.1542/peds.2016-1642

Özaltaş, H. N. (2019). Egzersiz ve immün sistem. S. Şahin & H. N. Özaltaş (Ed.), Farklı alanlarda sporda bilimsel çalışmalar (1. bs., ss. 179–196). Akademisyen Kitabevi. ISBN 978-605-258-540-5

Özavci, R., Korkutata, A., Gözaydın, G., & Çakır, Z.(2023). Üniversite öğrencilerinde algılanan stresin yaşam doyumu ve rekreasyonel sağlık algısına etkisi. The Online Journal of Recreation and Sports (TOJRAS), 12(3), 454-461. https://doi.org/10.22282/tojras.1314763

Poitras, V. J., et al. (2016). *Systematic review of the relationships between objectively measured physical activity and health indicators in school-aged children*. Applied Physiology, Nutrition, and Metabolism, 41, S197–S239. https://doi.org/10.1139/apnm-2015-0663

Reyhan, S. (2020). Effect of internet addiction on leisure facilitators in individuals thinking that their health worsens through the internet. African Educational Research Journal, 8(1), 70–77. https://doi.org/10.30918/AERJ.81.20.024

Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2015). Motor competence and its effect on positive developmental trajectories of health. *Sports Medicine*, *45*(9), 1273–1284. https://doi.org/10.1007/s40279-015-0351-6

Rollo, S., Antsygina, O., & Tremblay, M. S. (2020). The whole day matters: Understanding 24-hour movement guideline adherence and health indicators in children and youth. *Journal of Sport*

and Health Science, 9(6), 493–500. https://doi.org/10.1016/j.jshs.2020.07.004

Sallis, J. F., Owen, N., & Fisher, E. B. (2015). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 43–64). Jossey-Bass.

Samar, E. (2021). Covid-19 Salgın Süreci, Fiziksel Aktivite ve Evde Egzersiz. Elif Karagün, Ozan Yılmaz (Ed.), Spor Bilimlerinde Güncel Konular ve Araştırmalar-4 içinde (ss. 43-57). Konya, Çizgi Kitabevi Yayınları

Samar, E. (2022). Rekreatif etkinlik olan sosyal medya kullanımının yeme bozukluğuna etkisi: Etik yönüyle bir değerlendirme. E. Karagün (Ed.), Spor bilimlerinde etik yaklaşımlar-2 (ss. 1–22). Çizgi Kitabevi.

Sarışık, D. Ç., & Şahin, F. N. (2021). Polifenollerin Sağlık Ve Spor Performansına Etkileri. SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi, 19(3), 14-29.)

Saunders, T. J., Gray, C. E., Poitras, V. J., Chaput, J. P., Janssen, I., Katzmarzyk, P. T., ... & Carson, V. (2016). Combinations of physical activity, sedentary behaviour and sleep: relationships with health indicators in school-aged children and youth. *Applied physiology, nutrition, and metabolism, 41*(6), S283-S293. https://doi.org/10.1139/apnm-2015-0626

Singh, A., Uijtdewilligen, L., Twisk, J. W., Van Mechelen, W., & Chinapaw, M. J. (2012). Physical activity and performance at school: a systematic review of the literature including a methodological quality assessment. *Archives of pediatrics & adolescent medicine, 166*(1), 49-55. https://doi.org/ 10.1001/archpediatrics.2011.716

Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *Quest, 60*(2), 290-306. https://doi.org/10.1080/00336297.2008.10483582

Strong, W. B., et al. (2005). *Evidence based physical activity for school-age youth*. The Journal of Pediatrics, 146, 732–737. https://doi.org/10.1016/j.jpeds.2005.01.055

Şarvan Cengiz, Ş., & Coşkun, E. Ş. (2023). Denge Yetisi ve Sportif Performans İlişkisi. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 9(2), 189-205.

Şarvan Cengiz, Ş., Örcütaş, H., Ulaş, A. G., Ateş, B. (2022). Sedanter Bireylerin Yeme Bozukluğu, Beden Algısı ile Fiziksel Aktiviteye Karşı Tutum ve Davranışlarının Belirlenmesi. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 8(1), 198-214

Şarvan Cengiz. Ş., & Delen, B. (2019). Gençlerde Fiziksel Aktivite Düzeyi. Uluslararası Güncel Eğitim Araştırmaları Dergisi, 5(2), 110-122.https://dergipark.org.tr/en/pub/intjces/article/667989

Şeyhanlı D., Gürbüz, C., & Akman, C. N. (2024). COVID-19 korkusunun normalleşme sürecinde fiziksel aktivite üzerine etkisi. İ. Doğan, Ü. Erbaş, & Z. Çakır (Ed.), Disiplinlerarası spor çalışmaları (ss. 5–16). Duvar Yayınları.

Tremblay, M. S., et al. (2016). Canadian 24-Hour Movement Guidelines for Children and Youth. *Applied Physiology, Nutrition, and Metabolism, 41*(6), S311–S327. https://doi.org/10.1139/apnm-2016-0151

Tremblay, M.S., Aubert, S., Barnes, J.D. *et al.* Sedentary Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. *Int J Behav Nutr Phys Act* 14, 75 (2017). https://doi.org/10.1186/s12966-017-0525-8

Uzun, M., & Gözaydın, G. (2017). Tercih edilen rekreatif alan ve aktivite çeşitlilikleri: Çanakkale örneği. Kilis 7 Aralık Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi, 1(1), 1-14.

Weaver, C.M., Gordon, C.M., Janz, K.F. *et al.* The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors: a systematic review and implementation recommendations. *Osteoporos Int* 27, 1281–1386 (2016). https://doi.org/10.1007/s00198-015-3440-3

Wijndaele, K., White, T., Andersen, L. B., Bugge, A., Kolle, E., Northstone, K., ... & Ekelund, U. (2019). Substituting prolonged sedentary time and cardiovascular risk in children and youth: a meta-analysis within the International Children's Accelerometry database (ICAD). *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 96.

World Health Organization. (2010). *Global recommendations on physical activity for health*. WHO.

World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. WHO.

Yaman, M. S. (2021). Technology addiction in physical education and sports teacher candidates. The Turkish Online Journal of Educational Technology (TOJET), 20(3), 85–91

Yaşar, Y., & Direkçi, V. (2025). Farklı şehirlerdeki beden eğitimi ve spor öğretmenlerinin iletişim beceri düzeylerinin incelenmesi. U. Erbaş & M. A. Ceyhan (Ed.), Sporda gelişim ve etkileşim: Teorik ve uygulamalı yaklaşımlar (ss. 80–90) içinde. Duvar Yayınları

Yaşartürk, F., Akyüz, H., & Karataş, İ. (2017). Rekreatif etkinliklere katılan üniversite öğrencilerinin serbest zamanda sıkılma algısı ile yaşam doyum düzeyleri arasındaki ilişkinin incelenmesi. International Journal of Cultural and Social Studies, 3, 239-252

Yel, K., Şencan, D., Güzel, S., & Erkılıç, A. O. (2024). Physical activity, nutrition, and healthy living. *International Journal of Health, Exercise, and Sport Sciences (IJOSS)*, *1*(3), 15-28. https://www.ijoss.org/Archive/ijoss-Volume1-issue3-02.pdf

Yıldız, M. E., Aslan, H., & Günel, İ. (2024b). Fiziksel aktivite ve yaşam doyumu. C. Yavuz & T. Çelik (Ed.), Spor bilimlerinde yenilikçi yaklaşımlar–2 (ss. 183–194). Duvar Yayınları.

Yıldız, M. E., Günel, İ., & Dalbudak, İ. (2024a). The relationship between physical activity and mindful awareness of university students. Physical Education of Students, 28(4), 234-241.

— — — — — — — — — — — — — —