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Current Studies in Sports Science

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Current Studies in Sports Science

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Cover Design & Layout

Resul BUTUNER

This book was typeset in 10/12 pt. Times New Roman, Italic, Bold and Bold Italic.

Current Studies in Sports Science

Published by ISRES Publishing, International Society for Research in Education and Science (ISRES). Includes bibliographical references and index.

ISBN

978-625-6959-96-5

Date of Issue

December, 2025

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PREFACE

This book, titled Current Studies in Sports Sciences, is composed of different chapters by authors invited by the editor. This issue consists of 13 chapters on the field of Sports Sciences. The book consists of chapters on; Examination of Traditional Sports Games in the Context of Ethnosport; The Place and Importance of Playgrounds in Terms of Child Development; Disability and the Concept of Disability in the Historical Process; Beyond the Label: Autopsy and Case Report of Specific Organ Damage Caused by Sports Supplements; Respiratory System and Stretching; Data-Driven Approach in Soccer Training; The Concept of Play and Games in the Digitalization Process; The Effect of War Toys and Military Figure Toys on Children (An Evaluatıon on the Example of Nazi Germany and the Gaziantep Toy Museum); The Importance of Physical Education and Sports in the Development of Society; The Importance of Physical Education and Sports Concepts in Elementary Schools and an Examination of Their Development; Smoking Addiction and Exercise; Respiratory Assessment in Performance Sports; Overtraining and Burnout in Individual Sports. All chapters are reviewed by at least two international peer reviewers and the book aims to provide its readers with the opportunity to conduct scientifically peer-reviewed sports research. Current Studies in Sports Sciences is published by ISRES Publishing. December, 2025.

December, 2025

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Alıncak, F. (Ed.). (2025). *Current studies in sports science.* ISRES Publishing.

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In This Book

Chapter 1,

The purpose of this study is to examine traditional sports games in the context of ethnosport events. Ethnosport is a new institutional form that combines traditional physical activity types, including national sports, and is revived as historical reconstructions of traditional indigenous games. Ethnosport is an important part of the cultural heritage of the world's peoples and acts as a type of ethnocultural identity. It includes traditional games and ethnocultural physical activity types related to national lifestyles and customs. Ethnosport festivals are held in various cities in Turkey with the aim of preserving ethnosport disciplines and passing them on to future generations. This makes it possible to preserve the common Turkish culture and disseminate cultural elements. In particular, events with international participation benefit Turkey both in terms of tourism activities and in terms of promoting cultural values abroad. In addition, festivals showcasing the same shared values with the Turkic Republics serve to spread Turkish culture and strengthen cultural dialogue. In this respect, ethnosport festivals combine many beneficial elements. Thus, on the one hand, economic benefits will emerge and significant revenue can be generated, while on the other hand, the goal of sharing and spreading Turkish cultural values can be achieved.

Chapter 2,

Play is considered a universal language; children learn through play, and the development of children who play is positively impacted. Children who play make sense of themselves and their world. The purpose of this study is to examine the role and importance of playgrounds in terms of child development. When a child is born, they are unconscious and innocent. Moreover, the world is quite complex and meaningless to them. Play makes the world more meaningful in the child's eyes and helps them adapt. A child's job is to play. It provides an environment for them to engage in activities and fulfill responsibilities that they will continue to pursue later in real life as an adult.

Chapter 3,

This disadvantage has been one of the most discussed current issues around the world. Disabled individuals, who have been referred to by different names and adjectives throughout history, have also been defined in different ways. It can be seen that definitions focusing on structural and mental deficiencies have become more humane over time, aimed at eliminating social problems and emphasizing the educational field. In this context, three models are generally mentioned in these definitions. The "medical model" views disability as a deterioration of bodily functions (anatomical) or physical structure, while the "social model" argues that disability stems not only from individual deficiencies but also from societal barriers to equal participation in society. The purpose of this study is to examine the concept of disability and the types of disabilities in the historical process. The number of individuals with intellectual disabilities is quite high, yet they are not recognized by society. Even if they are not recognized by society, prejudices against individuals with intellectual disabilities are prevalent in social life. One of the greatest prejudices that exacerbates the disability of individuals with intellectual disabilities is the belief that nothing can be done for them from a young age. Contrary to this belief, individuals with intellectual disabilities can achieve success in many different areas. Even if they lag behind in social adaptation, meeting their personal needs, and using their language skills, there are many things they can do that are within their intelligence level.

Chapter 4,
The section aims to elaborate on the severe side effects of sports supplements and this sport supplement's details. This systematic review used PRISMA guidelines and PICOS criteria to examine case reports on adverse effects of sports supplements in healthy, drug-free individuals. Following a search of three databases, 25 studies reporting on 39 total cases were included for analysis. The findings reveal that sports supplements cause to organs damage and even death. The reported cases primarily involved liver and heart damage, with DMAA and caffeine identified as the potential lethal ingredients. Caffeine overdoses averaged 26 times the recommended dose, with specific products like OxyELIT Pro, Caffeine Anhydrous, and Jack 3d linked to organ damage and death. Unapproved sports supplements, often sold online, pose critical risks including organ damage and death due to inappropriate use. This study's findings aim to raise consumer awareness and guide interventions to reduce these severe side effects.

Chapter 5,
This section explains the respiratory system and the mechanism of breathing. The respiratory system has the ability to remove oxygen (O2) and carbon dioxide (CO2) that the body needs both at rest and during intense exercise. Breathing is the process of overcoming the forces encountered during inspiration (the elastic structure of the lungs and chest and airway resistance) through the body's responses. While breathing is a passive process during expiration, it is an active process during inspiration. The skeletal muscles are designed to create movement in response to movement. However, this is not the case with the respiratory muscles. Respiratory system muscles are highly effective in resisting forces and overcoming elastic loads. Stretching is the process of elongating muscle fibers by mobilizing connective tissue. Having a strong respiratory mechanism depends on chest mobility, sufficient and healthy respiratory muscles that can create lung volumes, and the ability to move for adequate pulmonary ventilation. The purpose of this study is to explain the respiratory system and the stretching mechanism.

Chapter 6,
This section explains information about data-driven approaches in football. This section examines GPS units used in team sports, which enable the measurement of player positions, speed, and movement patterns. In the current literature, GPS-based athlete tracking systems objectively measure athletes' individual efforts and physical stress, analyze competition performance, evaluate the workload of athletes in different positions, determine training fatigue, and track changes in physiological needs. With the development and adoption of microtechnology in sports, microelectromechanical systems (MEMS) products such as three-axis accelerometers, magnetometers, and gyroscopes have been integrated into GPS devices. Thus, GPS and MEMS together have begun to provide practitioners with a wide range of data on athletes' physical loads and activity profiles. Parameters commonly used in GPS systems include total distance, acceleration, deceleration, moderate speed distance, high speed distance, and sprint distances. The purpose of this study is to explain the importance of a data-driven approach in football.

Chapter 7,
The concept of play is one of the oldest phenomena in human history. Play began with the existence of living things. Not only humans but also animals play. Humans unconsciously created play by imitating what they saw around them and explaining their actions to each other through movement. For example, a person who caught prey would explain

how they caught it to others through imitation. These imitations gradually evolved into conscious religious and magical ceremonies. This increases oxygen intake, accelerates blood circulation and allows more nutrients to be transported to the tissues. Movement games also help children explore and recognise their environment. Games enable children to understand the world around them by using their physical skills. Actions such as walking, running and jumping develop the child's motor skills and encourage them to interact with their environment. The aim of this study is to examine the concept of Game and the place and importance of Game in the Digitalization Process. As a result, studies show that playing games has various positive effects, such as emotional relief, and that it is considered normal for people who lead healthy lives to play digital games. However, when an individual is unable to resist the urge to play games, exhibits uncontrolled behavior, experiences emotional fluctuations, undergoes changes in their thoughts, and experiences a serious disconnect from social life, this problem can be defined as addiction.

Chapter 8,

Play helps children feel good about themselves. Play is an outlet for a child's happiness and excess energy in life (Nutku, 2006). Play is one of the fundamental building blocks of personality, encompassing various values such as sociability, talent, and intelligence. Play is a form of learning that involves the release of excess energy, relaxation, and enjoyment. This study examines how war toys affect children's mental world and psychologically prepare them for war. The ideological function of toys in Nazi Germany is the clearest example of this process. The same ideological reflections are evaluated through historical soldier-figured toys exhibited at the Gaziantep Toy and Toy Museum today. War toys intertwine the concepts of heroism and violence in children's worlds. The example of Nazi Germany is the most striking example of how toys can become a propaganda tool. During this period, children were raised with the ideal of "being a good soldier," and playgrounds became mini-war training camps. The war-themed toys at the Gaziantep Play and Toy Museum make visible these ideological manipulations of the past and enable society to confront this past. Consequently, ethical responsibility is paramount in toy production. Toys presented to children should teach love, not violence, freedom, not authority, through peaceful means instead of war. Play is not just entertainment; it is a cultural language through which children begin to think, feel, share, and ultimately learn who they will become.

Chapter 9,

Today, it is widely accepted across all segments of society that sports are an essential activity for individuals to develop their skills, maintain their health, and improve their overall well-being. Encouraging individuals to participate in sports not only increases their physical fitness, but also serves as a critical factor in facilitating the maximization of their productivity and performance in their activities (work, education, etc.). In this context, the direct positive effects of sports on an individual's overall quality of life and productivity have become a scientifically and socially proven necessity. The purpose of this study is to highlight the importance of physical education and sports in the development of society. In conclusion, sports have become an integral part of human life, playing a vital role in ensuring that individuals remain healthy, successful, and happy throughout their lives, while also maintaining high morale. Sports are a critical factor in alleviating social isolation and preventing the tendency to act irresponsibly alone. Through sporting activities, individuals experience a sense of shared purpose and

collective action. This contributes to the emergence of unity, solidarity, and common ideals within society. Societies with such a strong structure are very difficult to dissolve or destroy. Therefore, sport should be recognized as an indispensable phenomenon in terms of physical, mental, and social development.

Chapter 10,
Education is the process of consciously bringing about desired changes in individuals' behaviors through their own lives. The future of countries depends on the skills and mental development achieved by their citizens. Therefore, education is carried out with the aim of raising individuals in a way that creates a unity between their spiritual, social, and physical aspects. The aim of this study is to examine the importance and development of physical education and sports concepts in primary schools. Advancing students' physical abilities is a goal specific to physical education classes. The human body's movement mechanism is actively formed by muscles and passively by bones. Physical activities are essential for muscle and bone development. Since Physical Education and Sports classes in schools are conducted for scientific purposes, improvements in the functions of internal organs occur as a result of the student's metabolism adapting to physical activities and becoming more resilient and suitable for them. As a result, students in society are observed to have increased endurance against fatigue by adapting to changing situations. For individuals in society to be able to perform all positive activities, the individuals that make up society must have acquired the habit of exercising regularly.

Chapter 11,
While addiction has long proliferated as a personality disorder, in recent years it has begun to be recognized as a brain disease. Cigarette, which is made by wrapping tobacco leaves in a thin paper, is a substance that is consumed by inhaling the smoke after burning. The active ingredient is a dark liquid called nicotine. Nicotine increases the release of epinephrine, norepinephrine and serotonin in the brain. Nowadays, addiction disease, which is extremely important for individuals and public health, is becoming more and more common and affects people of all ages. As research shows how serious cigarette addiction is, it is a situation that should not be ignored. According to research conducted by the World Health Organization in 2021, 1.5 billion people worldwide smoke. Smokers are more intolerant to exercise and finish exercise in a shorter time. Non-smokers can maintain a maximal level of exercise for longer than smokers. in various studies, it is estimated that different types of exercises and physical activities have a reducing effect on smoking addiction and the physiological factors that cause the feeling of smoking, and that more detailed explanations will be provided on exercise and smoking addiction with new research in the future.

Chapter 12,
This study demonstrates that explaining athletic performance solely through cardiovascular or musculoskeletal factors is insufficient in modern sports science, and that the respiratory system plays a decisive role in sustaining high-intensity and prolonged performance. The strength and endurance of the respiratory muscles, ventilatory control mechanisms, and ventilatory thresholds (VT1–VT2) directly influence oxygen distribution, metabolic balance, fatigue development, and intermuscular blood flow. Assessment methods such as spirometry, MIP/MEP measurements, respiratory muscle endurance tests, and cardiopulmonary exercise testing (CPET) enable a multidimensional evaluation of athletes' physiological capacity, with CPET and ventilatory thresholds

providing more functional indicators of sustainable performance than VO_2max alone. In addition, respiratory-focused interventions such as inspiratory muscle training (IMT) and inspiratory muscle warm-up (IMW) are highlighted for their ability to reduce ventilatory cost, delay respiratory muscle fatigue, lower perceived exertion, and ultimately enhance athletic performance.

Chapter 13,

This review examines the physiological and psychological dimensions of overtraining and burnout in individual sports, and their implications for athletic performance and well-being. The greater responsibility, stress and isolation that individual sports place on athletes increases their vulnerability to maladaptive training responses. Overtraining is discussed as an imbalance between training load and recovery, and is categorised as either functional or non-functional, with subtypes linked to autonomic nervous system responses. Its aetiology involves physiological, psychological, and neurological mechanisms, and diagnosis requires monitoring of performance, mood, biochemical markers, and recovery status. By contrast, burnout is conceptualised as a motivation-related syndrome characterised by emotional exhaustion, depersonalisation and a reduced sense of achievement, which is often influenced by environmental and psychosocial stressors. The review highlights the close relationship between chronic overtraining and burnout, noting that inadequate recovery and prolonged stress can cause athletes to withdraw from sport. Effective prevention requires coordinated monitoring, appropriate training and rest, balanced recovery strategies, and psychosocial support.

Examination of Traditional Sports Games in The Context of Ethnosport Events

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To Cite This Chapter:
Alincak, F., & Cilkiz, H. (2025). Examination of traditional sports games in the context of ethnosport events. In F. Alincak (Ed.), *Current studies in sports science* (pp. 1–7). ISRES Publishing.

Introduction

Ethnosport is a new institutional form that combines traditional physical activity types, including national sports, and is revived as historical reconstructions of traditional indigenous games (Kylasov, 2011). Ethnosport is an important part of the cultural heritage of the world's peoples and acts as a type of ethnocultural identity. It includes traditional games and ethnocultural physical activity types related to national lifestyles and customs (Kylasov, 2013). Ethnosport, based on the concept of ethno, is defined as "an inclusive term that refers to sporting events that have filtered through different traditional cultures and survived to the present day, containing many elements specific to local identities" (World Ethnosport Federation, 2019).

Central Asian countries are engaged in efforts to preserve nomadic traditions and culture and revitalize their own identities. The World Ethnosport Confederation's initiatives in this area, aimed at helping preserve cultural uniqueness and promoting the development of ethnosport, are viewed positively by Central Asian countries. For example, the "Rukhani Zhagyru" strategic program developed by the government of Kazakhstan. One of the program's goals is to preserve folk traditions, customs, games, rituals, and holidays. All of this is described in detail in N. Nazarbayev's articles "A Look to the Future: Modernization of Public Consciousness" and "The Seven Faces of the Great Steppe" (World Ethnosport Confederation, 2024).

Tourists participating in ethnosport events from abroad gain an understanding of the nation by seeing the history and current situation of the country they visit. Increasing these activities and imposing them on the tourism sector, treating them as part of tourism, will benefit the promotion of the country and provide a source of income for the local population. It will also contribute to the preservation of culture. Language, customs, and traditions are social riches inherited from the past in cultural terms (Imamoğlu,

Taşmektepligil, and Turkmen, 1997). Therefore, ethnosport practices are extremely important in terms of revealing social character. It can be said that the lifestyles of societies in their daily lives have led to the emergence of the concept of ethnosport culture. For this reason, cultural values differentiate nations from one another and give them intrinsic value. Due to the importance of ethnosport activities, it has been determined that sports organizations in Turkey that fall within this scope should be supported and their capacity increased.

Aim of the Study

The aim of this study is to examine traditional sports games in the context of ethnosport events.

Sport Concept

The term "sport," which has spread globally through English, is derived from Spanish words like "deportore." These words carry meanings such as dispersion and separation (Şahan, 2007). People have engaged in sports since ancient times, often without a conscious goal. These activities are techniques that help individuals improve their physical and mental health and revitalize themselves by gaining strength and skills. Sports has a structure that divides physical education activities into various categories, and when practiced professionally, it transforms into an activity with specific rules and competitions that require a high level of physical and mental effort. The primary goal of sports is generally to win and compete (Aracı, 1999).

For those interested in sports from another perspective, competition is a physical, mental, and practical struggle aimed at winning. Studies are being developed and conducted to inspire excitement and enthusiasm in spectators, supported by fields such as anatomy, physiology, kinesiology, and psychology. This is a sustainable technique (Erkal, 1992). However, when applied as a game that combines fun and competition in an atmosphere of excitement and movement, which begins as a social state and effect, it helps relieve anxiety and calm. In a competitive situation, it is the exercises and intense muscle movement that ultimately wins after a high-energy struggle. Therefore, sport is considered an enjoyable and technical endeavor that contributes to the struggle and victory of professionals and amateurs, and to the social development of spectators (Taşçıoğlu, 2000). Sport is a competitive, cooperative, and cultural process that alters an individual's natural state through human influence. It is practiced individually or collectively, with or without equipment, within a timeframe, or professionally, within specific rules. It integrates individuals into a socialized society and develops both spirit and body (Erkal, 1982).

In other words, sport is a branch of science that fosters the spiritual, physical, and intellectual development of individuals and fosters coordination among these areas

(Harris, 1972).

Sport is a source of excitement. This excitement in people is eternal and will undoubtedly remain so. Consequently, sports such as shooting, horseback riding, and wrestling have been among the national sports enjoyed by Turks since ancient times (Karaküçük, 1992). Sports improves physical health and, conversely, has positive effects on mental and social well-being. Regular physical activity supports cardiovascular health, strengthens muscle and bone structure, and strengthens the immune system. Psychologically, it plays an active role in reducing negative conditions such as stress, depression, and anxiety. Furthermore, sports contribute to socialization by strengthening teamwork, leadership, and social interaction (Açıkada, 1990).

The Concept of Ethnosport

Ethnosport is a concept created to preserve and promote traditional sports derived from folk culture in today's world. The disciplines practiced are those that foster social relationships, enhance solidarity among individuals, and support the preservation of cultural identities. For example, sports such as javelin throwing, horseback archery, and oil wrestling, which are played around the world and in Turkey, fall under the scope of ethnosport (Çalışkan, 2020).

Ethnosport is now considered not only a physical activity but also an occasion that reminds a society of its cultural heritage. These sports support the preservation of the history of the people internationally and in our country, while also greatly increasing social solidarity (Büyük, 2015).

When we look at the origins of ethnosport, we see games that emerged from the community's own identity and extended to the community's religious beliefs. Looking back at the dusty pages of history, the games played have been a means for people to survive and gain respect within society. For example, in the Ottoman Empire, javelin throwing and oil wrestling were important sports both for maintaining social interaction and for defending themselves in the military sphere (Kara, 2020).

The Social and Cultural Importance of Ethnosport

Ethnosport brings people in rural areas together and strengthens internal politics through social solidarity. Traditional sporting events held in certain rural areas, in particular, reinforce social cohesion among individuals. At the same time, the sports practiced greatly support the physical and mental development of young people (Erkal, 1982).

Ethnosport plays a crucial role in preserving cultural richness. These sports ensure that traditional values, cultivated over the years like flowers across various cultures, are kept alive and passed on to future generations. For example, the inclusion of oil wrestling, which has been practiced in Turkey for centuries, in the UNESCO list of intangible cultural heritage has contributed to the international recognition of this sport (Büyük,

2017).

Ethnosport events not only attract tourists to the host country but also foster cultural interaction and, so to speak, breathe life into local businesses through shopping. In addition to the events themselves, the fairs, exhibitions, and sales of products unique to the region demonstrate that these activities contribute significantly not only to culture but also to the economy (Türk and Kılıç, 2017).

World Ethnosport Confederation

The World Ethnosport Confederation began its operations in Istanbul in 2015 as an international organization dedicated to the preservation, development, and international promotion of traditional sports. The primary purpose of the World Ethnosport Confederation was to address the widespread prevalence of modern sports across all disciplines, leading to the disappearance of traditional sports from our history. The World Ethnosport Confederation has adopted the principle of offering a solution to this problem, aiming to recognize traditional sports as cultural heritage and promote them internationally (Çalışkan, 2020).

Throughout the history of the World Ethnosport Confederation, traditional sports belonging to Turkish and Central Asian cultures have been at the forefront. For example, disciplines such as oil wrestling, javelin throwing, and horseback archery, which have retained their influence from the Ottoman period to the present day, have been among the first areas of focus for the World Ethnosport Confederation. Furthermore, the Ethnosport Culture Festival, one of the first major initiatives organized by the World Ethnosport Confederation, was intended to be an important step in introducing traditional sports to a wider audience. Held annually since 2016, this festival, like the initiatives planned for future years by TEKNOFEST, known as the World's Largest Technology Festival, was prepared by the World Ethnosport Confederation to support the revival of traditional sports in the modern world (Büyük, 2017).

Another important event that enabled the Confederation to gain international recognition was the World Nomadic Games held in 2018. This organization increased the global visibility of traditional sports and strengthened the World Ethnosport Confederation's influence in the international arena (Türk and Kılıç, 2017).

The Purpose of Establishing the World Ethnosport Confederation

The purpose of the World Ethnosport Confederation is to revive, preserve, and pass on traditional sports that have been forgotten under the influence of the modern era to younger generations. Traditional sports are important components that reflect the history, social structure, and cultural values of a society. The World Ethnosport Confederation believes that these sports should be regarded not only as physical activities but also as a

form of social memory and an element of a society's identity (Kara, 2020).
Another important goal of the Confederation is to promote traditional sports in all countries around the world and to use these sports as a tool for cultural diplomacy. Traditional sports increase mutual understanding and cooperation by establishing interactions between different cultures. Through the events it organizes, the World Ethnosport Confederation highlights the unifying and community-building power of traditional sports. For example, events such as the Ethnosport Culture Festival and the World Nomadic Games have brought together participants from many nations, facilitating cultural and commercial exchange. (Türk and Kılıç, 2017). Another priority in the founding purpose of the World Ethnosport Confederation is to introduce young people to traditional sports and ensure that these sports become part of their daily lives. In line with this goal, projects such as training programs, seminars, and experience centers have been implemented. These efforts aim to convey to young people that traditional sports are not just activities, but reflections of cultural values (Erkal, 1982).

Despite the global dominance of modern sports today, the World Ethnosport Confederation aims to compete by preserving the cultural and spiritual values of traditional sports. The Confederation carries out various working protocols, projects, and promotional campaigns to ensure the viability of traditional sports at the national and international levels (Çalışkan, 2020). The World Ethnosport Confederation aims to introduce and foster interaction among the traditional sports and games of different cultures through its annual Ethnosport Culture Festival. The festival includes activities such as archery, javelin (cirit), and aba wrestling, along with demonstrations of traditional musical instruments, handicrafts, and local cuisines. In this way, cultural harmony is achieved (Kara, 2020). Through seminars and workshops, the Confederation enables young people to become acquainted with traditional sports. Additionally, it aims to remain effective over time by conducting promotional activities both online and in person (Çalışkan, 2020).

Conclusion

Ethnosport festivals are held in various cities in Turkey with the aim of preserving ethnosport disciplines and passing them on to future generations. This makes it possible to preserve the common Turkish culture and disseminate cultural elements. In particular, events with international participation benefit Turkey both in terms of tourism activities and in terms of promoting cultural values abroad. In addition, festivals showcasing the same shared values with the Turkic Republics serve to spread Turkish culture and strengthen cultural dialogue. In this respect, ethnosport festivals combine many beneficial elements. Thus, on the one hand, economic benefits will emerge and significant revenue can be generated, while on the other hand, the goal of sharing and spreading Turkish cultural values can be achieved.

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The Place and Importance of Playgrounds in Terms of Children's Development

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To Cite This Chapter:
Toklu, B., Atli, B., & Turak, O. (2025). The place and importance of playgrounds in terms of children's development. In F. Alincak (Ed.), *Current studies in sports science* (pp. 8–17). ISRES Publishing.

Introduction

Play is considered a universal language; children learn through play, and the development of children who play is positively impacted. Children who play make sense of themselves and their world (Aly Amer, 2019). Burriss and Tsao (2002) emphasized that play should not be viewed solely as a fun activity; children engage in many profoundly meaningful learning experiences while playing. While playing, a child's basic need, they also acquire the skills necessary for survival. The reasons why play is so important are that children participate voluntarily, direct play as they wish, and express their feelings and thoughts within play (Pilten and Pilten, 2013). Gaming has been a part of our lives since the dawn of time, an activity in which people of all ages, young and old, spend a significant portion of their time. With technology making every aspect of our lives easier, it has also become increasingly widespread, particularly in the areas of entertainment and gaming (Özmen, Alıncak & Cağdanlıoğlu, 2023). Play helps children to feel good about themselves (Alıncak, 2016). Play is an outlet for the child's happiness and excess energy in life (Nutku, 2006). Play enables children to discover themselves and recognize the characteristics that distinguish them from others. Imitative games, especially housekeeping games, imaginary games, and role-playing games that simulate various professions and situations, make significant contributions to children's psychosocial development. While playing, children learn social skills such as communicating with others, sharing, cooperating and helping each other, and solving problems together. They acquire social rules and moral values more easily through play. For example, play supports the learning of values and rules such as waiting for one's turn, respecting the rights of others, taking responsibility, and distinguishing right from wrong. It increases their experience of social life and reinforces what they have learned. In addition, play

activities contribute to physical development by supporting the development of fine motor skills, such as hand-finger coordination, and gross motor skills, such as leg-arm coordination. Games that require muscle strength (running, jumping, climbing, etc.) in particular help growth by exercising the body system (Cirhinlioğlu, 2001). Play is one of the basic building blocks of personality, which includes various values such as sociability, ability and intelligence. Play is the most important element that prepares the child for life and guides him/her in his/her life, as well as internalizing the right behaviors in the child's social life (Alıncak and Tuzcuoğulları, 2016). Attitudes are one of the important concepts in human life. Attitude is not a concept that can be measured directly, but it is possible to measure an individual indirectly through behavioral patterns (Öztürk et al., 2017). Numerous remains of clay dolls have been found in ancient Egyptian tomb excavations, and other excavations have revealed that children of that period played with rattles filled with seeds and small wheeled toy carriages. In ancient Greek civilization, dolls made of baked clay with joints have been found, and it is known that hopscotch was a game that was quite popular among adults as well as children (Onur, 1992). It is thought that children living in Roman civilization played almost the same games as Greek children, and it is noted that old engravings, believed to be related to the game of hopscotch, have been found in the Roman Forum in Rome. It is thought that various children's games were played in every corner of medieval Europe, and most of these games can be traced back to books of the period or illustrations of daily life drawn on paintings (Johnston, 2011).

Play is a form of learning that involves the discharge of excess energy, relaxation and pleasure (Aksoy and Çiftçi, 2014). At the same time, play is an activity that allows children to recognize themselves (Yıkılmaz and Kurşun, 2018; Ayan et al., 2017).

Under the conditions of the era, owning and playing with a toy represented, for children, the class differences in their community and the class of their families (Onur, 1992). Thus, the games children played could be considered to reflect their families' social standing, lifestyles, and class differences. It is generally believed that children from peasant families used clothing scraps, candles, animal bones, sticks, and stones found at home, transforming them into playthings such as dice, marbles, balls, and so on, according to their own resources. However, it is known that craftsmen in towns made the same toys using wooden materials, such as puppets and spinning tops. In line with the daily conditions of the era, one of the behaviors children observed in their families' lives and repeated as play was hunting. Village boys spent their time hunting small animals with homemade traps, bows, and arrows (Elliot, 2004).

In Wittgenstein's (2010) Philosophical Investigations, it is emphasized that all elements of games, such as play, rules, and competition, fail to adequately define what games

are. According to Wittgenstein, "play is defined as a rule-following activity. For Wittgenstein, the activity of use is considered one of the most fundamental elements" (Anlı, 2013). However, Wittgenstein does not bother with a terminological definition, but rather prioritizes identifying similarities among the games played, thus creating class-based groupings. Indeed, language is defined through similarities. Another point in Wittgenstein's work is his interpretations of desire. In Wittgenstein, desire, or desiring, ceases to be a negative characteristic and assumes a productive character within the context of language play, enabling desire to reproduce itself (Baker, Hacker and Wittgenstein, 1991). These inferences Wittgenstein draws do not provide conceptual clarity. Geras (2009) states that Wittgenstein was criticized by many people, such as Thomas Hurka, and that his definitions were more widely accepted.

Aim of the Study

The purpose of this study is to examine the role and importance of playgrounds in terms of child development.

The Importance of Play

One of the primary criteria for children's playgrounds is the selection of a suitable location. Playgrounds that are easily accessible, safe, and designed with parents and children in mind will be preferred by users. Playgrounds serve as recreational areas for children and their accompanying parents. Urban recreational areas can be created where all city residents can spend quality time. Playgrounds should be of an appropriate distance and size from residences and schools. They should be easily accessible by car or on foot. Areas away from traffic should be chosen for both safety and to avoid noise and air pollution. The slope and drainage conditions of the area should be considered when selecting the location, and a healthy drainage system should be established (Aklıbaşında, Tırnakçı and Özhancı, 2018; Bulut and Kılıçarslan, 2009; Yılmaz and Bulut, 2002). Locations that are free from noise, safe and accessible in terms of transportation, and rich in oxygen should be selected. Entrances, paths, signs, and boundaries should be provided to ensure maximum access to and use of the area (Onay and Şahin, 2019). Today, with changing living conditions and developments in technology, children's games and the spaces where these games take place may undergo changes. It is possible to emphasize that traditional children's games today take place on the streets under parental supervision and within a competitive concept. These changes in play can be linked to the disappearance of natural children's play areas, the instrumentalization of free play time, and the isolation and institutionalization of children's games. Indeed, children's games are being shaped by technology in today's conditions. As a result of modernization and urbanization, the free time and space available for play are becoming limited. As the number of natural children's play areas decreases, children are being drawn into closed spaces, and as a result, they are turning to digital games (İnal, 2017).

Children's Playgrounds

Children's playgrounds are the first spaces outside their homes that children, who are beginning to communicate and socialize, embrace and feel a sense of belonging in. In an urban environment shaped by buildings, they connect with nature and engage in exercises that develop their physical, psychological, and physiological structures through play elements (Bal, 2005). Children learn about the world and the new stimuli they encounter in their environment using their senses. Therefore, it is important to consider children's health and development during the design phase of playgrounds, to include engaging elements in playgrounds, to create recreational areas that contribute to children's development, and to encourage children to interact with living and non-living things (Taştepe, Başbay and Yazıcı, 2016). Research has shown that children aged 6-8 prefer to go to the park with their families, while this situation changes for children aged 9-10. In this context, access distances to playgrounds should be determined based on age groups (Veitch et al., 2006). From past to present, playgrounds, like children's playgrounds, have held a significant place. While in the past, many children could be seen playing in the streets, this has now diminished to almost nothing. This can be attributed to the increase in the number of vehicles and the resulting traffic, the replacement of vacant lots with new buildings or apartment buildings, a lack of trust in the outdoors among families, and the rise in mobile or computer games. Traffic is a significant factor preventing children from playing outdoors. As children age, the risk of inattention or driver errors and carelessness has become unavoidable. For this reason, parents prefer not to send their children to play in areas where vehicles can pass (Yılmaz and Bulut, 2002). The study found that 76.7% of children did not want to play outside because they were worried about traffic, and their parents approved and supported them in this. With increasing urbanization, children had difficulty finding free space to play. Therefore, going outside gradually decreased, leaving their focus on indoor alternatives. With the advancement of technology, playing with toys also decreased significantly, giving way to mobile and computer games. This situation has both positive and negative aspects. The positive aspect was that children did not fall behind in developing technological devices, developed themselves by learning their many functions, and kept up-to-date. However, the negative impact was primarily physical (Coşkun, 2015). Children's playgrounds have become important for developing spatial awareness and for learning and reinforcing basic concepts such as direction, distance, number, and color. The most important factor for children's playgrounds is safety. When designing playgrounds, the following safety considerations should be made (Erkan, 2011):

The characteristics of the land, whether it is flat or sloping, and its location, as well as its sociocultural suitability for the environment, are important.

- Outdoor playgrounds should be designed with winter in mind. It is crucial to prevent ponding in the event of rain or snow, and to ensure that water is transported away without damaging the area or the play equipment, without accumulating.

- Shading should be provided, especially in the summer months, to block some sunlight. This can be achieved by selecting appropriate trees. Trees can also help prevent strong winds.
- Care should be taken to ensure that playgrounds are away from sources such as gas, water, and sewage.
- Playgrounds should be located in a location that provides easy access. Furthermore, access roads should not be hazardous.
- To increase the safety of playgrounds and to identify specific areas within the playground, children-friendly fences should be provided.

The location and importance of children's playgrounds

Children one of the primary criteria for playgrounds is the selection of a suitable location. Playgrounds that are easily accessible, safe, and designed with parents and children in mind will be preferred by users. Playgrounds serve as recreational areas for children and their accompanying parents. Urban recreation areas where all city residents can spend quality time can be created. Playgrounds should be of an appropriate distance and size from residential areas and schools. They should be easily accessible by car or on foot. To ensure both safety and distance from noise and air pollution, areas away from traffic should be selected (Aklıbaşında, Tırnakçı and Özhancı, 2018). Locations should be selected that are free from noise, safe and accessible in terms of transportation, and rich in oxygen. Entrances, paths, signs, and restrictions should be in place to ensure maximum access to and use of the area (Onay, 2019).

The quality of children's playgrounds

Kevin Lynch's (1977) book, "Growing up in Cities," is one of the few books addressing the needs of young people in public spaces. Research following Lynch's has emphasized the importance of spaces that include private recreational opportunities where young people can socialize, observe their surroundings, and remain unseen. Such spaces should be taken into consideration by designers.

Quality from the Designer's Perspective: Designers focus on three fundamental elements when designing a children's playground. These elements (Frost, 1985):

1. Pre-design (Human factors, safety, materials),
2. During design (Games, accessibility, connectivity, modular play elements),
3. Post-design (Trained play leaders). These criteria, which must be considered before, during, and after design, are directly related to the usability of the playground.

Usability can be achieved by decision-making groups developing appropriate and appropriate solutions. The most important criteria here are safety, enabling play variety, and guiding and training play leaders. However, trained play leaders can only exist in specific, systematic, and institutionalized play areas. Play quality is another criterion for usability. The factors that determine the quality of play are the qualities of the play area

and play elements. The qualities that determine the "quality" of the play area and play elements are listed below (Heseltine and Holbrn, 1987):

Time: The ability to hold the child's attention for the longest period of time without allowing repetition.

Modifiability: The ability of the play area and play elements to be frequently changed.

Interest: The ability of the play area and play elements to meet the child's personal expectations.

Possibilities: The abundance of opportunities the play area offers the child.

Suitability: The ability of the play area to meet the expectations of different age groups and groups.

Collaboration: The ability of the play area and play elements to encourage group play and cooperation among them.

The impact of children's play areas on child development

The child's physical environment varies in terms of housing, the immediate surroundings of the home, school, playgrounds, etc., in parallel with the child's physical, perceptual, and socio-emotional development. Therefore, the physical environment with which the child interacts is of great importance in the child's socialization and development as a member of society (Eroğlu and Ertosun, 2015).

Social Skills:

Play is formed and shaped by its own unique rules. In this way, children learn to follow rules through play. Along with a competitive environment, they learn to respect others, say thank you, apologize, defend their rights, and not infringe on the rights of others. These skills enable them to become healthy individuals in later years and to be compatible within society.

Emotional Skills:

Children express their emotions through play. Therefore, play is a tool for children to express their emotions. When children are acknowledged, appreciated, and supported while playing, it enables them to be happy and confident. Conversely, children who are not appreciated, acknowledged, or loved become unhappy and insecure.

Cognitive Skills:

Children perceive objects and concepts through play. This perception supports and develops the child's cognitive activity. They learn basic discrimination skills such as contrast, compatibility, and incompatibility through play. Play areas are a spatial educational environment designed to support activities that are essential for physical development and education. The play space should allow for different types of play, such as creative play, play with natural elements, water and sand play, quiet play, and

shared open space play. A well-designed, well-managed play environment provides children with opportunities for development, such as motor skill development, social development, learning, decision making, fantasy play, and playing for fun (Alqudah, 2003).

Physical activities are essential for children. Children want to spend most of their time outdoors doing physical activities (Sallis, Prochaska and Taylor, 2000). The most important places for children to spend time outdoors are playgrounds. Children's playgrounds are important public spaces in urban areas. These places are open spaces where children can engage in activities and form social relationships. Play activities in open green spaces not only make children happy but are also healthier than those in enclosed spaces such as shopping malls and cafeterias (Nemutlu, Akdeniz and Çamayaz, 2018).

Children are people's most valuable assets. Providing natural playgrounds away from the hustle and bustle of the city has become the sole purpose of adults (Timur et al, 2018). One of the primary criteria for playgrounds is the selection of a suitable location. The playground should be easily accessible to homes and schools. Areas away from traffic should be chosen for both safety and to avoid noise and air pollution. Parents usually accompany their children in these areas. When play areas are designed appropriately, they can become urban recreation areas where all city residents, from young to old, can spend quality time (Bulut and Kılıçarslan, 2009).

The importance of children's play areas in urban areas

Children's parks are important public spaces in urban areas. These places are open spaces where children can engage in activities and form social relationships. Play activities in open green spaces make children happy and are healthier than indoor spaces such as shopping malls and cafeterias (Nemutlu, Akdeniz and Çamayaz, 2018). They serve as recreational areas for children and their accompanying parents. When well-planned and provided with suitable conditions, urban recreational areas can be created where all city residents, from young to old, can spend quality time. Children are people's most valuable assets. Providing natural children's play areas away from the hustle and bustle of the city has become the goal of adults. Nature has been educational for everyone. Outdoor play areas designed with inspiration from nature have given children the opportunity to learn by doing. Children feel more peaceful and comfortable in open green spaces, where they have fun and use their imagination and creativity to create their own games (Timur et al, 2018). Children's play areas are the first place outside their homes where children, who are beginning to communicate and socialize, feel a sense of belonging. In an urban environment shaped by buildings, it is a place where children interact with nature and engage in exercises that develop their physical, mental, and physiological structure with play elements (Bal, 2005).

Conclusion

When a child is born, they are unconscious and innocent. Moreover, the world is quite complex and meaningless to them. Play makes the world more meaningful in the child's eyes and helps them adapt. A child's job is to play. It provides an environment for them to engage in activities and fulfill responsibilities that they will continue to pursue later in real life as an adult.

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The Concept of Disability and Disability in the Historical Process

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To Cite This Chapter:
Yikilmaz, M., Alincak, H., Baltaci, R., & Karabas, H. (2025). The concept of disability and disability in the historical process. In F. Alincak (Ed.), *Current studies in sports science* (pp. 18–35). ISRES Publishing.

Introduction

The individual differences possessed by all individuals are the most important characteristics that distinguish them from one another within society. However, these differences do not affect their participation in society and do not cause problems in their lives (Spiridula, 2013). However, in some cases, differences that manifest themselves in one or more areas have given rise to the concept of disability, which has emerged throughout human history. This situation continues to be a disadvantage in today's societies (Genç, 2015). This disadvantage has been one of the most discussed current issues around the world. Disabled individuals, who have been referred to by different names and adjectives throughout history, have also been defined in different ways. It can be seen that definitions focusing on structural and mental deficiencies have become more humane over time, aimed at eliminating social problems and emphasizing the educational field (Kiose, 2016). In this context, three models are generally mentioned in these definitions. The "medical model" views disability as a deterioration of bodily functions (anatomical) or physical structure, while the "social model" argues that disability stems not only from individual deficiencies but also from societal barriers to equal participation in society (Kotsiatu and Panagiotu, 2004). The "Biopsychosocial Model" emphasizes that the development of individuals with disabilities cannot be explained by a single cause and must be addressed through an interdisciplinary approach (Sezer Korucu et al., 2021). Hartokollis (1981) defines disability as an inability to perform work and movement actions and a failure to meet social needs as a result of an incurable functional disorder, deficiency, or abnormality arising from illness or accident

(Argiriou, 2015). Gaming has been a part of our lives since the dawn of time, an activity in which people of all ages, young and old, spend a significant portion of their time. With technology making every aspect of our lives easier, it has also become increasingly widespread, particularly in the areas of entertainment and gaming (Özmen, Alıncak and Cağdanlıoğlu, 2023). According to Musayev, Ersoy and Avcı define disability from a medical perspective as follows: it is the inability of an individual to adequately fulfill the roles expected of them based on their age, gender, and social and cultural factors due to existing or subsequently developed impairments in their body. For example, a child who cannot speak will reveal their disability when they want to fulfill roles based on verbal communication at school, in class, or in society (Musayev, 2013). Attitudes are one of the important concepts in human life. Attitude is not a concept that can be measured directly, but it is possible to measure an individual indirectly through behavioral patterns (Öztürk et al., 2017). Kılıçarslan (2013), on the other hand, approached the same situation from a social model perspective, arguing that a person should not be considered disabled due to hearing loss. He stated that if sign language interpreters or assistive hearing devices were provided in the environments where this person participates, full participation could be achieved, and thus, a person defined as disabled could overcome their disability if environmental factors were adjusted. Looking at the concept of disability in international legislation, the Declaration on the Rights of Disabled Persons, No. 3447, annexed to the Universal Declaration of Human Rights, adopted at the meeting of the United Nations General Assembly on December 9, 1975 adopted at the United Nations General Assembly meeting on December 9, 1975, defines a person with a disability as “a person who, due to any congenital or acquired deficiency in their physical or mental abilities, is unable to perform the tasks that a normal person must perform in their personal or social life” (Çetin, 2016).

Aim of the Study

The purpose of this study is to examine the concept of disability and the types of disabilities in the historical process.

Disabled Concept

Disability has been a social reality seen in every society since the dawn of humanity. However, due to cultural differences, people with disabilities have periodically been invisible and ignored in social life, struggling to survive with their disabilities and other obstacles posed by society. With social changes, scientific advancements, and the increasing importance of human rights, social awareness of disability is beginning to emerge. Through increased awareness and sensitivity, individuals with disabilities have become socially visible and have begun to seek their rights. Undoubtedly, this increased visibility and awareness within society has resulted from the hard work, effort, and struggle of individuals with disabilities, despite the social culture and the barriers not

created by society (Meşe, 2015). A disability is the inability of individuals to properly demonstrate expected behaviors within society, resulting from inadequacies stemming from age, gender, social, and cultural differences (Cavkaytar and Diken, 2005). According to the Turkish Language Association (TDK), a disabled person is "a person who, whether congenital or acquired, has lost physical, mental, spiritual, sensory, or social abilities to varying degrees, and who has difficulty adapting to social life and meeting daily needs" (TDK, 2024). Disability is a problem an individual faces in the process of interacting effectively and adequately with the environment due to inadequacy caused by functional losses due to organ damage (Ataman, 2003).

Defining disability is not an easy thing to do. The primary goal of theoretical approaches is to lay the groundwork for the subject and to show how the subject is viewed from which perspective. The most well-known theoretical approaches to disability are medical, social, political and cultural perspectives. In addition to these approaches, there are also model studies for the development of feelings and thoughts about disability. It is known that the medical model, which is the first theoretical approach to disability, emerged from the disease view used in medicine. This view explains disability in terms of individual disorders and biology. This view, which emerged in a period when it was very common to be "normal", emphasizes the requirements for disabled people to be "normal" (Dönmez et al., 2016). Some definitions of disability arising from the theoretical approaches to disability or leading to these approaches are as follows (Darıca, Abidoğlu, and Gümüşşcü, 2002).

According to the State Institute of Statistics (DİE), disabled people are defined as people who are unable to adapt to the requirements of normal life due to the loss of physical, mental, spiritual, sensory and social abilities to varying degrees, either from birth or for any reason, and who require special physical arrangements in buildings and open spaces to be able to move independently (DİE, 2004).

Historical Development of Disability

The history of disability is a long process that began with human history, and throughout this process, individuals with disabilities have gone through many stages, including murder, torture, abandonment, humiliation, exploitation, entertainment, isolation, charity, and, in recent years, protection, acceptance, and love (Velivasaki and Çivaliou, 2007). For a long time, until the emergence of major monotheistic religions, babies born differently than normal or children who failed to develop normally were either killed or abandoned to their fate (Baykoç Dönmez, 2010). One of the main reasons for this attitude towards disabled individuals in ancient times was the belief that they had been punished by the gods for crimes or sins committed by themselves or their parents. Furthermore, in some societies in ancient times, there was a belief that disabled individuals were

possessed by demons and should be killed. In societies with the opposite belief, disabled individuals were thought to have special powers and were therefore respected (Çitil, 2013). In the Middle Ages, there were both positive and negative practices towards disabled people. In addition to the negative practices of the early ages, mentally disabled individuals were sometimes considered innocent children of God, and their care was provided in monasteries. In some societies, however, killing disabled babies was a very rare practice due to the high value placed on children (Sucuoğlu, 2016). Additionally, negative attitudes toward individuals with disabilities have been partially replaced by interest, protection, and compassion over time, partly due to the influence of religions (Baybal, 2015). This shift is rooted in the religious motivation to earn merit or avoid sin, as promoted by major faiths (Baykoç Dönmez, 2010). Starting in the 1700s, the situation of people with disabilities in Europe gradually began to improve. A method developed around 1510 by the Spanish monk Pedro Ponce de Leon to teach communication to people with hearing impairments became widespread in Spain and France. These methods of teaching sign language inspired the establishment of boarding schools, first for children with hearing impairments and later for children with visual impairments (Çetin, 2016). Some studies conducted during this period served as guides and played a significant role in the development of disability. A brief review of some of these studies reveals that the first attempt to educate a 12-year-old mentally disabled boy, whom Itard found in the forest and named Victor, was made (Baykoç Dönmez, 2010). These studies, conducted by Itard and Victor, are considered the first systematic educational efforts for individuals thought to have intellectual disabilities (Sucuoğlu, 2016). Louis Braille (1809-1852), himself a blind Frenchman, developed a finger-reading system based on six raised dots that could be used by blind people (Baykoç Dönmez, 2010).

In Türkiye, the beginnings of special education actually date back to ancient times. After embracing Islam, the Turks established many institutions for the disabled, enabling disadvantaged individuals to benefit from these institutions (Baykoç Dönmez, 2010). Looking back to the 1950s, the first instance of the education of children with disabilities in 19 countries is the “Enderun School,” a system for the education of gifted children, purportedly implemented in the 16th century during the Ottoman Empire (Ataman, 2019). In Türkiye, the first institutional special education services were provided to hearing-impaired children. In 1886, upon the recommendation of an Austrian named Ferdinand Grati, the School for the Deaf, Dumb, and Blind was opened, and a department for the blind was later added to this school (Günay and Görür 2013). Before the Republic of Turkey was declared, in 1921, during the War of Independence, the “Special Izmir Institution for the Deaf and Blind” was opened in Izmir (Orhan and Genç, 2013). This school was later transferred from the Ministry of Health and Social Welfare to the Ministry of National Education, and it is known that it operated under the Ministry of Social Welfare until 1950. One of the most striking developments of the 1950s was

the transfer of the planning and implementation of special education services to the Ministry of National Education (Kargın, 2004). When we examine legal regulations, we find numerous regulations concerning individuals with disabilities in Turkey since the 1950s. The primary legal basis for services related to individuals with disabilities in Turkey today is the 1982 Constitution. The phrase "persons with physical and mental disabilities" in Article 50 of the law directly refers to individuals with disabilities. Furthermore, although not explicitly stated in Article 60, the social security rights of individuals with disabilities are also guaranteed. Article 42, in the section on the right and duties of education and training in the third part of the 1982 Constitution, states, "The State shall take measures to render those who need special education due to their condition useful to society." This article protects the educational rights of our citizens with special needs, as they did in the 1961 Constitution (Çitil and Üçüncü, 2018). The "Law on Children in Need of Special Education," enacted in 1983, includes sections on definitions, principles, institutions and their duties, and diagnosis, placement, and monitoring. This law is particularly important because it addresses inclusive education. The concept of inclusion was further developed and addressed in Decree Law No. 573, issued in 2000. While this law emphasized inclusive education, it also established a more comprehensive legal framework for the provision of individualized and special education support (Kargın, 2004). Article 7 of the same Decree Law stipulates that preschool education is compulsory for children diagnosed with special needs and that this education be provided in special education schools and other preschool educational institutions (Koçyiğit, 2015). Law No. 5378, "On Amendments to Disabled Persons and Certain Laws and Decree Laws," enacted in 2005, is of significant importance for individuals with disabilities. This law, which includes numerous regulations related to individuals with disabilities, is the first law enacted directly for individuals with disabilities (Baykoç Dönmez, 2010). The purpose of the Disability Law is to prevent disability, address the problems of individuals with disabilities related to their health, education, rehabilitation, employment, care, and social security, and establish the necessary regulations for the coordination of these services (Çitil, 2013).

Causes of Disability

Disability generally arises as a result of physical, mental, or psychological factors (Kikeri and Gogka, 2016). When examining the causes of impairment in these areas, two approaches are commonly highlighted in various sources. One approach focuses on the various causes arising during the prenatal, perinatal, and postnatal periods that lead to individuals being affected by disability. Prenatal causes include genetics, infections suffered by the mother, accidents, medication use, X-rays; causes during birth include premature or difficult birth, breech presentation, umbilical cord entanglement, oxygen deprivation during birth; and postnatal causes include infections suffered by the child, measles, mumps, meningitis, accidents, malnutrition, neglect, lack of education, harmful

traditions and customs, hip dislocation, etc. (Öztürk, 2011). Another classification distinguishes between genetic and environmental factors. Genetic (organic) classification addresses prenatal genetic abnormalities, while environmental classification addresses conditions that develop as a result of exposure to adverse circumstances (Stavris, 2009).

Prenatal Causes

Genetic factors, hereditary diseases resulting from consanguineous marriages, blood incompatibility, and chronic diseases in the mother (e.g., diabetes, hypertension, epilepsy, and heart disease) are among the significant causes of disability that arise before birth. In addition, infectious diseases contracted by the mother during pregnancy (rubella, parasites, hepatitis B, chickenpox, and sexually transmitted diseases), advanced maternal age, uncontrolled medication use during pregnancy, chemicals causing poisoning, exposure to X-rays, malnutrition, and stress are also causes of prenatal disability (Kabak, 2019). Children with mental disabilities often have a strong physical build, but if this strength is not properly channeled, it can turn into aggressive behavior. However, with the right education, this physical strength can be channeled into a positive direction that contributes to the baby's development (Kınalı, 2003).

Causes During Birth

Problems experienced during birth can also lead to disability. These problems include oxygen deprivation due to prolonged labor, improper interventions during birth, and premature or late births (Kabak, 2019).

Postpartum Causes

Conditions that cause disability after birth include high fever and seizures, head injuries, accidents, prolonged jaundice, and excessive antibiotic or medication use. These factors also include metabolic syndrome encountered during the newborn period, psychosocial traumas, workplace accidents, accidents at home, traffic accidents, environmental factors, and natural disasters. In developed countries, the most common factors that cause disability include unhealthy nutrition, infectious viruses, inadequate prenatal health care, accidents, and injuries. People may partially or completely lose their physical, mental, emotional, and social abilities at birth or as a result of illness or accidents that occur later. This makes it difficult for individuals to sustain their lives and can seriously hinder their participation in social life (Kabak, 2019).

Perception of Disability

The challenges of having a child with a disability aren't limited to the family experiencing the disability. This is because the family lives within a society. And that society, in turn, has an order created by the individuals within it. Therefore, those who don't conform to this order are immediately noticed. These individuals are often perceived by society as

needy, disabled, needing to be removed, or repulsive (Özgür, 2017). The most important factor in the formation of this order is the perception society develops toward people with disabilities. The word "perception" comes from the Latin word "capere," meaning "to receive." Perception is the cause-and-effect relationship established between the external world and a person's inner world (Ertan, 2017). According to another definition, perception is described as "awareness, comprehension, evaluation, consciousness," indicating that the process of perception is a cognitive process. After analyzing the mass of information generated around us with our sensory organs, we are able to understand the world outside ourselves by subjecting it to the perception process (Bakan and Kefe, 2012). Perceptions play an important role in explaining the behaviors of people within a social group. Since people perceive the same stimulus from their environment differently, they respond differently. Different responses vary depending on individuals' perception characteristics, forms, knowledge, and experiences (Stephen and Timothy, 2024). In perception, our previous life experiences play a role in determining which stimuli in the environment will be perceived, which ones will be responded to, and how (Ekici, 2004). Therefore, since the perception process is variable and subjective, people can be influenced by environmental factors, culture, and different views throughout this process (Tufan, 2022).

Diğer and Yıldız (2021a) consider the perception of disability as the attitudes and behaviors exhibited towards individuals with disabilities in many processes of social life. Social perceptions of people with disabilities are fundamentally shaped by social attitudes shaped by social representations. Therefore, when existing attitudes towards disability are "positive," they tend to be inclusive of people with disabilities, while when they are "negative," they tend to be exclusionary (Aslan and Şeker, 2011). In short, when the perception of people with disabilities is positive, social acceptance increases; when it is negative, the tendency to reject and speak negatively increases. Significant improvements have been made in the lives of people with disabilities through legal regulations and administrative measures. However, despite all legal and administrative measures, people with disabilities are still viewed as "pitied, excluded, unaccepted, ridiculed, belittled, and distrusted." This attitude creates a negative perception of people with disabilities and leads to their exclusion from society (Aslan and Şeker, 2011). This established perception has spread over time and persisted until today. In this context, it is believed that the reason individuals with disabilities encounter the perception of disability at every stage of their daily lives is the accumulation of negative perceptions from the past to the present (Diğer and Yıldız, 2021b). Therefore, changes in negative social perceptions and attitudes toward individuals with disabilities will have an impact on their participation in social life (Gencer, 2019). Families with children with disabilities spend a significant portion of their time supporting their children and meeting their needs. However, like all people, these parents are social beings and need socialization. In this regard, parents need companionship, friendship, the feeling of not being alone, and

emotional support for socialization (Kaya, 2020). Parents' psychological well-being will enable them to more easily support their children, who face many challenges (Üstüner Top, 2009).

Types of Disabilities

Disabilities are classified as follows:

1)Physical disabilities,
2)Intellectual disabilities,
3)Hearing impairments,
4)Visual impairments,
5)Spasticity,
6)Learning and attention deficits,
7)Emotional and behavioral disorders (MEB, 2015).

Physical disability

It is generally not possible to clearly distinguish between different types of disability. Some illnesses can lead to mental or physical impairments even when left untreated or after treatment. Therefore, in terms of disability, it is not so much the problem itself that causes the disability, but rather the resulting functional impairment or lack of work capacity in the individual that is important (Çakmak, 2006).

Hearing Impaired People

The ability of people to form thoughts in their minds and communicate these thoughts to others is a fundamental element of social life. When we consider the connection between human behavior and sound, we see that the hearing mechanism plays a critical role in the process of combining and adapting human activities with the constant influences of nature (Mert, 2005). Healthy hearing requires the smooth functioning of all auditory pathways in the ear. A disease, problem, or abnormality in one or more of these systems can lead to hearing loss. Hearing impairment is defined as the decrease in an individual's hearing sensitivity, preventing them from developing, adapting to social life, and adequately performing verbal communication tasks (Özsoy, 1982). Hearing impairment is defined as a disability that can range from mild to severe (Ertürk, 2003). Hearing impairment is a condition that makes it difficult for an individual to communicate with the outside world and develop social relationships. Hearing impairment is the partial or complete absence or reduction of hearing sensitivity, resulting in difficulties with an individual's speech, language, and communication skills, which negatively impacts their educational performance and social adaptation (İlhan, 2021). Hearing-impaired individuals are defined as individuals who require special education and support services due to the partial or complete loss of hearing sensitivity (MEB, 2010). People with hearing impairments require the use of hearing aids due to the partial or complete loss of

their ability to perceive and recognize sounds (Karaağaç, 2017).

Speech and Language Impairments

Individuals with speech impairments are defined as those who have impairments in the flow of speech, rhythm, and stress, or the accurate production of phonemes (Atala, 1996; MEGEP, 2009). People live their lives communicating and socializing with others. They use a common language to share their feelings, thoughts, and desires with those they share a common environment, and to exchange information with them. Individuals with language and speech disabilities lack the ability to speak, a crucial skill for human life, and this leads to difficulties in adapting to social life. Language and speech disabilities are disorders of the flow, rhythm, pitch, emphasis, articulation, and meaning of speech (MEB, 2011). These individuals are unable to speak for any reason or have problems with the speed, fluency, expression, and volume of speech. These include those who can hear but cannot speak, those with larynx removal, those who use devices to speak, stutterers, aphasia, and those with disorders of the tongue-lip-palate-jaw structure (TUİK, 2010).

Visually impaired individuals

Visual impairment is a health problem that occurs when the eyes cannot perform their necessary functions and can range from blindness to partial vision loss. This condition can significantly impact an individual's quality of life. According to the International Classification of Obligations (ICD) (ILO, 2007), visual impairment encompasses conditions such as moderate low vision, severe low vision, and blindness (Julka et al., 2014). Individuals with low vision must be able to perceive objects and environments with environmental and optical aids in their daily lives. On the other hand, individuals who rely on contact or hearing, cannot benefit from optical devices, and cannot read are defined as "blind." According to the World Health Organization (WHO), visual impairment is a condition that cannot be corrected with standard glasses or contact lenses and that partially or completely impairs an individual's ability to perform certain tasks. Blindness is defined as the inability to distinguish between light and dark, or the complete loss of vision (Abdulah et al., 2019). Congenital visual impairment can result from genetic factors or adverse conditions in the womb during pregnancy. Later-onset vision loss is linked to factors such as trauma, infections, diseases, or aging (Gürel, 2019). Social interactions developed through eye contact and observation can impair social development in visually impaired individuals. Increased fear of strangers in children, ambiguity in facial expressions, and differences in nonverbal communication are possible consequences of this (Sterkenburg et al., 2022).Visual impairment can be defined as the partial, partial, or complete loss of vision due to various causes, including hereditary factors inherited from the family, febrile illnesses experienced by the mother during pregnancy, premature and difficult birth, various accidents, poisoning, and aging, which negatively impacts individuals' social life and educational life (Özdemir and Başkonak, 2018). Visually impaired individuals may exhibit specific behaviors such as swaying

back and forth, waving their fingers and hands, rubbing their eyes, and walking slowly, depending on the nature of their disability. Other characteristics of these individuals include delays in motor and cognitive skills and deficiencies in abstract thinking. The other sensory organs of visually impaired individuals are more developed than those of individuals with normal development; they can notice fine details more quickly, are more attentive, and participate more in social activities in these areas (MEB, 2015). Today, visually impaired individuals have access to educational services in various fields at boarding schools for the disabled, special education schools, inclusive classrooms, special education and rehabilitation centers, and support education rooms (Karakoç and Çelik, 2020; Yarımkaya and Töman, 2021). Visual impairment is classified in different ways, and the most common types of classification in the literature are as follows: according to the time of onset of impairment, according to the cause of impairment, from a legal and educational perspective, in terms of visual acuity, and from a sporting perspective (Örer, 2020).

Physical Disability

A physical disability is a condition that affects all or part of an individual's body and is caused by nervous system damage, diseases, accidents, or genetic factors, and prevents an individual from performing daily activities (Phetrasuwan et al., 2009). Polat (1998) divides the concept of physical disability into five main categories to further explain it:

1) Nervous system disorders and disabilities
2) Muscle disorders and weakness
3) Joint disorders and diseases
4) Psychomotor disorders and disabilities
5) Skeletal system disorders

Physical disability is a condition in which a person's anatomical structure loses its expected functionality, either for a long period of time or permanently. The causes of this condition may originate from the prenatal, perinatal, or postnatal periods, as mentioned above. Physical disability can also be defined as the limitation or complete loss of physical abilities due to any deficiency or disorder in a person's anatomical structure or physical form (Cumurcu et al., 2012). It is a condition in which the skeletal, muscular, and nervous systems are damaged due to unwanted accidents and genetic problems, resulting in the inability to perform their functions (Kırlıoğlu, 2015). Another definition describes it as a dysfunction of the muscular and skeletal systems (Öztürk, 2011). Physical disability can also result from congenital causes, infections, febrile illnesses, systemic diseases, or accidents experienced by the individual after birth (Gürsel, 2006). Physical disability is the most common type of disability and is also known as orthopedic disability (Yücel and Bulut, 2020). According to a 1981 World Health Organization publication, physical disability is the loss of some or all bodily functions in the musculoskeletal or nervous system, whether congenital or acquired, due to illness or accident. This disability makes

it difficult for an individual to perform daily activities and increases the individual's need for personal care and rehabilitation. Physical disability is the impairment of movement skills due to diseases and problems in the musculoskeletal and nervous systems that make up the body's movement system (Yıldırım and Arslan, 2015). Physical disability, on the other hand, is the condition in which individuals with physical disabilities experience anatomical or physiological functional impairments that prevent them from participating in educational activities (Atasaoy, 2020). People with physical disabilities may experience difficulties maintaining their daily lives and adapting to social life due to the loss of physical functions resulting from deformations in their musculoskeletal systems. They must benefit from personal care, protection, rehabilitation, and counseling services (Ministry of National Education, 2011). Common characteristics of people with physical disabilities include limited movement coordination and mobility skills, a generally sedentary lifestyle, a unique gait, balance disorders, and frequent complaints of fatigue and pain (Ministry of National Education, 2011). Öztürk (2006) classifies individuals with physical disabilities into three groups according to their degree of disability: Individuals with mild physical disabilities can meet their personal needs independently and do not require any devices during daily activities. However, without necessary interventions, deterioration in motor and sensory skills may be observed. Individuals with moderate disabilities need occasional support to sustain their lives. These individuals may experience involuntary muscle movements, pain, or soreness. They may also use assistive devices such as crutches. Perceptual and sensory impairments are common in this group. Individuals with severe physical disabilities are dependent on constant support and use assistive devices in their daily lives. They need the help of others to meet their basic needs. Severe pain limits these individuals' functioning, and perception and sensory-perception disorders negatively affect their academic success and motor skill acquisition.

Individuals with intellectual disabilities

Children with intellectual disabilities are generally observed to have considerable physical strength. However, this strength can often turn into aggressive behavior when used in an uncontrolled manner. Yet, this physical energy can be channeled in a positive direction that contributes to the child's development if properly directed (Kınalı, 2003). In the field of education and training, children with intellectual disabilities are generally classified according to the intelligence quotient (IQ) scores they consistently receive on intelligence scales. These classifications are based on intelligence tests that have proven validity and reliability. For example, according to intelligence test results:

1) those with IQ scores of 0–24 are classified as "idiots" or severely mentally disabled,
2) those with IQ scores of 25–44 are classified as "trainable mentally disabled,"
3) those with IQ scores of 45–74 are referred to as "trainable mentally disabled" (Özgür, 1993). Mental disability is defined as the brain's inability to complete its development,

which is the organ in our body with the most nerves and blood vessels, and the loss of brain function due to factors affecting brain functions during development, resulting in the brain's inability to function normally. Mental disability is caused by a combination of multiple, interrelated conditions (Karakoç, 2015). Mental disability is a condition that can occur before, during, or after birth, involving factors that affect the central nervous system and slow down mental development and brain functionality, preventing the development of adaptive behaviors in the affected brain and causing permanent deficiencies in social and academic behaviors (Çoban Esen, 2003). Individuals with limited ability to comprehend messages received from the environment in terms of mental functioning, limited socialization and adaptation skills, and all these symptoms observed before the age of 18 are defined as mentally disabled (MEB, 2006; Koç, 2014). Individuals with intellectual disabilities, whose intelligence functions are below what is considered normal, experience difficulties in maintaining basic skills such as communication skills, meeting daily household needs, academic success, self-management, self-care, and social skills (İlhan, 2008). The number of individuals with intellectual disabilities is quite high, yet they are not recognized by society. Even if they are not recognized by society, prejudices against individuals with intellectual disabilities are prevalent in social life. One of the greatest prejudices that exacerbates the disability of individuals with intellectual disabilities is the belief that nothing can be done for them from a young age. Contrary to this belief, individuals with intellectual disabilities can achieve success in many different areas. Even if they lag behind in social adaptation, meeting their personal needs, and using their language skills, there are many things they can do that are within their intelligence level (Özer, 2010).

Mental and Emotional Disabilities

Mental and emotional disabilities, like other types of disabilities, have become increasingly accepted by society. Over time, attention has been drawn to the problems they face in social life, and efforts have been made to develop solutions. Many international institutions and organizations conducting research on mental and emotional disabilities have developed various definitions (Oktay, 2022). The World Health Organization (2018) defines mental health as a state of well-being in which individuals are aware of their abilities, can cope with the stresses of life, work productively, and contribute to society. Therefore, mental health does not simply mean the absence of mental illnesses (disorders) or disabilities (WHO, 2018). Psycho-emotional illness is generally defined as abnormalities in thinking, perception, emotion, behavior, and communication with others (WHO, 2019). The loss of behavioral functions in human communication, as mentioned above, resulting from psycho-emotional illnesses is referred to as mental disability (WHO, 2011). The term psycho-emotional disability refers to the disability status expressed as a percentage due to loss of function due to psycho-emotional disorders (Prilleltensky, 2012). Mental and sensory disabilities encompass many disorders. Examples include depression,

attention deficit and hyperactivity disorder, conduct disorder, schizophrenia, and autism. Individuals with mental and sensory disabilities share certain characteristics. Some patients are gifted, while others may exhibit intellectual disabilities. Individuals with disabilities in this group also experience educational interruptions and serious problems with communication and socialization skills. They are also prone to crime (MEB, 2011).

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Beyond The Label: Autopsy and Case Report of Specific Organ Damage Induced by Sports Supplements

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To Cite This Chapter:
Eyipinar, C. D., & Colak, H. (2025). Beyond the label: Autopsy and case report of specific organ damage induced by sports supplements. In F. Alincak (Ed.), *Current studies in sports science* (pp. 36–59). ISRES Publishing.

Introduction

Individuals who exercise and athletes have frequently used sports supplements to improve their performance and physical appearance. This has become a widespread and accepted practice today (Koncic & Tomczyk, 2013). Globally, it is estimated that between 40% and 88% of athletes use supplements (Silver, 2001). A study conducted by the United States Olympic Committee in 2004 found that approximately 90% of athletes used various supplements. Such high demand has produced countless products specifically designed for individuals who exercise or play sports. However, these products are not scientifically substantiated for use in sports. They are often advertised as containing certain illegal substances added intentionally or unintentionally to enhance the product's effectiveness, despite manufacturers' inadequate controls and storage conditions. Given this, there is growing evidence that the use of these products may not be reliable (Koncic & Tomczyk, 2013). The general belief is that sports supplements consisting minerals, vitamins, and herbal products are natural and safe. However, these products have a wide range of adverse effects, including headaches, muscle cramps and digestive problems, as well as short- and long-term cardiovascular complications, gout, kidney stones and even kidney failure (Jairoun et al., 2020). As these supplements have been found to contain substances such as heavy metals, potent stimulants, or various banned ingredients, concerns regarding their safety extend far beyond simply reviewing the list of ingredients stated on the supplement label (Harty et al., 2018). Cohen (2009) emphasised in his study that the dosage of substances found in supplements can vary widely, from low/therapeutic/detectable doses to potentially toxic doses. Ultimately, the supplement industry has produced numerous products whose efficacy, quality, and contents are questionable (Koncic & Tomczyk, 2013; Deldicque & Francaux, 2016). The benefits provided by sports supplements remain controversial (Suzic Lazic et al., 2011), and their inappropriate use can lead to various organ damage (Thorsteinsdottir et al., 2006; Dara et al., 2008; Whitt et al., 2008) and even death (Fong et al., 2010). Therefore,

this systematic review has been prepared to support awareness and knowledge on the subject by examining in detail the serious side effects caused by sports supplements used by individuals who exercise or play sports to enhance athletic performance, and the sports supplements held responsible for these side effects. When nutritional supplements used in sporting activities may contain toxic or illegal components, discrepancies may exist between the ingredients listed on the labels and the actual contents. Adverse health outcomes are inevitable when combined with a lack of awareness regarding the use of sports supplements (Liu, 2021). Although the use of sports supplements is common among athletes, information regarding their toxicity and mortality tends to be limited to case reports. Whether the scientifically unjustified use of sports supplements stems from a fad or a lack of studies revealing their actual mechanisms and magnitude of effect (Alonso & Fernandez-Garcia, 2020). This systematic review aimed to elaborate on the severe side effects of sports supplements and the details of these supplements.

This study was from the master's thesis entitled Time to Understand the Side Effects of Supplements Used in Sports: Micro Analysis of Case Reports.

Method

Research Model

This research is a systematic review study conducted to support the awareness and understanding of sports supplement users by extensively examining the serious side effects caused by sports supplements used by individuals who exercise or play sports to enhance athletic performance. A systematic review is a specific methodology that identifies, selects, evaluates, analyses, synthesises, and reports existing studies in a way that allows for reasonably clear conclusions about what is known and what is not known. A systematic review is not considered a traditional literature search, but rather an independent research project that investigates a clearly defined question derived from a policy or practice problem using existing studies (Denyer & Tranfield, 2009).

Search Strategy

Between June 2011 and July 2021, a search was conducted using the Cochrane Library, PubMed, and Google Scholar databases to access studies in English. The search terms used were 'failure in sports supplements,' 'sports supplements case reports,' 'sports supplements case studies,' and 'side effects of sports supplements case report,' and case reports were filtered. During the search, results from 2011 to 2021 were marked. Study selection was based on the Population, Interventions, Comparisons, Outcomes, and Study Designs (PICOS) approach, with the criteria for each category listed below:

Population (P): It is limited to healthy individuals who engage in sports or regular exercise and do not take medication. There is no age restriction.

Intervention (I): The data were obtained from published case reports and series concerning various side effects observed due to sports supplements intended to enhance athletic

performance, which did not directly involve using prohibited substances. Therefore, there was no intervention, the intervention criterion was not used in this study.

Comparisons (C): As numerical values relating to risks were to be presented, no comparison criterion was used, and priority was given to interpretations.

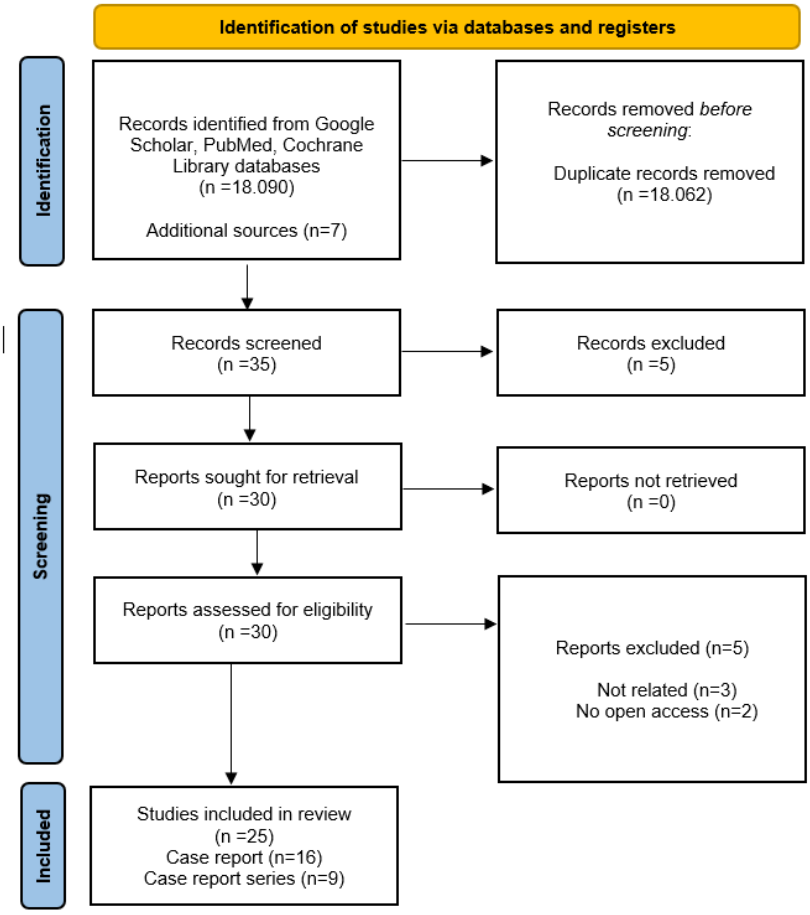
Outcomes (O): The contents of side effects caused by sports supplements, their distribution, symptoms observed in relation to their use, the names of sports supplements responsible for side effects, the potential active ingredients they contain, and the percentages exceeding the recommended daily intake of potential active ingredients have been reported.

Study Types (S): Case reports and case series indicating that the serious side effects observed were related to the use of sports supplements, detailing the individual's symptoms and clearly discussing vital signs, were included in the review.

The complete search strategy for all database is detailed in Figure 1.

Figure 1

Flow Chart of The Procedure Used to Collect Case Reports Included in the Systematic Review (Liberati et al., 2009)



Eligibility Criteria

Inclusion Criteria

Studies were included if they met all of the following criteria: (a) case report or case report series; (b) studies involving sports supplements related to athletic performance; (c) studies that do not use prohibited substances and open access; (d) Studies that have determined the relationship between the serious side effect observed and the use of sports supplements, and that clearly discuss the symptoms and vital signs; (e) healthy individuals who exercise regularly or athletes.

Exclusion Criteria

Studies were excluded if they met all of the following criteria: (a) Articles that directly use prohibited substances and no open access; (b) studies involving sports supplements unrelated to athletic performance; (c) Studies that did not indicate a relationship between the serious side effect observed and the use of sports supplements; (d) studies in which symptoms and vital signs are not clearly discussed; (e) non healthy individuals who exercise regularly or non-athletes; (f): non human studies; (g) case reports and case series involving individuals with any chronic illness or taking medication were excluded from the study, as they could lead to misleading results regarding the effects of sports supplements due to the possibility of interaction between a substance in the supplement and the medication.

Data Synthesis

Five studies were found concerning changes in blood plasma caused by the side effects of sports supplements used to enhance athletic performance, 16 studies concerning organ damage, and four studies linking their use to death. The numerical distributions of the contents of these studies included in the research were calculated, and the data were recorded in the SPSS 23 software package, utilising descriptive statistics consisting of frequencies and percentages.

All 25 studies identified through systematic screening were examined in detail and reported within the scope of the thesis. However, in line with this book chapter's aim to provide a more focused and concise presentation, 20 studies are presented in tabular form. The selection was made by prioritising the studies that best represented the topic and provided the most up-to-date evidence. Readers can refer to the original thesis for comprehensive methodological details and a list of all studies.

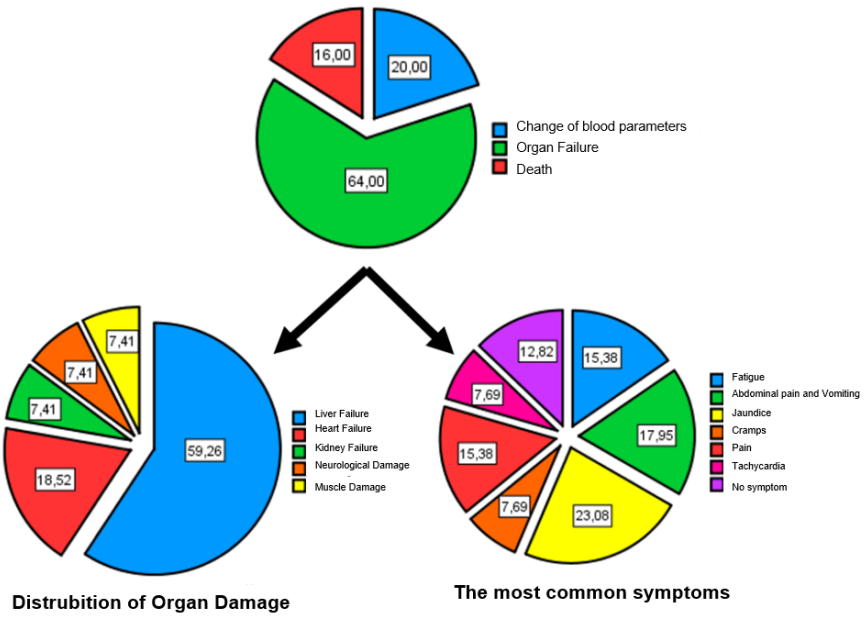
Results

Classification of Case Reports and Series

The findings obtained in relation to the study are explained in detail below.

Figure 2

Classification of Case Reports and Series



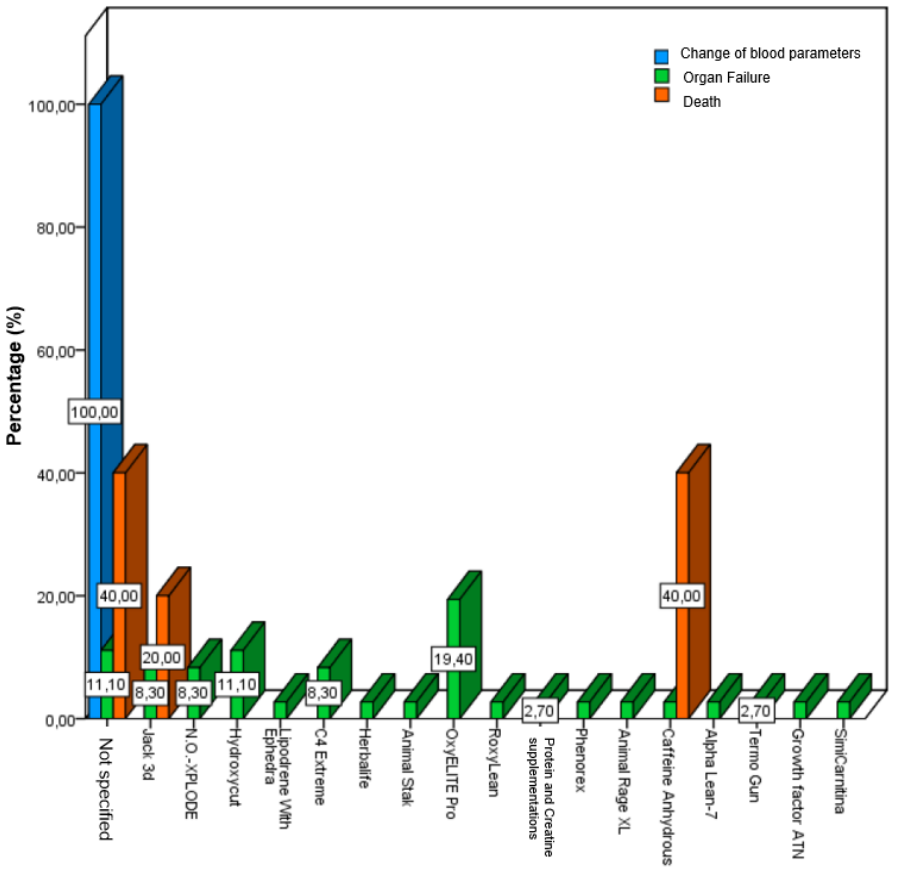
Serious adverse effects in case reports and case series accounted for 64% of organ damage, 20% of changes in blood plasma, and 16% of deaths. Among these, organ damage had the highest rate (64%), with 27 individuals involved in these cases. When examining the details regarding the sample sizes of case reports and series, it was determined that 59.3% were liver damage, 18.5% were heart damage, and 7.4% were kidney, muscle, and neurological damage.

Additionally, the number of individuals who underwent liver transplantation as a result of sports supplement use accounted for 18.75% of all liver damage cases. Looking at the predominant symptoms associated with supplement use, 23.08% of symptoms were related to jaundice, 17.95% to abdominal pain and vomiting, 15.38% to fatigue and pain, and 7.69% to tachycardia and cramps. Although multiple symptoms accompanied all cases, no symptoms were observed in 12.82%.

Changes in Blood Plasma, Organ Damage and Death Caused by Sports Supplements

Figure 3

Changes in Blood Plasma, Organ Damage and Death Caused by Sports Supplements



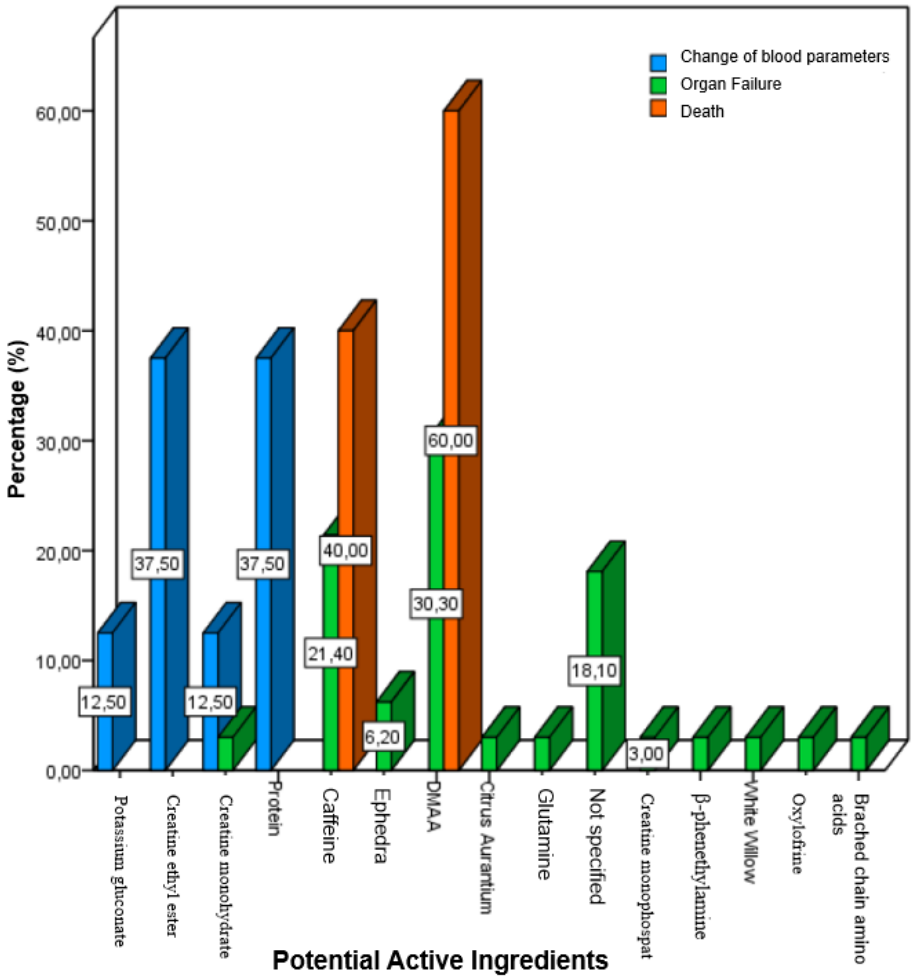
The names of the supplements causing changes in blood plasma have not been specified, and the supplements causing organ damage are, in order, OxyELIT Pro (USP Labs) at 19.4%, Hydroxycut (Muscletech) at 11.1%, C4 Extreme (Cellucor) at 8.3%, N.O-Xplode (BSN), Jack 3d (USP Labs), 2.7% with Growth Factor ATN (American Team Nutrition), SimiCarnitina (Farmacia Similares), Lipodrene With Ephedra (Hi-Tech Pharmaceuticals), Herbalife (Herbalife Nutrition), Animal Stak RoxyLean (Animal), Phenorex (Gaspari Nutrition), Animal Rage XL (Universal Nutrition), Caffeine Anhydrous, Alpha Lean-7 (Hard Rock Supplements) and Thermo Gun (Sheer Strength).

The number of supplements causing organ damage is higher than the number of supplements causing changes in blood plasma and death. The supplements causing deaths are Caffeine Anhydrous (40%) and Jack 3d (USP Labs) (20%). The names of the sports supplements responsible for 40% of deaths were not specified in the studies.

Potential Active Ingredients in Sports Supplements That Cause Changes in Blood Plasma, Organ Damage and Death

Figure 4

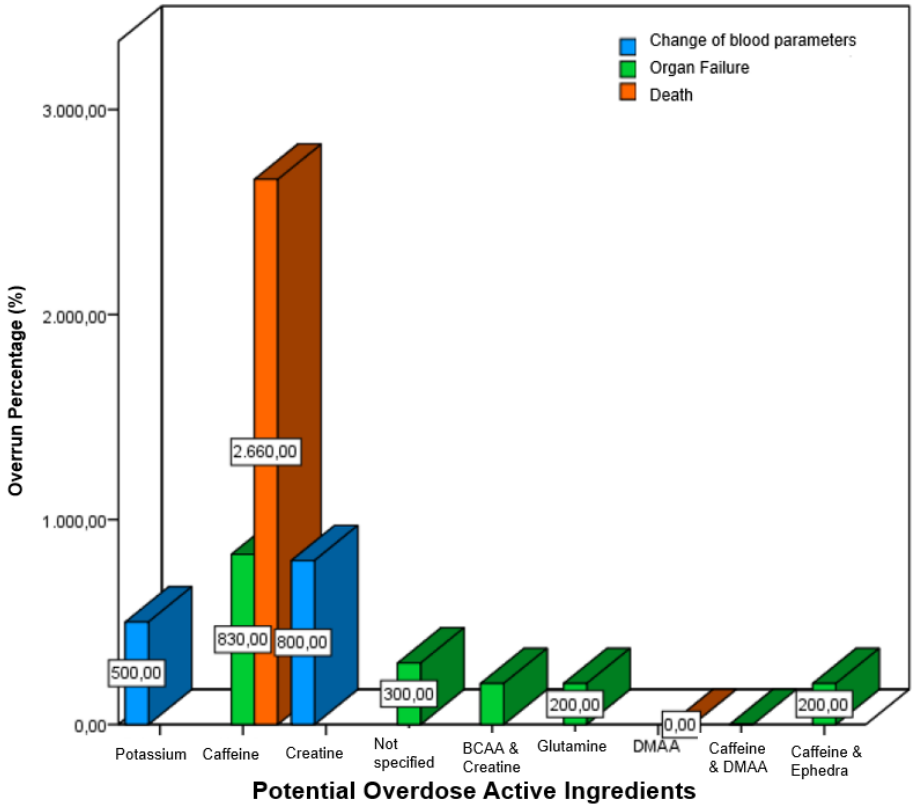
Potential Active Ingredients in Sports Supplements



Protein and creatine ethyl ester account for 37.5% of the changes in blood plasma, while potassium gluconate and creatine monohydrate account for 12.5%. Potassium gluconate, creatine ethyl ester, and protein did not cause death or organ damage. The factor most responsible for organ damage (30.3%) is the potential substance DMAA. This is followed by caffeine (21.4%), ephedrine (6.2%), creatine monophosphate (3%), citrus aurantium, glutamine, b-phenethylamine, white willow, oxilofrine, and branched-chain amino acids. None of these substances, except for DMAA and caffeine, caused death. The two potential active ingredients responsible for all deaths are DMAA (60 per cent) and caffeine (40 per cent).

Percentage of Recommended Daily Intake Exceeded for Sports Supplements Used and Potential Active Ingredients Exceeding the Recommended Daily Intake
Figure 5

Potential Active Ingredients Exceeding the Recommended Daily Intake



The supplements causing changes in blood plasma contained five times the recommended amount of potassium (500% excess) and eight times the recommended amount of creatine (800% excess). The caffeine content in supplements causing organ damage was 8.3 times higher than recommended (830% excess), while glutamine, BCAA+creatine and caffeine+ephedrine combinations were taken at twice the recommended amount (200% excess). Sports supplements containing caffeine + DMAA combinations were taken at the recommended amount. Potential active ingredients taken at three times the recommended amount could not be clearly identified. The caffeine contained in the supplements that caused deaths was taken at an average of 26.6 times the recommended amount (2660% excess). Supplements containing DMAA were taken at an average of the recommended amount. As the case series and reports did not provide sufficient information about the supplements used in each case and their quantities, the necessary assessment was made only based on reports containing this information. Accordingly, caffeine is the potential active ingredient most frequently exceeded in the recommended amount. While the average caffeine overdose rate in death reports is 2660%, this rate is 830% in cases of organ damage.

Case Reports on Organ Damage Associated with the Use of Sports Supplements

The characteristics of case reports concerning organ damage caused by sports supplements used to enhance athletic performance are shown in Table 1.

Table 1

Case Reports on Organ Damage Associated with the Use of Sports Supplements

Study ID	Samples	Supplement	Potantial Active Ingredient	Symptoms	Vital Signs	Diagnosis	Final Process
Rhidian (2011)	36-year-old male marathon runner	Unspecified	Caffeine & Ephedra	Tachycardia Agitation Hypoxia Metabolic acidosis Hypoglycaemia	Body temp: 39^{0}C, K: 6.2 mmol /l, Creatinine: 188 µmol / l, CK: 130.098 U/l, Lactate: 14.7 mmol /	Rhabdomyolysis	The necessary treatments have been administered and the patient has been discharged.
Avelar-Escobar et al., (2012)	17-year-old male bodybuilder	N.O.-XPLODE Growth factor ATN SimiCarnitina	Unspecified	Vomiting Epigastric pain Jaundice Dark-coloured urine	AST: 489 U/L, ALT: 640 U/L, ALP: 850 U/L	Acute Hepatotoxicity	The necessary treatments have been administered and the patient has been discharged.
Young et al., (2012)	26-year-old male soldier (who exercises regularly)	Jack3d	DMAA & Caffeine	Severe headache Blurred vision in the left eye	ALT/AST: 408/223 U, thalamic haemorrhage measuring 2 × 1.8 cm was detected in the head CT scan.	Haemorrhagic stroke	The necessary treatments have been administered and the patient has been discharged.
Carol (2013)	25-year-old male soldier (who exercises regularly)	Hydroxycut	Caffeine	Severe pain and weakness in the arm and elbow	AST: 624 IU/L, ALT:171 IU/L, LDH: 2,865 IU/L, CK: 33.600 IU/L, Myoglobin is positive in urine, BUN and creatinine are normal.	Rhabdomyolysis	The necessary treatments have been administered and the patient has been discharged.
	20-year-old male soldier (who exercises regularly)	Hydroxycut Hardcore		Severe cramps Vomiting	AST: 70 IU/L, ALT: 73 IU/L, CK: 1.040 IU/L, Myoglobin is positive in urine, BUN: 48 mg / dL, Creatinine: 4,0 mg / dL.		
Peterson et al., (2013)	28-year-old male soldier (who exercises regularly)	NO Xplode Hydroxycut	Unspecified	Jaundice Dark-coloured urine Itching Myalgia Fever	TB: 22,1 mg/dL, AST: 262 IU/L, ALT: 402 IU/L, ALP: 455 IU/L.	Liver damage	Liver enzyme levels have returned to normal.
	31-year-old male soldier (who exercises regularly)	Lipodrene With Ephedra	Ephedra		TB: 30,4 mg/dL, AST: 80 IU/L, ALT: 65 IU/L, ALP: 464 IU/L.		

	23-year-old male soldier (who exercises regularly)	C4 Extreme	Unspecified		TB: 12.9mg/dL, AST: 423 IU/L, ALT: 301 IU/L, ALP: 582 IU/L.	Liver damage	Liver enzyme levels have returned to normal
	46-year-old male soldier (who exercises regularly)	Herbalife	Bacterial contamination		TB: 12,1 mg/dL, AST: 496 IU/L, ALT: 1191 IU/L, ALP: 301 IU/L.		
	31-year-old male soldier (who exercises regularly)	Animal Stak	Unspecified		TB: 10,5 mg/dL, AST: 195 IU/L, ALT: 592 IU/L, ALP: 67 IU/L.		
Foley et al., (2014)	45 year-old female soldier (who exercises regularly)	OxyELITE Pro	DMAA	Jaundice Exercise intolerance Steatorrhoea	TB: 26,4 mg/dL, AST: 2514 U/L, ALT: 1980 U/L, ALP: 136 U/L, Creatinine: 0,8 mg / dL.	Acute liver failure	Liver Transplant
	28 year-old male soldier (who exercises regularly)	OxyELITE Pro		Fatigue Drowsiness Jaundice	TB: 32,0 mg/dL, AST: 1497 U/L, ALT: 2379 U/L ve Creatinine: 0,7 mg/dL.	Acute liver failure	Liver Transplant
	19 year-old male soldier (who exercises regularly)	OxyELITE Pro C4 Extreme Jack 3d		Şevere headache Abdominal pain Vomiting	TB: 1,2 mg / dL, AST: 1155 U / L ALT: >2000 U/L, Creatinine: 0.8 mg/ dL and tachycardia were detected.	Chemical-induced liver damage	Liver enzyme levels have returned to normal.
	28 year-old female soldier (who exercises regularly)	OxyELITE Pro C4 Extreme		Nausea Abdominal pain	TB: 6,7 mg / dL AST: 1285 U/L ALT:1162 U/L, Creatinine: 0,7 mg/dL.	Chemical-induced liver damage	Liver enzyme levels have returned to normal.
	23 year-old male soldier (who exercises regularly)	OxyELITE Pro RoxyLean Protein ve Kreatin suplemanları		Discomfort in the abdominal area Jaundice	TB: 17,5 mg/dL, ALT: 194 U/ L, Creatinine: 1 mg/dL.	Acute liver failure	Liver enzyme levels have returned to normal.
	23 year-old male soldier (who exercises regularly)	OxyELITE Pro		Jaundice Itching	TB: 2,8 mg/dL, ALT: 176 U/L, Creatinine: 1 mg/dL.	Acute liver failure	Liver enzyme levels have returned to normal.

Abbrevations: ALP: Alkaline Phosphatase, ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, BUN: Blood Urea Nitrogen, Ca: Calcium, CK: Creatine Kinase, DB: Direct Bilirubin, DMAA: 1,3 Dimethyl Amylamine, ECG: Electrocardiography, HDL: High-Density Lipoprotein, IU/L: International Units per litre, K: Potassium, LDH: Lactate Dehydrogenase, LDL: Low-Density Lipoprotein, mEq/L: Milliequivalents per litre, mg/dL: Milligrams per decilitre, mmol/L: Millimoles per litre, mL/min: Millilitres per minute, mm Hg: Millimetres of mercury, ng/L: Nanograms per litre, P: Phosphorus, TB: Total Bilirubin, TC: Total Cholesterol, U/L: Units/litre, °C: degrees Celsius, µmol/L: micromoles/litre.

	24 year-old female soldier (who exercises regularly)	OxyELITE Pro		Nausea Jaundice Vomiting Itching	TB: 6,3 mg/dL, ALT: 3348 U/L, AST: 1725 U/L, Creatinine: 0,8 mg / dL.	Chemical-induced liver damage	Liver Transplant
Smith et al., (2014)	A 22-year-old male who exercises regularly	Phenorex Jack 3d	Citrus aurantium & DMAA	Chest pain	Cardiac troponin T: 1.36 ng/mL, CK: 518 U/L, TK: 106 mg/dL, LDL: 52 mg/dL, HDL: 42 mg/dL. Sinus arrhythmia present on ECG.	Myocardial infarction	The necessary treatments have been administered, and the patient has been discharged.
Siano (2014)	26 year-old male soldier (who exercises regularly)	N.O.-Xplode	Unspecified	Abdominal pain Loss of appetite Pink-coloured urine Nausea	Creatinine: 10.64 mg/dL, K: 6.2 mEq/L, BP: 182/94 mmHg, eGFR: 6.8 mL/min, Renal biopsy revealed damage to the renal tubules.	Acute tubular necrosis	When he stopped taking the supplement, his condition returned to normal.
Araujo & Worman (2015)	41-year-old male individual who does strength training	Hydroxycut SX-7 Clean Sensory	Unspecified	Jaundice Nausea Vomiting Fatigue	AST: 2360 U/L, ALT: 6218 U/L, ALP: 109 U/L, TB: 8,3 mg/ dL, Creatinine: 1.80 mg/dL, Abdominal ultrasound revealed increased liver echogenicity.	Acute liver failure	The necessary treatments have been administered, and the patient has been discharged.
Arshad et al., (2015)	41-year-old male individual who does strength training	Unspecified	Branched-chain Amino Acids & Creatine (monohydrate)	Sweating Vomiting Mild shortness of breath	Troponin T: 3467 ng/ L, An intracoronary thrombus was detected during angiography.	Myocardial infarction	The necessary treatments have been administered, and the patient has been discharged.
Karnatovskaia, Leoni & Freeman (2015)	21 year-old male who exercises regularly	Unspecified	DMAA	No symptom	Troponin T: 1.09 ng/mL, CK: 1868 U/L, ST segment elevation detected on ECG.	Sudden cardiac arrest	A cardioverter defibrillator has been implanted.
Harris, Winn & Ableman (2017)	25 year-old male soldier (who exercises regularly)	Animal Rage XL	Caffeine Creatine (monophospat) & β-phenethylamine	Severe headache Nausea and vomiting Imbalance	Magnetic resonance angiography revealed bilateral cerebellar haemorrhagic stroke.	Haemorrhagic stroke	The necessary treatments have been administered, and the patient has been discharged.

Andrade et al., (2018)	32 year-old female who exercises regularly	Caffeine Anhydrous (toz formu)	Caffeine	Fatigue Anxiety Nausea and vomiting	Tachycardia (160 bpm), metabolic acidosis (Lactate: 5.3 mmol/L), Glucose: 254 mg/dL, Ca: 2.5 mmol/L, P: 1.8 mg/dL, polymorphic tachycardia detected on ECG.	Cardiac arrhythmia	The necessary treatments have been administered, and the patient has been discharged.
Wang (2019)	33 year-old female who exercises regularly	Alpha Lean-7	Caffeine	Chest tightness Shortness of breath Pre-syncope	Tremor and tachycardia present, Troponin: 50 ng/L, vital organs, mental status, cardiovascular and respiratory system examinations normal.	Cardiac ischaemia	The necessary treatments have been administered, and the patient has been discharged.
Ferreira et al., (2020)	36-year-old male MMA fighter	Thermo Gun	Oxilofrine White Willow Caffeine	Lethargy Jaundice	TB: 7 mg/dL, AST: 480 IU/L, ALT: 373 IU/L	Acute liver failure	Liver Transplant
Hatami et al., (2020)	35-year-old female bodybuilder	Unspecified	Glutamine	Nausea and vomiting Jaundice Dark-coloured urine	TB: 14,8 mg/dL, AST: 2500 IU/L, ALT: 2400 IU/L, ALP: 492 U/L, A lesion has been detected in the liver using dynamic magnetic resonance imaging.	Acute liver failure	Liver enzyme levels have returned to normal.

Abbrevations: ALP: Alkaline Phosphatase, ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, BUN: Blood Urea Nitrogen, Ca: Calcium, CK: Creatine Kinase, DB: Direct Bilirubin, DMAA: 1,3 Dimethyl Amylamine, ECG: Electrocardiography, HDL: High-Density Lipoprotein, IU/L: International Units per litre, K: Potassium, LDH: Lactate Dehydrogenase, LDL: Low-Density Lipoprotein, mEq/L: Milliequivalents per litre, mg/dL: Milligrams per decilitre, mmol/L: Millimoles per litre, mL/min: Millilitres per minute, mm Hg: Millimetres of mercury, ng/L: Nanograms per litre, P: Phosphorus, TB: Total Bilirubin, TC: Total Cholesterol, U/L: Units/litre, °C: degrees Celsius, µmol/L: micromoles/litre.

Characteristics of Case Reports Related to Deaths Associated with the Use of Sports Supplements Intended to Enhance Athletic Performance

The characteristics of case reports concerning death caused by sports supplements used to enhance athletic performance are shown in Table 2.

Table 2

Case Reports on Deaths Associated with the Use of Sports Supplements

Study ID	Samples	Supplementation	Potential Active Ingredient	Symptoms	Vital Signs	Diagnosis	Final Process
Eliason et al., (2012)	22-year-old male soldier	Unknown	DMAA	Leg cramps Loss of consciousness	High fever (40.8 °C), K: 7.4 mEq/L, Na: 149 mEq/L, Creatinine: 2.3 mg/dL, Glucose: 188 mg/dL, Metabolic acidosis (Lactate: 38.2 mg/dL), CK: 7.3 U/L, Cardiac Troponin I: 0.069 ng/mL	Sudden cardiac arrest	DEATH
	32 years old female soldier			Shortness of breath Leg cramps	Shock present, hypotensive (77/36 mmHg), tachycardic (109 bpm), metabolic acidosis (Lactate: 21.5 mmol/dL), K: 5.2 mEq/L, Na: 133 mEq/L, Creatinine: 1.8 mg/dL, Glucose: 261 mg/dL, AST/ALT <5 IU/L.		
Jabbar & Hanly, (2013)	39 year-old male bodybuilder	Caffeine Anhydrous	Caffeine	Severe vomiting	The autopsy revealed 350 mg/L of caffeine in the blood.	Sudden cardiac arrest	DEATH
Poussel et al., (2013)	44-year-old male bodybuilder	Caffeine Anhydrous	Caffeine	Sweating Tremor Tachypnoea	K: 2.6 mmol/L, WBC: 14,740 g/L CK: 9040 IU/L, Troponin I: 31.01 µg/L and 190 mg/L caffeine was detected in the blood.	Sudden cardiac arrest	DEATH
Archer et al., (2015)	30-year-old female marathon runner	Jack 3d	DMAA	Rigidity in the lower extremities	Bicarbonate: 22.6 mmol/L, Lactate: 18 mmol/L, Glucose: 2.9 mmol/L, K: 9.67 mmol/L, Na: 136.9 mmol/L.	Acute heart failure	DEATH

Abbreviations: ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, CK: Creatine Kinase, DMAA: 1,3 Dimethylamylamine, g/L: gram per litre, IU/L: International Unit per litre, K: Potassium, mEq/L: milliequivalent per litre, mg/dL: milligram per decilitre, mm Hg: millimetre of mercury, mmol/dL: millimole per decilitre, mmol/L: millimole per litre, Na: Sodium, ng/mL: nanogram per millilitre, U/L: Unit per litre, WBC: White Blood Cell, °C: degree Celsius, µg/L: microgram per litre.

Recent Developments (2022-2025)

While the main arguments and structure of the thesis have been retained, an additional literature review has been conducted to enhance the currency and depth of this book chapter, given the rapidly evolving nature of scientific knowledge.

Update Method: A search was conducted using the Cochrane Library, PubMed, and Google Scholar databases between 2022 and 2025 using the terms 'failure in sport supplements,' 'sport supplements case reports,' 'sport supplements case studies,' and 'side effects of sport supplements case report,' and case reports were filtered. The search was limited to studies published after the thesis defence. During this process, newly emerging case reports on the subject (Erfanifar et al., 2022; Gokdemir & Ulutan, 2022; Khan et al., 2022; Ridha et al., 2023; Altaf et al., 2024; Pallangyo et al., 2024; Kermanshah et al., 2025) were identified and integrated into the relevant sections of the book chapter, enriching the existing discussion.

As a result, seven case reports were obtained. Six of these were related to organ damage and one was a case report related to death. The table below summarises information on current case reports identified during this process that have made significant contributions to the subject.

Table 3

Case Reports on Organ Damage and Deaths Observed between 2022 and 2025

Study ID	Samples	Supplement	Potantial Active Ingredient	Sypmtoms	Vital Signs	Diagnosis	Final Process
Gokdemir & Ulutan, 2022	22 years old male bodybuilder	Jack 3D	DMAA	Arrhythmia, Tachyarrhythmia	BP: 130/80 mmHg, Pulse: 126/min RR: 18/min Temperature:36,5 C^0	Atrial Fibrillation (Arrhythmia)	The bodybuilder converted to normal sinus rhythm after the second line therapy.
Pallangyo et al., 2024	25 years old male fitness trainer	Pre-workout (Not specified)	Caffeine or theophylline,	Crushing mid-sternal chest pain	BP: 114/71mmHg, Pulse: 58 /min LDL: 1.02mmol/L, HDL: 1.53mmol/L, TG: 0.77mmol/L Cholesterol: 2.96 mmol/L troponin I: 5.14ng/mL CK-MB: 78.1 ng/mL.	Myocardial infarction	He was released from the hospital with drug therapy. He demonstrated normal function during his four-week follow-up.
Altaf et al., 2024	36 years old man who exercised regularly	Pre workout (Not specified)	Creatine or caffeine	Progressive weakness and numbness in both lower limbs, pain and sensitivity	AST: 2168 U/L ALT: 501 U/L Creatinine: 4.9 mg/dl BUN:50 mg/dl CK: 84983 U/L Na: 131 mEq/L K:7.3 mEq/L	Severe Rhabdomyolysis, kidney and liver damage	He has been discharged following treatment.
Ridha et al., 2023	35 years old man who exercised regularly	Pre workout (Not specified)	Not specified	Abdominal pain	Lipase: 3000 U/L.	Pancreatitis	He has been discharged 2 days later following treatment.
Erfanifar et al., 2022	20-year-old male athlete	Growth hormone injection	Growth hormone/ Somatotropin	Hallucinations	White blood cell: 15800 /L Urea: 33 mg/dl AST: 157 U/L ALT: 359 U/L CKMB: 374 U/L CPK: 2620 U/L	Rhabdomyolysis	Died

Kermanshah et al., 2025	35 years old healthy man who exercised	Pycnogenol (Maritime Pine Bark Extract)	Polyphenolic complex	Myalgia, soreness, and tea-colored urine, mild tenderness and edema in upper extremity muscles	CK: 154000 U/L AST: 2400 U/L ALT:700 U/L	Rhabdomyolysis	The supplement was discontinued and intensive fluid therapy was administered. The patient made a full recovery.
Khan et al., 2022	29 years old male bodybuilder	SARM supplements	SARM	Jaundice, fatigue, itching, pale stools and dark urine	Hematocrit: 51.9%, Platelet: 470/µL, total bilirubin: 16.9 mg/dL AST: 79 U/L ALT: 165 U/L, ALP: of 213 U/L. Ferritin: 602.1 ng/ml	Hepatic Injury	Liver function tests returned to completely normal within six months.

Abbreviations: BP: Blood Pressure, RR: Respiratory Rate, DMAA: 1,3 Dimetil Amilamin LDL: Low Density Lipoprotein HDL: High Density Lipoprotein, TG: Trigliserit, CK-MB: Creatin Kinase -MB, AST: Aspartate Transaminase, ALT: Alanine Aminotransferase, CK.Creatine Kinase, U/L: Units/Liter, mg/dl: miligram per decilitre, Na: Sodium, K: Potassium, mEq/L: milliequivalent per litre, CPK: Creatine Phosphokinase, SARM: Selective Androgen Receptor Modulators, ALP: Alkaline phosphatase.

According to Table 3, a 22-year-old male bodybuilder was admitted to the hospital with a sudden onset of palpitations and shortness of breath. His blood pressure was 130/80 mmHg, pulse was 126/min and arrhythmic, respiratory rate was 18/min, and temperature was 36.5C0. Physical examination revealed tachyarrhythmia. When asked directly about his supplements, he stated that he was using Jack3d, a bodybuilding supplement. It is quite noteworthy that a sports supplement triggered this severe arrhythmia in a healthy young man with no structural heart disease (Gokdemir & Ulutan, 2022).

A healthy 25-year-old guy presented with an immediate feeling of crushing mid-sternal heartburn lasting 4 hours. His health issues began approximately an hour after finishing his 2-hour workout at the fitness centre. He was taking a pre-workout product for eight months as a component of his fitness program. Three days before going to the hospital, he began "dry scooping". Dry scooping, the dangerous act of taking in pure pre-workout protein powder in the hopes of experiencing a more noticeable energy spike, has grown into a global fitness practice. Coronary enzyme levels were high, with troponin I rising at 5.14 ng/mL and CK-MB at 78.1 ng/mL. The foregoing history and clinical signs led to the diagnosis of anterolateral ST-elevation myocardial infarction (Pallangyo et al., 2024).

A 36-year-old male was transported to the intensive care unit after presenting with increasing weakness and numbness in both lower extremities, as well as discomfort and soreness. The patient reported the leg pain as "electric," starting in the left anterior hip and spreading to the foot. First lab results showed acute renal failure, raised liver enzymes, high serum creatine kinase (CK), and acid-base abnormalities, involving hyperkalaemia and anion gap acidosis. His condition had severe rhabdomyolysis, a potentially fatal electrolyte and acid-base imbalance, hemoconcentration, dehydration, and kidney and liver damage. He was on a regular exercise regimen and had been taking a pre-workout supplement for the previous two months. He reported taking a workout aid high in creatine monohydrate, a standard, easily accessible, and frequently promoted pre-workout supplement. It was stated that the problem was linked to using pre-workout supplements and exercise (Altaf et al., 2024).

A 35-year-old man who exercised regularly, reported to the hospital's emergency room with stomach pain, increased enzyme levels in his pancreas, and radiographic abnormalities consistent with acute pancreatitis. The patient's medical history showed no prior risk factors for pancreatitis. The liver enzymes, lipid composition, and IgG4 serum test were all within normal ranges. Lipase level was detected as 3000 U/L. Further investigation revealed that the patient started using a new exercise supplement about a month ago to improve his workouts and performance. He acknowledged using pre-workout supplements. The male patient gave the investigators the brand name of the pre-workout supplement he was consuming, and the investigators began looking into

specific ingredients of the supplement and their potential link to pancreatitis. The investigators stated that the mix of ingredients in the sports supplement may raise the risk of pancreatitis and other organ harm (Ridha et al., 2023).

A young athlete presented to the hospital emergency room with delusions after using 300 mg subcutaneous growth hormone injections. He was tachycardic with moderate hypertension. Lab results showed hypernatraemia (157 mEq/L), hyperkalaemia (5.3 mEq/L), elevated LDH (1448 U/L), and CPK (2620 U/L), all pointing to rhabdomyolysis. He was said to have taken 30 subcutaneous somatropin injections, each carrying 10 mg/1.5 mL, to improve performance for the upcoming bodybuilding competition. After several episodes of hyperthermia, hypertension, and possibly pulmonary embolism, he died after a somatropin overdose (Erfanifar et al., 2022).

Kermanshah and colleagues described a case in a 2025 study with a 35-year-old male patient who exercised regularly and complained of extensive myalgia, discomfort, and tea-colored urine. A medical exam revealed minor soreness and oedema in the upper extremity muscles. Laboratory testing revealed a baseline CK value of 154,000 U/L, aspartate aminotransferase (AST) of 2,400 U/L, alanine aminotransferase (ALT) of 700 U/L, and normal kidney function (creatinine: 0.7-0.8 mg/dL). CK values greater than 150,000 U/L are unusual and indicate significant skeletal muscle degeneration. Following an in-depth follow-up conversation in the hospital, the patient admitted that he had taken excessive amounts of Pycnogenol, an over-the-counter pine bark extract supplement, for “antioxidant/energy” benefits. The actual product name was unclear. This example implies a link between high Pycnogenol intake and severe rhabdomyolysis caused by low physical exercise. According to the authors, this instance is relevant because it indicates that even ‘natural’ or ‘herbal’ supplements can induce dangerous side effects when used in excessive dosages (Kermanshah et al., 2025).

Khan and colleagues published a case report in 2022 about a 29-year-old bodybuilder who got jaundice, tiredness, and abnormal liver function tests after initiating Selective Androgen Receptor Modulators (SARM) intake. The patient came to the hospital with jaundice, fatigue, itching, pale stools and dark urine. Initial laboratory tests showed haematocrit 51.9%, platelet count 470/μL, total bilirubin 16.9 mg/dL, direct bilirubin 12.1 mg/dL, AST 79 U/L, ALT 165 U/L, and ALP 213 U/L. The total iron-binding capability is 428 mcg/dL, with iron saturate at 41% and ferritin at 602.1 ng/mL. Further research revealed that the patient began taking a SARM supplement for bodybuilding around four weeks prior. Liver damage was diagnosed due to bile stasis and neutrophil accumulation (microabscesses) associated with supplement use. The supplements were discontinued, and supportive treatment was administered. Liver function tests were regular within 6 months (Khan et al., 2022).

Discussion and Conclusion

This study, 25 case reports and series involving serious adverse effects associated with using sports supplements were evaluated in the Cochrane Library, PubMed, and Google Scholar databases between June 2011 and July 2021.

According to the results obtained;

- The case reports and series examined revealed that 64% of serious adverse effects were related to organ damage, 20% to changes in blood plasma, and 16% to death. When examining the details of the case reports and series related to organ damage in terms of sample size, it was determined that 59.3% of these damages were liver damage, 18.5% were heart damage, and 7.4% were kidney, muscle, and neurological damage.

In contrast to these findings, a large-scale field study reporting side effects associated with supplement use found that deaths accounted for 2.2% of all cases; hospitalisations accounted for 25.4%; life-threatening outcomes accounted for 7.9%; and serious adverse outcomes accounted for 35.5% of all cases (Timbo et al., 2018).

- When looking at the predominant symptoms associated with supplement use, 23.08% of symptoms were related to jaundice, 17.95% to abdominal pain and vomiting, 15.38% to fatigue and pain, and 7.69% to tachycardia and cramps. Although multiple symptoms accompanied all cases, no distinct symptoms were observed in 12.82%.

Contrary to these findings, in a study conducted with active individuals who regularly used sports supplements before exercise, when participants were asked about the side effects they experienced, 25.6% reported nausea and 23.4% reported cardiac abnormalities (rapid heartbeat, palpitations) In another study examining side effects associated with supplement use, 51.3% of cases were reported to show no symptoms (Palmer et al., 2003).

- The number of individuals who have undergone liver transplantation as a result of sports supplement use accounts for 18.75% of all liver damage cases. When examining sports supplements that cause organ damage, it was determined that OxyELIT Pro (USP Labs) was specifically responsible for liver damage, while the sports supplements Caffeine Anhydrous and Jack 3d (USP Labs) caused both organ damage and deaths.

Similarly, a systematic review of studies conducted on liver damage associated with supplement use in the Latin American population indicated that 22% of cases with liver damage required a liver transplant (Santos et al., 2020). In a study examining the side effects associated with the use of the sports supplement OxyELITE Pro (USP Labs), liver damage was reported in 55 individuals, with hospitalisation occurring in 60% of these cases and liver transplantation in 5% (de Boer & Sherker, 2017).

In another study evaluating the side effects associated with the use of DMAA-containing products in Texas, it was reported that 80.4% of individuals experiencing side effects used the sports supplements OxyELITE Pro (USP Labs) and 14.3% used Jack 3d (USP Labs) (Forrester, 2013).

- The potential active ingredients most responsible for changes in blood plasma is protein and creatine ethyl ester; the potential active ingredients that cause significant organ damage and deaths are DMAA and caffeine.

In contrast to the findings of this study, a meta-analysis on the side effects of supplements in active individuals who exercise regularly and use supplements showed a moderate correlation between creatine and dry mouth; caffeine showed a moderate correlation with tremors, protein showed a high correlation with constipation and numbness, and casein protein showed a high correlation with heart palpitations and a moderate correlation with nausea. The same study reported that protein supplements containing casein and soy proteins were responsible for many side effects (Gillani et al., 2020).

- When examining the excess amounts of sports supplements, it was observed that supplements causing changes in blood plasma contained up to 8 times (800% excess) creatine, while sports supplements causing organ damage contained up to 2 times (200% excess) BCAA, creatine, glutamine, caffeine and ephedrine.
- The active ingredient most frequently exceeded in excess of the recommended amount is caffeine, with the average caffeine excess rate in death reports being 2660%, while the rate for organ damage is 830%.

In a study involving the chemical analysis of creatine content in 33 creatine supplements available on the Italian market, it was generally determined that 50% of the analysed products exceeded the maximum creatine dosage recommended by the European Food Safety Authority (EFSA) (Moret et al., 2011).

In addition, recent case reports increasingly indicate that supplements used to enhance athletic performance can lead to serious organ damage and even death, even in young and healthy individuals. For example, Gokdemir & Ulutan (2022) reported that a 22-year-old bodybuilder developed serious arrhythmia after using a supplement called Jack3d, while Pallangyo et al. (2024) documented that a pre-workout supplement taken using the ‘dry scooping’ method caused anterolateral myocardial infarction. Altaf et al. (2024) emphasised that a pre-workout product containing creatine monohydrate resulted in severe rhabdomyolysis, kidney and liver damage. In addition, Ridha et al. (2023) revealed the link between a similar supplement and pancreatitis, while Erfanifar et al. (2022) reported a case where excessive growth hormone use led to death. Products thought to be plant-based also carry similar risks; Kermanshah et al. (2025) reported that excessive Pycnogenol intake led to severe rhabdomyolysis, raising CK levels above 150,000 U/L, while Khan et al. (2022) reported that SARM use resulted in biopsy-confirmed cholestatic hepatitis. These cases demonstrate that perceiving these products as ‘natural’ or ‘harmless’ is misleading and that effective pharmacovigilance and increased physician-patient awareness are urgently needed.

In almost all case reports examined between 2022 and 2025, the exact dosage and brand name of the supplements used were not specified. This situation reflects one of the most fundamental problems in the sector: lack of oversight and transparency (Costa et al., 2021). The absence of brand information makes it impossible to determine specific

product responsibility; the lack of dosage information prevents the establishment of a threshold value for toxicity and the establishment of a dose-response relationship (Hayes et al., 2020). Even more worrying is that this uncertainty allows for the masking of much more serious risks, such as the hidden content of supplements or product contamination. Cohen and colleagues found that 66.7 per cent of dietary supplements purchased and analysed at least six months after the FDA recall still contained banned ingredients. This indicates that a significant proportion of recalled supplements remain counterfeit despite the measures taken by the FDA (Cohen et al., 2014). The lack of brand information makes it impossible to identify and recall such specific products from the market (Hayes et al., 2021). Therefore, this methodological shortcoming does not diminish the clinical significance of the findings; instead, it provides strong evidence that these products operate in a grey area where existing regulatory mechanisms are inadequate. (Cohen et al., 2014).

In conclusion, the inappropriate use of sports supplements sold online, which are easily accessible and not approved by regulatory authorities, by individuals who exercise or play sports to enhance athletic performance can produce serious risks such as changes in blood plasma and organ damage, and can lead to death. The data obtained from this study could support consumers' awareness and understanding of the subject and contribute to identifying interventions aimed at reducing the risk of side effects associated with using sports supplements. These current case reports demonstrate that the spectrum of adverse events associated with the use of sports supplements can be more serious than anticipated. This evidence highlights the ongoing relevance of the issue and the critical importance of regulating these products and increasing physician awareness.

Take-Home Messages

- Individuals who exercise or play sports should be supported and informed to purchase sports supplements rigorously tested for toxic or illegal ingredients, subjected to third-party testing, and approved.
- Although the contents of supplements used may be natural or plant-based, they should not be used indiscriminately without consulting an expert due to reasons such as contamination, counterfeit products, hidden ingredients, illicit substances, scepticism about content, quality concerns or misinformation on labels. Professional help should be sought.
- The tendency towards dangerous sports supplements that harm or kill users should not be overlooked. Necessary studies should be conducted and necessary steps taken to design an effective system to prevent even one person from being harmed or killed.
- In addition to the necessary regulations concerning the sale of sports supplements that are released onto the market without undergoing sufficient control procedures and are easily accessible online, conducting toxicological studies and reporting on them could effectively enable users to make appropriate choices.
- It should be remembered that the ingredients listed on the label may not always be present in the bottle. The contents of sports supplements should be identified through

advanced analysis and their compliance with the label should be verified, and/or systems should be developed to ensure this.

- Although there is positive evidence regarding the use of various supplements, it may be advisable for users to use sports supplements after conducting a cost-benefit analysis, considering their individual differences and the requirements of their sport or exercise.
- Finally, athletes or individuals who exercise can be educated on the subject by specialists such as pharmacists, sports dieticians, and doctors; reports on the side effects of sports supplements (www.safetyreporting.hhs.gov), safe/approved supplements (www.consumerlab.com / https://sport.wetestyoutrust.com/), prohibited substances (www.wada-ama.org) and general information about supplements (www.drugfreesport.com).

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Respiratory System and Stretching

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To Cite This Chapter:
Cagdanlioglu, M. B. (2025). Respiratory system and stretching. In F. Alincak (Ed.), *Current studies in sports science* (pp. 60–68). ISRES Publishing.

Respiratory System

This remarkable system begins at the mouth and nose, proceeds through the conducting airways, and reaches numerous air sacs surrounded by a capillary network. Through synchronized work with the muscles, it facilitates the processes of inspiration and expiration. The respiratory system has the ability to supply the body with the oxygen (O) it requires and to remove carbon dioxide (CO) both at rest and during intense exercise. The work of breathing refers to the effort needed to overcome the forces encountered during inspiration, such as lung and chest wall elasticity and airway resistance. While expiration is generally a passive process, inspiration requires active muscular effort (Gürsoy, 2004). All living cells depend on oxygen to sustain life and maintain healthy function. The respiratory system satisfies this essential need by enabling efficient gas exchange. It is an undeniable determinant of the body's overall performance capacity in all energy-requiring activities. Efficient functioning of the respiratory system enhances an individual's vitality and overall effectiveness in daily life (Erkal, 2000).

Respiratory Organs and Their Functions

The organs of the respiratory system include the mouth, trachea, nasal cavity, larynx, pharynx, right (three-lobed) and left (two-lobed) lungs, bronchi, alveoli, and bronchioles. Each breath of air travels through this pathway from start to finish. Anatomically, the lungs are not directly attached to the chest wall but rest upon a thin layer of serous fluid secreted and maintained by two membranes collectively known as the pleura. The space between them is the pleural cavity. The visceral pleura adheres to the lungs, while the parietal pleura attaches to the thoracic wall and diaphragm. Under certain conditions, the pressure within the pleural cavity (intrapleural pressure) may fall below atmospheric pressure, increasing the risk of lung collapse (atelectasis). The essential function of the pleura is to prevent such collapse. Air enters the respiratory tract through the nose, the mouth, or both. During quiet breathing, nasal inhalation predominates because it warms and humidifies the air. The nasal passages not only condition the air but also filter out dust and other debris through the nasal mucosa. However, during strenuous exercise—when a greater volume of air is required—oral breathing becomes more efficient (Ehrman, Kerrigan, & Keteyian, 2018).

Respiratory Muscles and Breathing

Muscle tissue in the body varies in form and function. Structurally, respiratory muscles resemble skeletal muscles; however, their specialized roles distinguish them functionally (Eston & Reilly, 2001). While skeletal muscles primarily generate movement, respiratory muscles are designed to overcome resistance and elastic loads within the thoracic cavity (Edwards & Faulkner, 1995). Inspiration begins with contraction of the dome-shaped diaphragm, which separates the thoracic and abdominal cavities and is innervated by the phrenic nerve. When stimulated, the diaphragm contracts downward, decreasing intrapleural pressure by approximately 2–3 mmHg, thereby expanding the thoracic cavity and, in turn, the lungs. This allows atmospheric air to flow inward. The external intercostal muscles, located between the ribs, assist by elevating the ribs and sternum, expanding the thoracic cavity outward and forward. As exercise intensity increases, the rate and amplitude of these movements rise, leading to an increase in both breathing frequency (breaths per minute) and tidal volume (the volume of air moved during a normal breath). Consequently, minute ventilation also increases. From a mechanical perspective, breathing can be classified as thoracic or abdominal. Thoracic breathing is primarily driven by the intercostal muscles (m. intercostalis externi et interni), while abdominal breathing is dominated by the diaphragm. Additional muscles—such as the m. transversus thoracis, m. pectoralis major/minor, m. levatores costarum, m. erector spinae, m. subcostalis, m. scalenes, and m. sternocleidomastoideus—also play direct or supportive roles in respiration. These two breathing modes operate simultaneously and cannot be completely separated (Weineck, 2002).

Stretching Exercises

Stretching is a process aimed at elongating muscle fibers by mobilizing connective tissue. It enhances flexibility and joint range of motion through externally or internally applied forces acting on muscle attachment points (Baltacı, Bayrakcı, Besler, & Ergur, 2016). Muscles involved in movement are prone to temporary or chronic impairments caused by sudden loads, aging, or fatigue (Frontera & Ochala, 2015). Even a single session of stretching can prevent such dysfunctions and improve joint mobility (Nakamura et al., 2021). Research investigating the long-term effects of stretching on muscle structure and function indicates that increased duration of stretching exercises enhances both muscle adaptability and functional capacity (Siatras et al., 2008). Although tendons and muscles are inherently elastic, sudden overstretching during exercise can lead to injury—particularly in athletes. Maintaining both flexibility and strength in these tissues is key to minimizing such risks (Toft et al., 1989).

Physiological Mechanisms of Stretching

Biomechanical Mechanism

Muscles are composed of tendons, nerves, blood vessels, fascia, and muscle fibers. These

structures possess a highly complex organization, and among them, muscle and nerve cells exhibit electrical properties. However, in order for the muscles to enter a resting state, the active electrical charge must become negative, preventing the transmission of electrical signals between cells. For such transmission to occur, neurotransmitters are involved, whose role is to establish connections with neurons or muscle cells and release specific chemicals. Stretching exercises lead to the elongation of muscle fibers, with the initial effect occurring at the sarcomere, which is the structural and functional unit of the muscle (Nelson & Kokkonen, 2013). The sarcomere, composed of actin and myosin filaments, maintains these two filaments side by side in a resting state, overlapping within the muscle. As muscles contract and become active, the interaction between actin and myosin increases (Mukund & Subramaniam, 2020). During the application of a stretching exercise, the interaction between myosin and actin decreases compared to the resting state, resulting in an increase in muscle fiber length. From another perspective, stretching improves the viscoelastic properties of the muscle-tendon unit, leading to elongation of the muscle, which is considered a fundamental biomechanical feature of stretching (Medeiros & Lima, 2017).

Neurological Mechanism

Nerve endings, known as proprioceptors, transmit all information from the musculoskeletal system to the Central Nervous System (CNS). Also referred to as mechanoreceptors, proprioceptors detect stretch, force, and positional changes. Proprioceptors are present in the nerve endings of all joints, muscles, and tendons throughout the body. In the context of stretching, the relevant proprioceptors are located within muscle fibers and tendons (Behm & Wilke, 2019). When considering the neurological mechanism of stretching, many researchers have examined changes in the Hoffmann reflex. This type of reflex is elicited by the electrical stimulation of a peripheral nerve. To activate motor neuron axons, alpha motor neurons and a monosynaptic connection are required. This connection becomes possible immediately before the Hoffmann reflex is elicited through the induction of M-waves. A reduction in the Hoffmann reflex following stretching provides information regarding postsynaptic and presynaptic changes. Presynaptic changes may be associated with presynaptic inhibition, which leads to an autonomic decrease in Ia afferents, while postsynaptic changes may result from autonomic inhibition via the Golgi tendon organ or Renshaw recurrent inhibition (Guissard, Duchateau, & Hainaut, 2001). For muscles to function properly and harmoniously, the activation of anterior motor neurons in the spinal cord alone is insufficient. All active muscles must continuously provide feedback to the spinal cord. How is this achieved? This is accomplished by sensory receptors responsible for providing sensory feedback. There are three primary muscle sensory organs responsible for perceiving kinesthetic sense: the Golgi tendon organ, the muscle spindle, and joint receptors (Guyton & Hall, 2007).

Respiratory Muscle Stretching Exercise

Possessing an efficient respiratory mechanism depends on chest mobility, adequately functioning respiratory muscles capable of generating sufficient lung volumes, and the ability to move effectively for proper pulmonary ventilation (Sonehara et al., 2011). Respiratory impairments often result from shortening within the respiratory muscle system. Structural and morphological changes in the chest wall, in particular, can lead to a 30–40% shortening of respiratory muscle fibers. Consequently, an imbalance occurs in the tension–length relationship, limiting thoracic expansion. This insufficient expansion affects costal mobility and reduces pulmonary function. Stretching exercises for respiratory muscles are believed to mitigate this adverse effect, as they directly elongate muscle fibers and are highly effective in increasing thoracic mobility (De Troyer, 2012). Additionally, these exercises promote adaptations in the muscle-tendon unit. By increasing the distance between the origin and insertion of the diaphragm, they reduce the tension caused by fiber shortening and facilitate more effective muscle contraction (Page, 201). Respiratory muscle stretching exercises can be applied acutely or chronically. Acute interventions are administered as a single session (Aguiar et al., 2016). Chronic programs typically range from 1 to 12 weeks, with applications performed two to three times per week. Session duration varies between 20 and 60 minutes. Passive stretching and muscle relaxation techniques are predominantly employed in this method (Häkkinen, Kautiainen, Hannonen, & Ylinen, 2008).

The muscles targeted in respiratory stretching exercises include the diaphragm, scalenes, pectoralis minor and major, serratus anterior, sternocleidomastoid, intercostals, and rectus abdominis. Previous studies have reported that even isolated intercostal stretching exercises improve vital capacity, reduce dyspnea levels, and clinically enhance thoracic expansion (Mohan et al., 2012). In animal studies, weekly stretching of shortened muscles was sufficient to reduce muscle atrophy, while stretching three times per week resulted in increased muscle fiber cross-sectional area and a higher number of sarcomeres (Coutinho et al., 2004). At the same time, when looking at human studies, various improvements have been observed in respiratory functions and respiratory muscle parameters in proper breathing exercises or diaphragm-focused breathing exercises (Vural et al., 2024; Yang et al., 2022).

Acute Effects of Stretching Exercises

When a muscle or group of muscles is passively stretched, short-term changes may occur within the muscle. These acute or short-term effects are primarily related to performance alterations observed during the initial hours following stretching. In some performance parameters, such as strength, a temporary decrease may be noted, whereas in others, such as joint range of motion (ROM), improvements can be observed. Acute stretching affects the viscoelastic properties of the muscle, resulting in an increase in muscle-tendon length

(Knudson, 2006). From a neurophysiological perspective, acute stretching elicits muscle reflexes, which are subsequently inhibited, reducing resistance and contributing to an increase in ROM (Budini et al., 2019). The speed of stretching is an important factor: higher stretching velocities result in greater muscle stiffness, whereas slow stretching generates less passive tension compared to rapid stretching (Sharman, Cresswell, & Riek, 2006).

It is generally recommended that stretching exercises be held for 20 to 30 seconds. This duration allows passive tension within the muscle to diminish over a certain range of motion, thereby reducing or eliminating stress on the muscle. The reduction or removal of this stress typically occurs within approximately 20 seconds (Duong et al., 2001). The effects of acute stretching vary depending on the type, duration, and frequency of the applied exercise. Notably, proprioceptive neuromuscular facilitation (PNF) stretching increases pain thresholds and produces an analgesic effect (Câmara-Gomes et al., 2022).

Although research does not provide definitive evidence that acute stretching directly reduces muscle stiffness, one of the most effective methods to achieve this is through warm-up protocols that increase muscle temperature prior to performance. Recent studies have reported mixed results: Taniguchi et al. observed temporary reductions in gastrocnemius muscle stiffness following static stretching (Taniguchi et al., 2015), whereas Hirata et al. found that only the stiffest muscles within the triceps surae group exhibited decreased stiffness after stretching (Hirata et al., 2016). Another variable to consider when examining the acute effects of stretching is muscle strength. Walsh et al. reported that dynamic stretching positively influences muscle strength more than static stretching and recommended that dynamic stretching be preferred in pre-performance warm-up protocols (Walsh, 2017). A recent systematic review highlighted that due to heterogeneity in procedures and outcome measures, achieving a consensus regarding the effects of stretching on maximal muscle performance is challenging (Mine et al., 2016).

Chronic Effects of Stretching Exercises

Chronic, or long-term, stretching exercises play an important role in enhancing force production by reducing inhibition within the neuromuscular system (Dallas et al., 2014). The physiological mechanisms underlying long-term stretching include an increase in sarcomere number, a reduction in muscle stiffness, and improved calcium ion function within the neuromuscular system. Regarding events that can enhance energy efficiency, decreases in muscle-tendon stiffness or improved compliance reduce resistance to movement. Energy efficiency is also directly associated with heat loss and viscoelastic changes in tissues that influence stretching (Kubo, 2005). Previous studies have consistently reported that long-term stretching improves flexibility across all types of stretching interventions. In several studies, stretching programs applied to various

muscle groups over three to six weeks resulted in approximately a 12° improvement in range of motion (ROM) (Kataura et al., 2017). Moreover, Konrad et al. reported that six weeks of PNF stretching increased joint ROM and reduced tendon stiffness (Guissard & Duchateau, 2004). Chronic elongation of muscles due to stretching is thought to be related to the myogenic response of sarcomeres (Decoster et al., 2005) Chronic and regular stretching has also been associated with a reduction in injury risk (Konrad, Gad, & Tilp, 2015). However, the long-term effects of stretching on muscle-tendon properties and muscle strength have not been fully clarified. In a four-week study, stretching positively influenced flexibility, but this effect was attributed more to changes in pain perception rather than alterations in the physical properties of the muscle-tendon unit (Gajdosik, 2001). A systematic review of fourteen studies examining the chronic effects of stretching on muscle performance indicated that long-term stretching positively affected functional tests and isotonic contractions but did not show significant effects on isometric contractions. This finding highlights the need for further research to investigate the chronic impact of stretching on muscle performance (Muanjai et al., 2017).

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Similarity Index:
The similarity index obtained from the plagiarism software for this book chapter is 19%.

Data-Driven Approach in Football Training

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To Cite This Chapter:
Cagdanlioglu, M. B. (2025). Data-driven approach in football training. In F. Alincak (Ed.), *Current studies in sports science* (pp. 69–74). ISRES Publishing.

Physiology of Football

Football is a team sport characterized by intermittent exercise and performance under variable conditions, involving intensive activity related to technical, tactical, physiological, biomechanical, and psychological domains. Previous research has demonstrated that football places diverse demands across multiple areas. From a physiological standpoint, numerous studies have contributed to the literature by examining parameters such as total distance covered, distance covered at different speed zones, heart rate variability, blood lactate concentrations, ratings of perceived exertion, fatigue and its physiological consequences, and technical performance (Talovic, 2019). Average oxygen consumption during a match is a crucial parameter for evaluating performance. However, the numerous short and intense activities occurring throughout the game can lead to increases in oxygen consumption rates. The extent of this increase can be modified through high-intensity interval training (Açıkada, 2021). During football matches, activities such as standing, walking, and movements performed at moderate to high speeds constitute the majority of the total distance covered. In addition to these, other actions such as dribbling, tackling, feinting, shooting, and lateral movements require higher energy expenditure from the players (Ünver, 2023). To maintain high energy expenditure and use energy more efficiently, while also sustaining desired performance, various training methods must be implemented. Separately, for important short-distance performance outputs such as Dribbling Acceleration, specific training methods such as reaction and sprinting can be used rather than general training methods such as strength endurance (Bozkurt, Vural, & Demiryol, 2025; Önlü, Demiryol & Çakan, 2022; Padron-Cabo et al., 2020).

Player Tracking Methods in Football

With the evolving and modernizing understanding of football in recent years, the physical demands expected from players during both competition and training periods have also changed. The introduction of new approaches to football, the reorganization of many football competitions, and the increasing number of matches have emphasized the importance of maintaining players' physical performance throughout the season. Meeting these growing and changing demands has led to the integration of technological devices into football, making them an essential component of the modern game (Scott,

Scott, & Kelly, 2016).

The use of technological equipment has facilitated the monitoring of players' performance and provided coaches with rapid and practical tools for analysis. Today, multiple technological systems are employed to monitor players' physical activities during both matches and training sessions (Buchheit et al., 2014). These innovations have enabled coaches to track the performance metrics of their players throughout the season, design training programs tailored to individual needs, and monitor their health status (Di Salvo et al., 2013).

During competition and training, or through post-session data retrieval, several monitoring systems are used—such as camera-based systems, computer software, ultrasonic technologies, video analysis tools, and GPS devices. Although these systems share similar purposes, each method presents distinct advantages and limitations (Buchheit, 2014; Scott, Scott, & Kelly, 2016).

The Use of GPS Technology in Sports

The Global Positioning System (GPS) is a satellite network that transmits regularly encoded signals and determines precise locations on Earth by measuring the distance between satellites and receivers (Hewitt, Greenham, & Norton, 2016). Initiated by the U.S. Department of Defense in 1978, the GPS has become a globally accessible and free service. As the cost of integrating GPS technology into vehicles, machinery, computers, and mobile devices has decreased, it has become a universal and widely utilized tool (Bajaj, Ranaweera, & Agrawal, 2002).

The first GPS units designed to monitor athletes in team sports were developed by the company GPSports® in 2003. Since then, they have been widely used in football, Australian football, rugby, and hockey (Edgecomb & Norton, 2006). The three main manufacturers producing GPS devices for team sport monitoring are GPSports, CatapultSports®, and StatSports®. In later years, GPSports and CatapultSports merged. Advances in technology have allowed the miniaturization of electronic devices, making GPS units even smaller than mobile phones (Hewitt, Greenham, & Norton, 2016).

During matches and training sessions, GPS receivers worn by players utilize signals from at least four satellites orbiting the Earth to determine position (Larsson, 2003). The use of GPS technology in team sports enables the measurement of player positioning, speed, and movement patterns. GPS units provide valuable insights into the specific and position-dependent physiological demands of team sports, thereby facilitating the design of training programs aimed at optimizing on-field performance (Cummins et al., 2013).

Modern GPS systems are now widely used by sports scientists and coaches, as they provide hundreds of data points that can guide athletes' training programs (Ünlü et al., 2018). Compared to other tracking systems, GPS devices are more advantageous due to their portability, wearability, and user-friendly software (Hewitt, Greenham, & Norton,

2016). The use of GPS technology with athletes was first introduced by Australian sports scientists in tennis and was later implemented in team sports for the first time by GPSports in 2003 (Edgecomb & Norton, 2006). Apart from brand differences, GPS systems are also categorized based on their data sampling frequency, measured in Hertz (Hz), which indicates the number of data transmissions per second and the number of satellites that can be connected simultaneously. Higher frequencies allow for more accurate data collection with reduced signal drift. Typically, models operating at 1 Hz, 5 Hz, 10 Hz, or 15 Hz are used to ensure reliable measurements (Scott, Scott, & Kelly, 2016).In current literature, GPS-based athlete tracking systems are employed to objectively measure players' individual efforts and physical stress, analyze competition performance, assess workload across different playing positions, determine training-induced fatigue, and monitor changes in physiological demands (McLellan, Lovell, & Gass, 2011). In addition to GPS systems, the development and integration of microtechnology in sports have led to the use of Micro-Electro-Mechanical Systems (MEMS)—including triaxial accelerometers, magnetometers, and gyroscopes—embedded within GPS devices. The combination of GPS and MEMS technologies provides practitioners with an extensive dataset describing athletes' physical loads and activity profiles (Akyıldız & Erdoğan, 2022).

Table 1

Frequently Used Gps Parameters

Accelerations & Decelerations A simple count of how many times you accelerated over 3m/s². Think of those short sharp explosive bursts to beat your opponent to the ball or quickly putting on the brakes to change direction.
Average Heart Rate This is the average heart rate score throughout your session, recorded in Beats per Min (BPM).
Distance Per Minute This is the distance you covered, divided by the duration of your session. A high value here indicates a high work rate throughout your session.
H**SR (High Speed Running)** This is the distance that you have covered over 5.5m/s (19.8km/h). Measured in meters or yards, the HSR distance tracks all those lung bursting runs, overlaps on the wings or tracking back to help your teammates. Pro players can tally upwards of 1,100 meters during a game depending on tactics and position played.
HSR (High Speed Running) Per Minute Is the average distance covered per minute at speeds above 5.5 m/s (19.8 km/h) across a session. It takes the total HSR distance and divides it by the total session duration in minutes.

High Intensity Distance We developed a metric just for all those hard yards you put in during a session! This is a combination of all your HSR distance, and your distance covered while accelerating and decelerating. Pro players can cover 2,000 – 2,800 metres of HMLD in a game depending on tactics and position played.
HID (High Intensity Distance) Per Minute is the average distance covered per minute from high-intensity actions. It combines two components: High Speed Running (HSR) Distance → distance covered above 5.5 m/s (19.8 km/h) Acceleration/Deceleration Distance → distance covered while rapidly changing speed The total High Intensity Distance is divided by the session duration in minutes to show how much high-intensity work is sustained across time.
Max Heart Rate Pair a BLE or Magnetic monitor to capture heart rate data. Your max HR score indicates the highest value recorded during your session.
Max speed A single score of your maximum speed reached throughout the session. This can be measured in m/s, mph or km/h.
Sprints A count of how many sprints you achieved throughout your session. Your sprint threshold can be increased or decreased via the 'Configure Apex' option located in the main menu. You must hold this speed or above for 1 second to register a sprint. The location of your Sprints can be seen in the Mapping section. **Step Balance** An excellent metric that can pick up on any imbalance in your running style. Ideally, we would like to see a 50:50 breakdown here but slight deviations +/- 2 may be normal for you. Large differences or sudden changes between right and left may be an indicator of a potential or historical injury.
Total Distance A key measure of the volume of your session. Pro players typically cover between 7km – 11km during a game depending on their position. Make sure to edit your session start time / end time for the most accurate readings.

Sources: (Beato, Wren, & de Keijzer, 2024, Dawson, McErlain-Naylor, Devereux, & Beato, 2025, Hennessy & Jeffreys, 2018)

Distances Covered in Soccer

Studies have shown that football players at different levels cover approximately 10–12 km during a match at varying speeds and perform about 1,200–1,250 sudden directional

changes in different body positions every three minutes. Within 5 seconds, they perform 35–40 sliding tackles. They also complete more than 700 jumps, accelerations, and decelerations, as well as 30–50 sprinting actions (Iaia, Ermanno, & Bangsbo, 2009; Dellal et al., 2012). Video-based match analyses have revealed that elite-level football players perform 2–3 km of high-intensity running (>15 km/h) and approximately 0.6–1 km of sprinting (>20 km/h) during a match (Iaia, Ermanno, & Bangsbo, 2009; Bradley et al., 2010).

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Similarity Index:

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The Concept of Game and Game in the Digitalization Process

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To Cite This Chapter:
Ozkoc, F., Yazicioglu, M., & Demir, M. (2025). The concept of game and game in the digitalization process. In F. Alincak (Ed.), *Current studies in sports science* (pp. 75–86). ISRES Publishing.

Introduction

The concept of play is one of the oldest phenomena in human history. Play began with the existence of living things. Not only humans but also animals play. Humans unconsciously created play by imitating what they saw around them and explaining their actions to each other through movement. For example, a person who caught prey would explain how they caught it to others through imitation. These imitations gradually evolved into conscious religious and magical ceremonies. Play thus acquired a cultural identity. As adults explained how they hunted, children began to emulate their actions and adopt them as role models in their daily lives. Such games were passed down from generation to generation and formed the basis of modern-day games. A statue in the British Museum in England, dating back to 800 BC, depicts two girls dancing the minstrel dance. A mural in the Akhor cemetery in ancient Egypt depicts a girl playing a game of hand-clapping. Blocks found in the ancient ruins of Ephesus have identified areas for tic-tac-toe and tic-tac-toe games. A game resembling backgammon appears in Greek pottery paintings. In Egypt, a girl was buried with her doll when she died. In ancient India, game boards depicting games played with dice and murals depicting spinning tops have been found. Leather balls have been unearthed in tombs excavated in ancient Egypt. Activities such as lifting stones in water and playing the rope game are widely known games worldwide. Furthermore, ancient Chinese sources indicate that kite flying has a history spanning more than three thousand years (Lefebvre, 2013). Games have been part of our lives since the dawn of time, representing an activity that people of all ages, young and old, spend a significant portion of their time on. With technology making life easier in every aspect, it has also become increasingly prevalent in the realm of entertainment and gaming. As people move away from traditional games, they are turning to digital games. With increasing digitalization, games have become an indispensable pastime in

the daily lives of children and young people. Although digital games are mostly used as a tool to make the most of free time and reduce daily stress and fatigue, it is a fact that they are increasingly affecting individuals like an illness. Digital games are increasingly used and have become one of society's indispensable pastimes. Both adults and children can easily and intensely play these games in all areas of life. They even neglect their own duties while playing these games. In this sense, the existence of digital games has become increasingly widespread in society, causing people to spend excessive amounts of time on them (Özmen, Alıncak and Cağdanlıoğlu, 2023). The concept of play encompasses all pleasurable activities undertaken by individuals in their spare time, guided by primary goals and rules, voluntary, as a means of socialization, involving shared excitement, affecting both participants and spectators, and without any material gain. Some researchers have also stated that play is a way to release excess energy from one's life. In playful activities, individuals demonstrate the imitative capacity they have possessed since time immemorial, and this view has been adopted by some theorists (Hazar, 2006).

Play has become an indispensable part of human life from the dawn of time to the present day. Scientists have described play in various ways. According to Gross, "Play is an acquisition of experience; it is the individual's experience, through play, of the attitudes and situations they will encounter in their daily life in the future. Children thus have the opportunity to experience events they may encounter in the future in a protected environment." Freud defined play as "beneficial activities that help children and young people in their social development and in finding their individual identity." Freud also defines it as "a mirror that reflects the child's movements and identity." Plato defines play as follows: "Education should be carried out in two areas: physical/motor and psychological education. Referring to the importance of the concept of play in terms of physical education, children should grow up through play." Bandura defines play as follows: "Children communicate, express themselves, make friends, and become social beings through play. Children who socialize observe and acquire new behaviors through repetition" (Duman, 2015).

This increases oxygen intake, accelerates blood circulation and allows more nutrients to be transported to the tissues. Movement games also help children explore and recognise their environment. Games enable children to understand the world around them by using their physical skills. Actions such as walking, running and jumping develop the child's motor skills and encourage them to interact with their environment. Games play an important role in the development of hand and finger muscles. Activities such as holding, plucking, cutting and tying help children to strengthen their small muscles. This allows them to acquire daily life skills, learn and interact with their environment (Alıncak, 2017).

Games are a part of life through which all people, from childhood to adulthood, express themselves in the best way possible (Sormaz and Yüksel, 2012). From the earliest stages of history to the present day, societies have played games for fun and relaxation, and with the advancement of technology, there has been a shift away from traditional games and towards digital games (Özdemir, 2006). Digital games are visually appealing games that people enjoy using devices such as computers, tablets, and mobile phones to make the most of their time after completing work (Çetin, 2013).

Play is present in all stages of an individual's life. Play plays a crucial role in the individual's socialization and development into a significant member of society. It is the most fundamental activity of infancy and childhood. Games are the most important means of social harmony and solidarity. There are countless games. Games vary depending on where they are played, the number of people playing, the tools and equipment used, and the gender and age of the players. With the development of technology, games have also begun to undergo changes. The most significant change has been the change in the setting of play. Games typically played on the street have been replaced by games played in digital environments. One of the main reasons for street games and the shift towards digitalization is that streets are no longer perceived as safe places. Henri Lefebvre examined the street from a political perspective, writing "The Urban Revolution," in which he discussed the "power of the street." According to Lefebvre, the street should not be considered merely as a road, avenue, or geographical location. He argued that cafes, parks, cinemas, and the street are a way of life and have a special and profound meaning (Lefebvre, 2013).

Through games, children learn the norms, values and social skills of their society. This interaction contributes to their personal development and understanding of their social responsibilities. Traditional games are not only a means of having fun, but also provide children with the opportunity to understand and internalise the cultural richness of the society they live in. For this reason, traditional games should be recognised not only as a means of entertainment, but also as an important learning tool that carries the values, norms and cultural identity of a society. Thanks to these games, children not only have fun, but also enrich their social accumulation and create strong foundations for their future role acquisition (Budak, 2016; Abakay et al. 2015). When the research on play is examined, it is seen that there are many definitions of play, but it is difficult to make a common definition, and different meanings are attributed to each definition. The lack of a common definition leads to the conclusion that the subject of play is very comprehensive and has wide boundaries. The fact that there are so many definitions and theories reveals the importance and value of play and answers the question of why so much research has been conducted on it (Aydınlı & Ramazanoğlu, 2016; Ayan et al., 2015). Factors that influence the preference for digital games, increase motivation, and lead to addiction are

generally evaluated under three main groups. Factors such as gaining status, leveling up, and competing with other players, which are difficult to achieve in real life, are explained by the achievement component in digital games. The social component refers to an individual's need to communicate with other gamers, develop mutual aid and social relationships, and belong to a group. Furthermore, factors such as the inability to fulfill real-life tasks, forming an emotional bond with the game and character, deep immersion in the game, and establishing a connection between the game and real life are explained by the immersion component (Uysal, 2005).

Aim of the Study

The aim of this study is to examine the concept of Game and the place and importance of Game in the Digitalization Process.

The Concept of Digital Games

With technological advancements, changing living conditions, and urbanization, along with the decline and disappearance of playable spaces on the streets, people are spending their free time using technological devices such as televisions, phones, computers, and tablets. In this context, digital games have gained a significant place in our lives (Gentile, 2009). Digital games are multimedia applications played using computers and portable technological devices (such as phones and tablets) within specific rules, with genres such as strategy and action based on users' preferences. They can be played individually, with other people connected over the internet, or offline (Kılıç, 2021). The concept of digital games has gained significant ground with the development of technology and its entry into our lives. Although technological advancements and the emergence of digital games date back to a relatively old era, various definitions have been offered for this concept. The terms video games and computer games are often used interchangeably in the literature, and some researchers have suggested that the concepts of digital games and console games can also be considered within this scope (Bozkurt, 2004). In this study, the term digital game was preferred. Digital games are defined as games played through various technological devices, such as computers, game consoles, mobile phones, and tablets, that allow user interaction, and that can be played online or offline (Kılıç, 2021; Erboy and Vural, 2010). In our age, technological advancements significantly impact many social and cultural areas. Technological advancements offer societies a new environment in which to share their feelings and thoughts and provide opportunities for the effective use of information technologies. The internet is now preferred by all age groups. Internet users generally access the internet through mobile phones, computers, etc. While the internet and technological tools are used by all age groups, they are more frequently preferred by children and adolescents (Güney, 2020).

With the advancement of technology, the internet, social media, computers, and the increasing number of users have also led to a rise in digital gamers. Digital games, promoted through advertising and other methods on the internet and social media, have become a major market. While games are a tool that contributes significantly to children's development, the decline of real-world play spaces and their replacement by digital spaces has also shifted children's socialization to the digital realm. Families' distrust of their surroundings, combined with the appeal of technological devices for the new generation, means that children prefer digital gaming platforms, where they connect through digital tools, to playing outside with their friends. Consequently, excessive use of digital platforms leads to the emergence of digital game addiction, particularly in children, adolescents, and adults (Şen, 2023).

The concept of digital games emerged with the development of technology and its integration into everyday life, where it has gained significant importance. Although the development of technology and the emergence of digital games date back relatively far, they are defined in different ways. In the literature, the concepts of video games and computer games are used interchangeably, while some researchers indicate that the concepts of digital games and console games can also be added to these (Mitchell and Savill-Smith, 2010). Bozkurt (2014) and Kılıç (2021) define digital games as games that are played using various technological devices (computers, game consoles, mobile phones, tablets, etc.), allow user input, and can be played online or offline.

Digital games, which initially began as a form of entertainment during free time, have gradually become a necessity, and their absence creates a sense of deprivation. Since playing games has become a necessity for individuals, any interruption in this activity leads to intense anger crises and aggression, causing them to disconnect from real life and take on a character that is unsuccessful, lonely, and irresponsible. Furthermore, prolonged screen time leads to physical problems caused by inactivity, such as obesity and diabetes (Yerlıkaya Alım and Ersoy, 2023). In our evolving and changing world, every new invention has brought with it a transformation. Digital products, which have entered our lives with the advancement of technology, have brought our games, as they have in many other areas, into the digital environment. Games are no longer played on the streets or in playgrounds; they are played on digital devices such as tablets, computers, game consoles, and smartphones. The display of data on a screen in an electronic environment is called "digital" (Binark, 2008). Games projected onto a screen through technological products and played with the help of a console or on platforms provided by digital devices are called digital games (Gökçearslan and Durakoğlu, 2014). Like traditional games, digital games share the fundamental characteristics of voluntarily making leisure time enjoyable and providing a free environment. In this context, it can be stated that digital games are no different from traditional games, but parameters such

as the tools used, content, and gameplay style vary (Sağlam and Topsümer, 2019).

Factors Contributing to Digital Game Addiction

The games that are usually played on the street have been replaced by games played in digital environments. One of the biggest reasons for the games played on the street and the shift towards digital is that the streets are no longer seen as safe places. Henri Lefebvre wrote the book "Urban Revolution" by examining the street with a political approach and mentioned the "power of the street" in this book. According to Lefebvre, the street should not only be considered as a road, street or geographical space, but also cafes, parks, cinemas and he argued that the street is a way of life and its meaning is special and great (Lefebvre, 2013). Digital game addiction is also defined by various terms, such as excessive game use, obsessive-compulsive gaming, game addiction, pathological gaming behaviors, and problematic gaming behaviors (Karaduman and Aciyan, 2021). The deep penetration of technology into our lives and its ubiquitous accessibility make it difficult to recognize addiction to technological products. Because digital games can be played on almost all technological devices, a significant increase in game addiction is observed. Digital games are known to have social, cultural, and economic impacts. The ability to experience imaginary events that cannot occur in real life in the virtual game world is considered one of the important reasons for the preference of digital games (Uysal, 2005). In today's conditions, it is possible to teach all lessons to children through drama. The reason for this is that the child obtains all his/her experiences through play and develops his/her ability to resist problems and to think (Alıncak, 2016). Thanks to the concept of play, children learn scientific concepts quickly and develop themselves (Alıncak & Tuzcuoğulları, 2016).

1. Success Component:

a. Advancement/Progression: The desire for power, rewards, rapid advancement, wealth, and status gained during gameplay.

b. Mechanics: The use of mechanical elements to enhance character performance and solve the game's rules.

c. Competition: The desire to compete with other players and the urge to fight.

2. Social Component:

a. Socialization: The desire to chat and cooperate with other players in the game.

b. Relationship: The opportunity to form long-term relationships with players living in different cities through online games.

c. Teamwork: The satisfaction of working together and forming a group with other players during the game.

3. Immersion Component:

- Exploration: The desire to explore the game world and solve quests step by step.
- Role-playing: The desire to embody the character of one's imagination and play

the desired role.

- Customization and Control: The ability to personalize and control the game environment and characters.
- Escape from Reality: The opportunity to escape from real-life problems and find refuge while playing the game (Yee, 2006).

The Positive and Negative Effects of Digital Games

Since the development of digital games, extensive research has been conducted on their effects on children's developmental domains. Although all age groups play digital games, they are also widely used by preschool children (Yengin, 2012). Research has revealed that games have both advantages and disadvantages, and these differ depending on the types of games children play and the amount of time they spend playing. Digital tools have become a part of children's daily lives. In the preschool period, digital games designed with the advancement of technology can be used as a powerful educational tool for successful and active learning. The use of digital games in education is beneficial for increased learning motivation and cognitive development (Zaranis, Kalogiannakis and Papadakis, 2013). Digital games have been found to be chosen for factors such as entertainment, spatial visualization, communication, language, helpfulness, empathy, and engaging elements (Toran et al., 2016; Anderson and Warburton, 2012). However, despite their benefits, they can also lead to numerous problems, such as addiction, during the preschool period, and parents have a responsibility in this regard (Yeşilay, 2020). Preschool children often exhibit behaviors such as imitating and modeling themselves on the adults around them (Akkoyunlu and Tuğrul, 2002). Studies have shown that avoiding excessive use and normalizing time spent with digital games have positive benefits, such as relaxing the individual (Prot et al., 2014).

Digital games can improve children's perception and cognitive abilities while also contributing to the development of their motor skills (Tüzün, 2006). During play, decision-making and problem-solving skills are developed, teamwork experience is gained, and a broader perception is developed (Bayırtepe and Tüzün, 2007). A competitive environment can help boost self-confidence through strategy development and a sense of accomplishment. Digital games can reinforce skills such as focus, planning, and coping with challenging situations (Eğitek, 2008).

Playing games for long periods of time can lead to physical health problems such as obesity, as well as trigger disorders such as sleep problems, headaches, and dry eyes (Amatem, 2008).

Children who play too many digital games spend very little time participating in social activities and gradually withdraw from social settings. This can cause them to neglect their

daily tasks, experience problems in social relationships, have difficulty communicating and maintaining conversations, become isolated, and become indifferent to distancing themselves from society. Research has found that violent games are the most interesting aspect of the disadvantages of digital games. The first studies on the violent tendencies of digital games began in 1976, and since the 1980s, there has been a significant increase in research on digital games. In 2000, due to visual and auditory developments in technology, children became more involved in them (Aydoğdu Karaaslan, 2015).
Griffiths (2010) divides the negative effects of digital game addiction into physical and psychological harms. Psychological harms include the individual's inability to stop gaming due to feeling good while playing, spending more time on the computer to play games, neglecting their immediate surroundings, experiencing feelings of emptiness, restlessness, and depression when not playing, and lying to others about fulfilling their duties. Physical harms include carpal tunnel syndrome, dry eyes, migraine headaches, back pain, irregular eating patterns such as skipping meals, and neglecting personal care and hygiene. Griffiths (2010) emphasizes sleep disturbances and changes in sleep patterns within the scope of physical harms (Ergür, 2015). It is particularly important to note that children who play digital games communicate less with their peers, and that violent games increase violent tendencies and aggression levels, desensitizing children to violence (Lemmens, Valkenburg and Peter, 2011; Brown, 2011). When considering the disadvantages of digital games, fatigue and drowsiness, decreased self-care skills, violent tendencies, impaired perception of time and place, detachment from real life, deterioration of interpersonal relationships, and addiction constitute a significant part of these (Ögel, 2012).

The world of digital games may differ from the physical world we know in terms of time and space perception. This situation can also cause children to perceive reality differently and be unable to understand it (Kneer and Glock, 2013). Children who play digital games excessively participate in social activities for shorter periods of time and become increasingly isolated from society as time passes. This can lead to neglecting daily tasks, problems in social relationships, difficulties in initiating and maintaining conversations, isolation, and becoming indifferent to disengagement from society (Ögel, 2012).

Digital games can be used as an escape mechanism for children who lack interest and do not have a healthy environment. These children constitute the group most exposed to the negative consequences of digital games (Kelleci, 2008). Until more extensive research is conducted on how digital games trigger children's development, caution should be exercised regarding screen time for preschool-aged children. In summary, when the study data is examined, it is seen that digital games are beneficial when used under supervision, but their unconscious use deeply affects children's development. Parents

have a big responsibility in this process (Budak, 2020).

- Violent games can encourage aggressive behavior in children (Asagem, 2008).
- Excessive time spent on digital games can lead to a lack of time for traditional games and a lack of socialization, which can increase the risk of antisocial behavior (Eğitek, 2008).
- Long periods of time spent playing games can lead to a decline in academic performance, failure at school, and even dropping out of school (Eğitek, 2008).

Conclusion

As a result, studies show that playing games has various positive effects, such as emotional relief, and that it is considered normal for people who lead healthy lives to play digital games. However, when an individual is unable to resist the urge to play games, exhibits uncontrolled behavior, experiences emotional fluctuations, undergoes changes in their thoughts, and experiences a serious disconnect from social life, this problem can be defined as addiction.

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The Effect of War Toys and Military Figure Toys on Children (An Evaluation on the Example of Nazi Germany and the Gaziantep Toy Museum)

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To Cite This Chapter:
Karabas, H., Kalkan, L., & Alincak, H. (2025). The effect of war toys and military figure toys on children (An evaluation on the example of Nazi Germany and the Gaziantep Toy Museum). In F. Alincak (Ed.), *Current studies in sports science* (pp. 87–96). ISRES Publishing.

Introduction

Play helps children feel good about themselves. Play is an outlet for a child's happiness and excess energy in life (Nutku, 2006). Play is one of the fundamental building blocks of personality, encompassing various values such as sociability, talent, and intelligence. Play is a form of learning that involves the release of excess energy, relaxation, and enjoyment (Aksoy & Çiftçi, 2014). Play contributes to individuals socializing with both their own groups and other groups and to the formation of a common language (Alıncak, 2017). It has been observed that preschool children imitate the adults around them (Akkoyunlu and Tuğrul, 2002). Gaming has been a part of our lives since the dawn of time, an activity in which people of all ages, young and old, spend a significant portion of their time. With technology making every aspect of our lives easier, it has also become increasingly widespread, particularly in the areas of entertainment and gaming (Özmen, Alıncak and Cağdanlıoğlu, 2023). When research on play is examined, it is seen that there are many definitions of play, but it is difficult to make a common definition, and different meanings are attributed to each definition. The lack of a common definition leads to the conclusion that the subject of play is very broad and its boundaries are wide. The existence of so many definitions and theories highlights the importance and value of play and answers the question of why so much research is done on this subject (Aydınlı & Ramazanoğlu, 2016; Ayan et al., 2015). Children, driven by a desire and curiosity to explore their surroundings, complete this process most effectively through play. It is also an area where they learn through experience, expand their imaginations, and connect with their environment. Toys are effective tools used in play. Like games, toys have different meanings for each child. This is because every child is different, and their

imaginations, levels of development, feelings, and thoughts are unique to them. Children become aware of their own capacities, their movement control mechanisms develop, their emotions become clearer, and their talents and skills develop. Motor skills such as strength, power, endurance, balance, flexibility, and coordination develop through motor responses that are constantly tested during play. Fine motor skills also develop through activities using materials such as clay, dough, cutting, gluing, and toys. The development and maturation of the neuromuscular system lead to the development of skills and performance. Starting with movement in the womb, children open their eyes to the world with various responses and motor skills. Babies' first movements and reflex responses form the basis of learning, and as they learn through experience, their motor skill development accelerates. It is crucial that the environments in which children grow up are designed to support their development in terms of proper and healthy development, especially during this period of rapid development from birth to the end of preschool (Alıncak & Bozdal, 2022; Bozkurt & Sözer, 2017; Kerkez, 2006). Childhood is the most crucial period in which an individual's values, social roles, and identity are shaped. During this period, play and toys play a fundamental role in how children perceive the world (Sezici and Yiğit, 2019; Girgin, 2024; Öztürk and Uğurlu, 2010). Toys are not merely objects of entertainment; they carry social, cultural, and ideological meanings. Especially in times of crisis and war, toys become a means of directing children towards specific ideological patterns (Ersoy, 2015).

Aim of the Study

This study examines how war toys affect children's mental world and psychologically prepare them for war. The ideological function of toys in Nazi Germany is the clearest example of this process. The same ideological reflections are evaluated through historical soldier-figured toys exhibited at the Gaziantep Toy and Toy Museum today.

The Cultural and Ideological Function of Toys

Toys play a mediating role in a child's understanding of social reality. According to Grossman (2000), the psychology of war is shaped by the values and symbols learned in childhood. Therefore, toys influence children's later perspectives on concepts such as violence, authority, and heroism.

From the late 19th century onward, the toy industry developed rapidly in Europe, and toy production, particularly in Germany, France, and England, became a tool for cultural identity. Hoffmann (2000) states that during this period, toy manufacturers consciously incorporated themes of national identity and patriotism into their products. Thus, toys became the carriers of state ideologies. Play and toys influence and enhance all areas of a child's development. Therefore, care must be taken regarding the games played and the toys they serve as tools. Care must be taken to ensure that play and toys are

not only entertaining but also educational. For play, children can be provided with spaces appropriate to their age and development, supporting their developmental areas, where they can have fun and engage in independent or group play. Care should be taken regarding the purpose and duration of technological games. Spending too much time in front of screens and using technological games reduces physical activity in children and increases their risk of obesity. Furthermore, it can hinder their ability to form social relationships and slow down language and communication skills (AAP, 2016). Screen time can also negatively impact sleep patterns, particularly when digital devices are used before bed, reducing sleep quality and negatively impacting children's health (Berk, 2013). This ideological transmission becomes clearly visible during times of war. When figures of soldiers, weapons, tanks, and warplanes enter a child's world, war becomes internalized as a "game." Jenkins (2006) emphasizes that children in modern culture are desensitized to violence through media and play tools, describing war toys as "visual propaganda objects."

Child Psychology and War Toys

Play is an area where children organize their inner world, learn social rules, and develop a sense of identity. However, war-themed toys can make this process violence- and authority-centered (Ersoy, 2015; Hürtürk, 2017). It has been found that war toys weaken children's empathy skills and increase their tendency toward aggressive behavior (Aydın, 2022). According to Piaget's (1962) cognitive development theory, children make sense of their environment through play (Bardak and Topaç, 2022). Therefore, war-themed toys cause children to perceive the world in terms of a "winner" and "loser" dichotomy. Grossman (2000) argues that military toys are psychological tools that condition children to "learn to kill" (Girgin, 2024; Aksu, 2013; Yazıcıoğlu, 2024). These toys give children a sense of heroism, but also portray violence as a normal phenomenon and armed conflict as part of everyday life, teaching them that violence is a legitimate tool. Thus, through play, children become individuals who conform to the future authority structure.

The Toy Industry and Propaganda in Nazi Germany

During the Nazi era, the toy industry was made part of the state ideology. (Hoffmann, 2000; Sormaz and Yüksel, 2012) During Hitler's reign, children's education was seen as the most important factor in shaping the future of the nation, and in line with this, the toy industry, like every other cultural field, served propaganda purposes (Yurdakul and Alperen, 2019). The "Elastolin" toy series by the O. & M. Hausser company was produced based on models of Nazi soldiers. Wehrmacht officers, SS soldiers, swastika tanks, and Hitler figures were used to teach children heroism and obedience. Even the catalogs for these toys were prepared in propaganda language: the goal was to present "fighting for the homeland" to children as if it were a game. During this process, children underwent ideological education without realizing it. According to Grossman (2000),

toys during the Nazi period became tools that eliminated the emotional cost of violence. Children learned to "obey through play" and equated violence with heroism.

War-Themed Toys at the Gaziantep Game and Toy Museum

The old stone building in Bey Mahallesi, Gaziantep, which was expropriated by the Gaziantep Metropolitan Municipality in the years and restored in 2010-2011, opened as the Gaziantep Toy and Game Museum on April 6, 2013, under the coordination of Sunay Akın. The Gaziantep Toy and Game Museum, which holds an important place in Turkey's cultural memory, houses thousands of toys from different periods, each reflecting the socio-cultural characteristics of their time. The most striking part of the collection is the section on the first floor of the museum, where toy soldiers are displayed.

The toys on display here offer important clues for understanding how children were subjected to an ideological education process in the past. According to the work of Sürme, Yiğit, and Güler (2021), the soldier figures displayed in the museum create both a nostalgic and questioning effect on visitors. While these toys appear to be memories of "innocent" childhood on the one hand, on the other hand, they reveal how war was romanticized.

The information panels next to the toys on the museum's first floor present this historical reality within a critical framework. Thus, military toys are transformed from propaganda tools of the past into educational materials that foster a consciousness of peace.

Figure 1

Information note regarding the soldier figures exhibited at the Gaziantep Game and Toy Museum

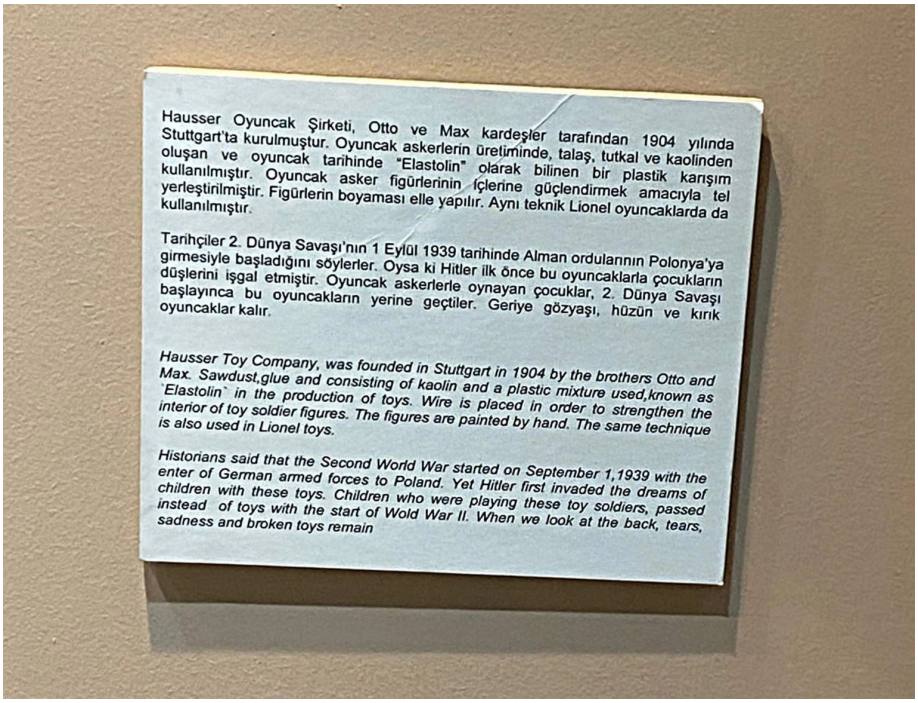

Figure 2

Soldier figures on display at the Gaziantep Game and Toy Museum (Toy history: 1920-1930 Germany)

Figure 3

Soldier figures on display at the Gaziantep Game and Toy Museum (Toy history: 1920-1930 Germany)

Figure 4

Soldier figures on display at the Gaziantep Game and Toy Museum (Toy history: 1920-1930 Germany)

Figure 5

Soldier figures on display at the Gaziantep Game and Toy Museum (Toy history: 1920-1930 Germany)

Figure 6

Soldier figures on display at the Gaziantep Game and Toy Museum (Toy history: 1920-1930 Germany)

The Process of Preparing Children for War Through Toys

The purpose of war toys is not to physically prepare children for war, but to initiate a mental preparation process by normalizing it. (Jenkins 2006; Yamlı, 2019) states that in modern societies, games serve the function of "training children to adult roles." War toys also teach children discipline, command, and enemy perception (Ataç, 2017). Through these toys, children are led to believe that war is inevitable and necessary in the future. This process contributes to the reproduction of militarism at the societal level. Cowan, Van Leeuwen, and Selander (2022) state that masked toys produced during the pandemic similarly serve the function of normalizing crises. This example demonstrates that toys can be used as a tool for social guidance in any era. In this part of the research, findings based on the analysis results of qualitative data are included.

Conclusion

War toys intertwine the concepts of heroism and violence in children's worlds. The example of Nazi Germany is the most striking example of how toys can become a propaganda tool. During this period, children were raised with the ideal of "being a good soldier," and playgrounds became mini-war training camps. The war-themed toys at the Gaziantep Play and Toy Museum make visible these ideological manipulations of the past and enable society to confront this past. Consequently, ethical responsibility is paramount in toy production. Toys presented to children should teach love, not violence, freedom, not authority, through peaceful means instead of war. Play is not just entertainment; it is a cultural language through which children begin to think, feel, share, and ultimately learn who they will become.

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The Importance of Physical Education and Sports in the Development of Society

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To Cite This Chapter:
Gultekin, O., Azili, E., & Sahin, Y. (2025). The importance of physical education and sports in the development of society. In F. Alincak (Ed.), *Current studies in sports science* (pp. 97–106). ISRES Publishing.

Introduction

Today, it is widely accepted across all segments of society that sports are an essential activity for individuals to develop their skills, maintain their health, and improve their overall well-being. Encouraging individuals to participate in sports not only increases their physical fitness, but also serves as a critical factor in facilitating the maximization of their productivity and performance in their activities (work, education, etc.). In this context, the direct positive effects of sports on an individual's overall quality of life and productivity have become a scientifically and socially proven necessity (Ramazanoğlu and Ramazanoğlu, 2004). The principle that human beings are ends in themselves rather than mere means should be adopted; therefore, mobilizing all resources and efforts for the individual's well-being, rather than using the individual for other purposes, should be a valid norm. Consistent with this philosophical approach, continuous efforts should be made for the individual's peace, comfort, happiness, and intellectual and spiritual development. In line with this inclusive goal, directing all individuals toward sports and ensuring their access to sporting activities, regardless of age, gender, or professional status (young-old, female-male, employed-unemployed), should be accepted as a fundamental requirement (Atıcı, Alıncak and Toycu, 2021).

Sports engage various segments of society, including individuals with physical disabilities, without distinction (Amman, 1999). Sports, which have become an integral part of human life, play an important role in ensuring that people remain healthy, successful, and happy throughout their lives and maintain high morale (Yalçınkaya, Saracaloğlu and Varol, 1993). The effects of sports on individuals include the development of personal virtues and social integration. While providing individuals with qualities such

as discipline, patience, and energy, sport also integrates them into social groups and the wider community, raising the ethical and moral level of individual-society relations. Furthermore, sporting activities bring people together around common goals, reinforcing a sense of cooperation and collaboration. Thanks to this collective experience, sport acts as an important social control and participation mechanism that reduces the individual's social isolation (loneliness) and prevents the tendency to act irresponsibly alone (Erkal, 1992). Societies have become compelled to solve the problems of individuals and seek remedies. This is because the peace, happiness, and health of individuals will also be reflected in society (Karahüseyinoğlu, Arslan and Ramazanoğlu, 2003). The challenges individuals face in their daily lives, and especially the intense stress factors inherent in urban living, combined with the fear of falling behind or being inadequate in the face of advancing technology (technological stress), create significant psychological pressures. Sports activities emerge as an effective mechanism for escaping this environment of anxiety and stress. This function of sports encompasses a critical dimension that serves not only the individual's mental relaxation but also the goal of maintaining a healthy lifestyle and physical well-being (the idea of being healthy). Therefore, sports offer both a psychological and physiological solution in coping with the challenges of modern life (Koruç and Bayar, 1992).

Aim of Study

The purpose of this study is to highlight the importance of physical education and sports in the development of society.

The Relatıonshıp Between Sport and Socıal Phenomena

Every social phenomenon is a historical phenomenon, and every historical phenomenon is a social phenomenon (Goldmann, 1977). Sport also appears as a social and cultural phenomenon between societies and within society itself (Atalay, 1998). Human existence has brought about certain associations, and significant progress has been made towards becoming a society alongside existence. People have formed communities, consciously or unconsciously, and this formation has necessitated that they find common ground. In other words, patterned behaviors have become apparent within societies (Katz and Kahn, 1977). Since the physical and physical development of individuals are compatible, they can be highly productive in terms of being healthy, hardworking and peaceful in society (Ayan, Alıncak, & Tuzcuoğulları, 2015). The lack of knowledge about physical activity causes people to misunderstand the effectiveness of physical activity and the link between physical activity and health (Karabaş & Alıncak, 2019).

After humans began living together, they entered into relationships with each other, and the interactions created by these relationships ultimately gave rise to meanings, values, rules, and forms of governance (Güven, 1992).

One of these formations is society. Society is a reality that makes humans human, determines the values they believe in, and influences their behavior and thoughts. It is the largest human group formed by social beings living in a specific place, whose members share a common way of life (Öztürk, 1998). Therefore, regardless of its size, level of civilization, economic activity, language, religion, values, and rules, any human group that shares a common way of life constitutes a society (Yetim, 2000).

With the formation of societies, processes of influencing and being influenced began as a result of sharing among people. This process revealed the characteristics of people as a society, as well as their culture and way of life. Human culture and forms of governance are also products of humans living together (Kongar, 1985). Everything that occurs within society, with a clear beginning and end point, presents itself as a social event. A social phenomenon, on the other hand, is a development that emerges within a process whose start and end times and location cannot be precisely determined (Öztürk, 1998). In today's world, which is entering a new century, the concept of sport, like many other areas, has undergone rapid change and, along with itself, has also brought about change in many areas dependent on it. It is a well-known fact that sport has had a very strong and hidden connection with society throughout history (Terekli et al., 2000).

The Role of Sports in Society

Sport is one of the factors that make the individual an individual, combined with the freedom, enlightenment, responsibility, constructive and creative life of individuals, in short, with the level of life befitting the individual. If we take into account that man is a being who is obliged to move due to his nature, then we can realize this need for movement in the most positive way through play, then let's add to these the human need for tension and joy purification and recreation. Then let us see these as a whole in the life of man. Then we realize how important sports are for the individual (Türkel, 2010). Sport is recognized as one of the fundamental cultural elements that unite human communities and shape them into a national identity (nation) (Güven, 1992). In addition to being an individual activity, the literature emphasizes that sport possesses a strong social phenomenon quality. In addition to the various methods and tools used to ensure the survival of societies, preserve their cultural heritage, and ensure their development, sports and sporting activities are also seen to be effective. Sports play an important role, particularly in ensuring social solidarity, as a center that brings individuals closer together and unites them (Öcalan and Ramazanoğlu, 2003). The educational process, which is a series of activities aimed at the continuous development and acquisition of knowledge, behavior, and skills, naturally includes sports and sporting activities. Therefore, as a social phenomenon, sport should be examined in detail within the framework of the education system (Erkal, 1992). The level of development of sport in modern societies is directly related to the completion of the education and training infrastructure and is

closely linked to gender equality, educational level, and the existence of appropriate sporting environments. The current dynamics of sports culture indicate a growing interest in sporting activities, both among passive spectators and active participants. However, it is known that in some societies, such as Turkey, women face limitations in terms of economic independence, employment, and socialization opportunities. In contrast, it has been observed that women's participation rates in sports are increasing in developed countries (Açıkada and Ergen, 1991).

Infrastructure deficiencies, often stemming from inadequate services, are among the primary obstacles to the widespread adoption of sports at the societal level. The current inadequate level of sports is one of the significant reasons for the limited scope of sporting activities and organizations. However, societies with intense, widespread, and developed sporting activities have the potential to build a strong and happy future.

The obligation to participate in sports exists in every social stratum, from the least developed societies to the most advanced ones (Dpt, 1983). Sport is a dynamic phenomenon influenced by its social and cultural environment (Karaküçük, 1995). While sport contributes to the advancement of society by influencing it, society has also supported the development of sport. This mutual interaction demonstrates that society and sports are inseparable parts of a whole.
Although the origins of the concept of sports are generally traced back to ancient times, activities equivalent to sports have existed throughout the history of human society. The importance of ancient times in the history of sports stems from the depth with which its activities have been documented for posterity. Interestingly, the word "sport" did not exist in ancient times; instead, two main types of activities were prominent: "Gymnastics" (today's equivalent of "Physical Education") and 'Agonistic' (today's equivalent of "Competitive Sports"). This duality can be considered the cornerstones of sport. However, today, sport has gone beyond mere competition, gaining a dimension of "sporting struggle" or "sporting endeavor" that "includes competition." The earliest uses of the word "sport" generally included meanings such as entertainment, relaxation, and recreation (Erdemli, 1996).

Sports contribute to individuals gaining values such as self-confidence, teamwork, mutual support, and behavioral integrity, while also serving a range of purposes that promote and enhance physical and mental health. This activity, which is easily embraced by the masses, plays a critical role in ensuring the physical development of society and preventing individuals from being drawn into social and mental crises (Keten, 1974).

In this context, it is evident that sport is a multidimensional phenomenon that combines physical, mental, and spiritual elements. Sport requires movements to be performed

within specific rules and a spirit of competition. Therefore, sport represents the entirety of purposeful and conscious movements that individuals perform within a specific set of rules in pursuit of their goals of competing, racing, having fun, and achieving a healthy lifestyle (Abakay et al., 2015).

For a more comprehensive understanding of sport, it is essential to examine it within social conditions (Alemdar, 2000). The sociology of sport focuses on explaining the social characteristics of sport by treating it as a continuous and significant social phenomenon, rather than merely as physical superiority or competition (Öztürk, 1998). It should not be forgotten that sport is one of the most effective and attractive tools for leading a balanced, strong, healthy, productive, and long life and for achieving a workforce with these qualities as a society. Sport is not just about winning degrees, breaking records, or competing; it primarily represents participation, doing, and living. At its core, sport is an activity based entirely on the principles of movement and competition, encompassing a series of customary training sessions and competitions in this regard (Ataman, 1978).

Importance of Sports

According to sports sociologists, the fundamental definition of sport encompasses activities conducted in a competitive environment with regulated and approved rules. These rules are determined and regulated by the relevant authorities (Abakay et al., 2017). Today, sport has become an integral part of human life. Therefore, regardless of age, sports practiced consciously and systematically, based on scientific foundations, play a critical role in maintaining an individual's lifelong health, success, happiness, and high morale (Yalçınkaya and Saracaloğlu, 1993).

At the societal level, solving individual problems and ensuring their well-being has become essential, as individual discomfort directly impacts society. Since the human element is one of the most important building blocks of society, the peace, happiness, and health of individuals also form the basis of social well-being. Sport plays an important role as a means of socialization within society and is effective in developing relationships between individuals and society. While sport contributes to the socialization of individuals, it is also influenced by the social and cultural conditions in which they operate (Karaküçük, 1995). Socialization in sporting environments can foster a closeness between people, free from self-interest, and foster a humanistic bond (Erkan, 1972). There are inextricable links between the social environment created by people and the development of sports (Taşmektepligil and İmamoğlu, 1996). This relationship is reciprocal: sports have both influenced society and helped it progress, while society has contributed to the development of sports. This reciprocal interaction is constantly evolving depending on the characteristics of the influencing and influenced factors. An individual's interest in and commitment to sports necessitates compliance with the rules of living within society. Sports are a vital factor in physical, spiritual, and social

development (Dpt, 2000). Furthermore, sports should be used as an effective tool for the healthy development and strengthening of human resources, a key element of socio-economic and cultural development (Sezgin, 1973). Sport is an activity that contributes to the active participation of individuals in social spheres and thus to their socialization. Sport brings modern societies together, encouraging different communities, cultures, colors to engage in various activities and interact together, thus strengthening social relations. Sport takes individuals out of their own limited environment and allows them to communicate and interact with different parts of the larger world. In this respect, sport enables people of different nationalities and different thoughts and beliefs to establish new relationships and develop new friendships and promotes social cohesion. Sporting activities involve not only those who play sports, but also those who watch, manage and operate these activities in the process of socialization through warm relationships. Sport contributes to the formation of a social society by improving human relations regardless of color, language, race or religion. This incredible effect of sport minimizes conflict and tension between people by making itself more attractive, thus contributing to the creation of a family consciousness in the same team or group of individuals from different social classes. According to many researchers, sport serves as a catalyst between societies in terms of social change (Yorulmazlar & Terlemez, 2020). It is seen that individuals develop psychomotor characteristics and communication skills with sports activities (Alıncak et al. 2015).

Sports facilitate compliance with certain rules of society that have developed spontaneously but cannot be imposed. Sporting activities, which play a critical role in regulating an individual's relationship with society and ensuring compliance with social rules, are considered important tools for both improving individual-societal relationships and enhancing social well-being. Sports enhance individuals' abilities to understand, assume responsibility, and establish order for cooperation. By fostering perseverance and energy, and by fostering a sense of belonging to a social group and society, they morally strengthen individual-societal relationships (Erdemli, 1996). The various pressures and stresses faced by individuals trying to keep up with the demands of the developing age and closely following technology create a burden on the societal level. In today's world, under the influence of mechanization and technology, sports stand out as a means of coping with these pressures and stresses. Sporting activities are one of the easiest ways to escape the intense stress of city life, the daily hassles, and the future anxiety caused by falling behind in technological advancements (Koruç and Bayar, 1992).

In addition to its role in regulating individual-societal relations, sports also play an important role in regulating industrial, commercial, and cultural relations as societies take steps toward becoming a global community (Ozan, 2002). Sports is an activity that brings together people from different countries, regardless of religion, language,

nationality, or race, in a voluntary, willing, and conscious struggle, uniting them and fostering competition (Akgün, 1973). Sports activities play an important role in the social structure not only in terms of spiritual influence but also in terms of trade, industry, and tourism, leading to positive developments in almost every segment of society. In particular, it is one of the natural and practical ways for countries to introduce their own culture and heritage to other societies. Through sports, societies can introduce the values that sustain them, such as customs, traditions, and norms. The promotion of a country's historical beauties and tourist areas leads to significant developments in tourism, industry, and trade. Sporting activities are not only a social and intellectual event that can reach all segments of society, but they also have industrial and commercial characteristics and therefore occupy an important place in national economies (Fişek, 1980).

In recent years, sports have become increasingly popular thanks to the policies of political powers and the contribution of mass media (Alemdar, 2000). It is a well-known fact that sports and society have become inseparable, from the most developed to the least developed societies. When social scientists discuss models for creating happy and peaceful individuals, the phenomenon of sport is among their common denominators. Every society, from the most backward to the most advanced, has a need for sport (Dpt, 1983). Societies where sporting activities are intense, widespread, and developed are candidates for being strong and happy (Gsgm, 1991). Sport is an activity that develops people's social and individual characters. People who play sports gain values such as friendship, respect, solidarity, compliance with rules, self-confidence, struggle, order, discipline, health, body awareness, aggression control and respect for the opponent (Alıncak et al. 2017; Duman & Kuru, 2010).

Conclusion

In conclusion, sports have become an integral part of human life, playing a vital role in ensuring that individuals remain healthy, successful, and happy throughout their lives, while also maintaining high morale. Sports are a critical factor in alleviating social isolation and preventing the tendency to act irresponsibly alone. Through sporting activities, individuals experience a sense of shared purpose and collective action. This contributes to the emergence of unity, solidarity, and common ideals within society. Societies with such a strong structure are very difficult to dissolve or destroy. Therefore, sport should be recognized as an indispensable phenomenon in terms of physical, mental, and social development.

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The Importance of Physical Education and Sports Concepts in Elementary Schools and an Examination of Their Development

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To Cite This Chapter:
Gulfidan, S., Yaricilar, N., & Alincak, F. (2025). The importance of physical education and sports concepts in elementary schools and an examination of their development. In F. Alincak (Ed.), *Current studies in sports science* (pp. 107–120). ISRES Publishing.

Introduction

Education is the process of consciously bringing about desired changes in individuals' behaviors through their own lives. The future of countries depends on the skills and mental development achieved by their citizens. Therefore, education is carried out with the aim of raising individuals in a way that creates a unity between their spiritual, social, and physical aspects. (MEB 2016). The purpose of Physical Education and Games lessons in primary schools is explained as preparing students for subsequent educational processes by developing their physical capacities, concepts, strategies, and related life skills through games and physical activities throughout their lives (Physical Education and Games Lesson, 2018). In today's education systems and approaches, the educational process aims to address the cognitive, physical, psychomotor, and behavioral aspects of the child and the individual

together, developing them in relation to each other (Alıncak, Ayan and Abakay, 2015). When we consider sports as an educational method, it is easy to see how many similarities there are between sports and education. Sports education is very important in helping individuals understand the importance of living together. Sports education motivates individuals to improve themselves physically and mentally, better prepares them for social life, and encourages positive thinking. When considered as a complement to physical education, sports education also plays a very important role in character education. If we examine the developmental stages of individuals, the aim is for them to take their place in society as individuals who are healthy in terms of their human and social aspects, at peace with themselves, harmonious, and of sound character; who embrace national values of decency and morality and internalize the principles of democratic life. It

should be noted that sports education is no different from general education and must be considered as a whole (İnal, 1998).

Educational programs aim not only to provide individuals with the best academic education but also to develop a strong will and character. Education in many parts of the world requires individuals to embrace the culture and values of the society in which they live. Therefore, sufficient importance should be given to activities that are in line with the objectives of education that will enable individuals to be educated together and facilitate their physical, emotional, and social development (Kuru, 2003).

Eitzen (2000) views sport as a microcosm of human life. He states that sport reflects all the characteristics of the society in which people live. In other words, sport exists in humanity with its own unique products, participants, documents, magazines, newspapers, cartoons, cinemas with audiences, economic expenses, and caricatures, just like the different institutions that exist within society (Öztürk, 1998). For this reason, sport is at the forefront of social institutions that are actively and widely used in societies today. The main purpose of sports is to contribute to the physical, social, and mental development of the individual. Along with this, sports emerge as a major phenomenon in the emergence of civilized societies (Yetim, 2000).

Aim of the Study

The aim of this study is to examine the importance and development of physical education and sports concepts in primary schools.

The Concept of Elementary School

Elementary school is the first step in preparing individuals to lead useful lives and adapt to their social environment. For this reason, it is referred to as “Basic Education” in our country, as it is worldwide. In our country, the right to basic education is guaranteed by Article 42 of our Constitution, and it is compulsory and free for all citizens. Ensuring this has been determined as one of the main duties of the state (Arslan, 2007). The duties and objectives of primary school, in accordance with the basic principles and policies of the Ministry of National Education, are as follows: to equip every Turkish child with the necessary social skills and behaviors and basic knowledge to grow up as a person who contributes to their country and society; to raise the child within the framework of national moral values; and to prepare them for their future life and higher education, taking into account their interests, concerns, and abilities (Büyükkaragöz, 1998).

Physical Education and Play Concepts

Physical education is a field of science that enables the development of people’s mental and physical health. It is also an effective field of science in the development of people’s

psychology and characteristics (Kürkçü, 2017). Since the human organism is based on an active lifestyle, a lack of movement can cause a number of physical problems. Studies on lack of movement show that children will benefit mentally and physically if they engage in 60 minutes of moderate or vigorous physical activity daily to become healthy individuals (Atlı, Mirzeoğlu, & Erkut, 2017).

We can define Physical Education as the science that regulates movement activities by adopting the aspects of sports that are suitable for human nature, with the development of the individual's mental and physical health. In this discipline, considering that it deals with the correct movements used in sports activities, it is an educational activity integrated with many stimuli that help strengthen the psyche, as a movement stimulates a specific point in the human body and promotes its development (Kürkçü, 2017, p. 21). Attitudes are one of the important concepts in human life. Attitude is not a concept that can be measured directly, but it is possible to measure an individual indirectly through behavioral patterns (Öztürk et al., 2017). Through play activities, children have the opportunity to recognize objects, individuals, and their own characteristics (Alıncak, 2016).

We can view physical education as a tool for learning and teaching. The impact of games on students' learning ability can be expressed in terms of the retention of learned information, the benefits of fostering positive behavior, and academic achievement. Games used to help students pass the time are not only enjoyable for them, but when used in coordination with physical education, they are an effective educational tool that aims to increase children's interest in school, ensure they become healthy individuals, and learn while having fun, in addition to being an interdisciplinary field of science (Seyrek and Sun, 1991, p. 9). Play is the most important factor that prepares children for life, guides their lives, and teaches them appropriate behaviors within their social lives (Alıncak and Tuzcuoğulları, 2016). Games and physical education play an indispensable role in keeping students' lives fit and dynamic. It should not be forgotten that psychological development, which is created solely through physical activities and is in harmony with mental development, is beneficial for the health, peace, and vitality of individuals and society (MEB, 2008). Play activities are a process that satisfies children's needs (Ayan, Ergin and Alıncak, 2017).

The National Association for Sport and Physical Education in the United States has listed the following characteristics as essential for a quality Physical Education class:

Time: This class should be held 5 days a week for at least 30 minutes. It can be conducted with a teaching approach that develops the student's basic motor skills and entertains them.

Class size: The number of students present in the classroom during the lesson should be the same as in other lessons (Math, Turkish, Social Studies, etc.). The most important

reason for this is that sufficient materials may not be available for the student, and the lesson may not be sufficiently effective due to the inadequacy of the space where the lesson is held.

Heart rate: The intensity of the activities performed during the lesson should be moderate to high, raising the student's heart rate to 50% above their normal heart rate. This ensures that minimum health standards are met.

Opportunity for practice: Students should be given sufficient opportunity and time to experience a skill or concept.

High success rate: Teachers should include activities in their daily plans for students with fewer skills or those who are new to the exercise process. It is necessary for these students to experience a sense of achievement and to increase their interest and motivation for the class.

Positive developmental environment: The classroom environment should be positive and friendly between the teacher and the student. Students should like and respect their teacher and not be afraid of them. Students should be taught to appreciate their achievements and not give up when faced with failure.

Teacher background: Teachers should be well-educated, knowledgeable about their job and their attitude towards students, and understand that they need to teach and guide students. They should also have good interpersonal skills.

Realistic approaches: Planning lessons that are compatible with the capacity, level, talents, and skills of the students attending the class.

Sufficient materials and sports facilities for teaching: All schools must have a gym and sufficient sports equipment for their students. However, even if these are provided, it is not enough for Physical Education and Sports classes to be taught properly. It varies depending on the teacher's ability to make the best use of the resources available to them and, if necessary, seek outside help.

It should be fun: Physical Education classes should be fun for students, not a chore; students should enjoy the way the class is taught. Teachers should find and implement methods that encourage student participation and enjoyment.

Psychomotor, social, moral, and knowledge dimensions: Physical Education classes, which focus on psychomotor development, should not neglect the moral, social, and

informational aspects. They should develop human relationships and ensure that individuals exhibit the necessary behaviors in social life.

The Importance of Physical Education and Games in Elementary Schools

Physical education and games, which exist as a complementary and supplementary element of formal education within the National Education system, also play an important role in the character development of students. It is a fundamental principle that students should be raised as individuals who contribute to the development of society, possessing a peaceful, selfless, dynamic, moderate character, being helpful, cultured, and respectful of the basic principles and rules of life (İnal, 1998).

Physical education and games are very important in positively developing students' skills and behavior, enabling them to continue sports in their lives, and protecting their physical health (Yenal and Çamlıyer, 1999). Therefore, it is very important that this course be given the necessary importance in elementary schools. Since the areas where physical education and games are taught differ from the classroom environment where other subjects are taught, the time spent together by the teacher and students differs from the time spent together and the communication in other subjects. These differences place more emotional and physical challenges and responsibilities on the teacher than on other subjects. Physical education and games classes are complementary to regular classes. Students participate in complementary education and general education as a whole (Arslan, 2008).

The student's progress has generally been found to be primarily related to the lesson time, the area where the lesson is held, and the availability of sufficient physical education teachers (Taşmektepligil et al., 2006). In theoretical terms, the game and physical education lesson is primarily focused on education and game-based programs in its initial period. Looking at the implementation of the program, it is seen that the activities carried out by first and second grade students are considered together and address the concepts of physical education and games jointly (Yaylacı, 1998).

Kale (2007) lists the objectives of the primary education part of the physical education course as follows:

- Rest, being healthy and happy.
- Maintaining health in addition to developing free time.
- Ensuring that students can improve their performance without putting their health at risk.
- Attracting students' interest in the class.
- Ensuring that students develop a desire for sports, games, and movement within the class.
- Preventing students from becoming reluctant towards the class and ensuring they are ready for all kinds of activities.
- Meeting the age-appropriate movement needs of primary school students.

- Discovering their sports and game skills by getting to know themselves.
- Learning the terms and concepts used in sports and the areas they are related to.
- Compliance with rules in the area of cleanliness.

The Role of Classroom Teachers in Physical Education and Games Classes

In this day and age, many teachers and administrators have focused solely on students' academic achievements, viewing other subjects such as physical education and games as unnecessary classes that should be excluded from education. However, numerous studies have shown this belief to be incorrect, demonstrating that sports and physical activity have a positive impact on academic achievement. It has been observed that sporting activities increase students' self-confidence, thereby significantly improving their academic performance (Arslan, 2008). Considering this, teachers need to provide opportunities for students to develop their motor skills between the ages of 6 and 11 and prepare an appropriate environment for their physical development.

MEB (2018) recommends that teachers pay attention to the following issues in the implementation of the physical education and games curriculum.

- Changes specific to the school are made in line with the characteristics specified in the curriculum, taking into account the characteristics of the students at the school.
- Daily life and other subjects are taken into account when determining the teaching-learning approach.
- Work coordination that can fulfill roles and responsibilities with the same goal is emphasized.
- The entire teaching-learning process should be influenced by the main principles of the Physical Education and Sports course curriculum. The specified principles are as follows.

Physical activities involving sports and games are for learning purposes.
Student-centered environments allow students to devise their own learning methods.
Time frames are at the forefront.
It is a continuously evolving and interconnected structure.
It has a flexible and adaptable structure.
Topics and themes are used to achieve the targeted outcomes.
In the student's educational process, their experiences and relationships with others around them are also important.
It is a tool for achieving gains in learning-teaching environments.
Students should feel physically and emotionally secure during the activities.
It is essential to be innovative through critical and expressive thinking.
Universal and social values are included.
The aim is to develop an understanding of playing fairly during the game and acting accordingly.

Teachers are given the opportunity to use their own teaching methods comfortably.
It is very important that all current students participate.
They should be sensitive to nature and the environment.
It provides an environment where students can learn while having fun.
They are subject to an evaluation process from different perspectives.
It strives to instill healthy living habits through an active lifestyle.

The responsibility placed on the teacher in the process of conducting lessons and shaping the process in the educational environment requires the teacher to have the necessary level of competence related to the subject they will teach and to be able to master the teaching and the student in line with the objectives of the intended teaching. understand the problems the student may encounter in the educational process, support the student in the learning process, and recognize the student's skills and abilities (Demirhan, 2006). Since the age to start sports coincides with elementary school age, this increases the responsibilities of the classroom teacher. The classroom teacher must have the ability to discover the student's athletic potential. The classroom teacher, who identifies students based on their abilities, should prepare a program tailored to the student's abilities and conduct activities according to this program. They should share the identified talent with the student's parents and ensure that the student is directed to an educational institution or sports course that provides sports training. Since the locations where the lessons are held are directly related to the weather conditions, the locations where the lessons are held differ depending on whether the weather is open or closed. The schedules for lessons to be held in the garden when the weather is clear and sunny and in closed areas on closed and rainy days must also be planned according to the location where the lesson will be held (Aksoy, 1999).

Practices Implemented by the Classroom Teacher in Physical Education and Games Lessons

The classroom teacher responsible for teaching programs aimed at instilling physical activity habits in students is responsible for preparing the lesson and conducting it in accordance with the program. (Dast and Pangrazi, 2009, p.156). As in other countries around the world, in Turkey this responsibility lies entirely with the classroom teacher who teaches the lesson (Arslan and Altay, 2009, p. 16). Gaming has been a part of our lives since the dawn of time, an activity in which people of all ages, young and old, spend a significant portion of their time. With technology making every aspect of our lives easier, it has also become increasingly widespread, particularly in the areas of entertainment and gaming (Özmen, Alıncak and Cağdanlıoğlu, 2023).

Physical education and games are taught in grades 1-4 in our country, and activities related to the teaching of the course are considered and planned separately for each grade. This is because there are differences in what students can do in physical education

and games classes due to their ages. The following activities are carried out in the 1st grade application of the course.

- Balancing activities.
- Location change attempts.
- Movements involving controlling an object.
- I am dancing.
- Health awareness 1 and 2.
- My food pyramid.
- Safety.
- We are a team.
- Direct your partner.
- Variation.
- I know my culture.
- The above-mentioned activities can be performed individually or combined with two or more others. In addition to these activities, teachers utilize games such as:
- I sell oil, I sell honey
- Frog leap
- Rolling toward the target
- Hanging the peg
- Finger game
- Four-touch
- Snowflakes
- Holding the basket
- Whisper down the lane
- (MEB, 2018 et al., 2019, p. 13).
- In addition to the 1st grade program, the Physical Education and Games class includes:
- Safety and equipment
- Active participation—open field games
- Active participation—traditional children's games, etc. In addition to these activities, the following games are also beneficial:
- Five Stones
- Caucasian Dance
- Folk Dance
- Hide and Seek
- Trash Pickup
- Musical Chairs
- Throw Far
- Hopscotch
- Slalom Run.

Third-grade students are given the "physical activity pyramid" application in addition to the applications given in first and second grades. The specified applications should involve at least 20 minutes of moderate or high-level physical activity. Circulatory system, endurance, muscle strength, and flexibility exercises should be performed together with these activities. Fourth-grade Physical Education and Games activities include:

- Movement to change position
- Movement to control objects
- Combined movements
- I am dancing
- I am learning about my culture
  Active participation—open field games. During these activities, elements from Paralympic games, catch the ball, and hop and jump games are also utilized (MEB, 2018).

The Role of Physical Education and Games in Teacher Training Programs

When we conduct research on teacher development and training practices in undergraduate

programs, we can clearly see that Physical Education and Games courses are subject to constant change. An example of these frequent changes is that in the 1998 undergraduate program curriculum, Physical Education was given as a 2-credit theoretical course in the 3rd and 4th semesters, while in the 6th semester, it was given as a total of 7 credits, consisting of two hours of practical application and two hours of theoretical play and physical education. The Physical Education course accounted for 4.5% of all other courses (YÖK, 1998). In subsequent years, the Higher Education Council (YÖK) decided to reduce the course hours to 6 and the credits to 4. With the decision taken, the Physical Education and Sports Culture course was set at 2 credits in the 3rd semester, and the Physical Education and Games Teaching course was set at 2 hours of practical and 1 hour of theoretical instruction in the 4th semester and put into effect.

The elementary school teacher undergraduate curriculum was changed again starting in the 2014–2015 academic year, adding the Games and Physical Activities course to the 4th semester with 1 hour of theory and 2 hours of practice, and the Physical Education and Sports Teaching course to the 5th semester with 2 hours of practice and 1 hour of theory. The Higher Education Council made another curriculum change on May 30, 2018, adding the Games and Physical Activities Teaching course and deciding that it should be taught for 3 hours of theory. Looking back from 1998 to the present, we see that the number of class hours and lessons in the primary school teaching degree curriculum has been reduced, and the practical components have been completely removed. When we look at the general profile of primary school students, we can see that they are in their developmental and play years and need more Physical Education and Games lessons throughout the school year. It is questionable how and to what extent classroom teachers, who graduate after taking only three hours of theoretical classes during their four-year university education, can meet the Physical Education and Games needs of their students.

The Effect of Physical Education and Play Classes on Child Development

The most obvious benefit of physical activities is that they aid in the child's physical development. No other field incorporates the student's ability to move and methods for solving health problems as much as Physical Education and Play classes. Physical activities carried out with programs that take into account the student's age and development, appropriate to their level, affect students' development in many areas. Teaching through physical activities contributes greatly to the development of manipulative, locomotor, and balance activity skills. Physical play activities aim to promote the development of the following objectives in students. Developing nerve-muscle coordination: The development of motor skills is related to the mental and sensory development of the society in which the student lives. All characteristics develop as a whole. The inclusion of physical activity in education is a very important factor for students to have a healthy childhood. It directs them towards developing their neuromuscular abilities (Çamlıyer, 1999).

Psychomotor Development: This involves developing the student's movement abilities with the aim of improving their physical activity. It means strengthening the balance and control of the metabolism. For example, it forms the basis for the development of basic skills such as swimming, running, and walking. Fundamentally, opportunities, teaching, and motivation within society are important in reaching the desired level of development (Gallohue, 1976).

Physical Fitness Development: It is a natural characteristic for students to reach their level of physical development. Physical activities provide significant benefits to the metabolism in terms of physical fitness. This is referred to as the chronic and acute benefits of exercise. The ability to play sports and live in close contact with sports, acquired in early childhood, is an important factor in acquiring physical movement skills (Çamlıyer, 1999).

We can define physical fitness as the ability to easily manage daily tasks. To perform our daily activities more effectively or to consciously engage in any sports activity, we need more than our normal abilities. Physical fitness is related to body health and composition. Characteristics such as cardiac health, speed, balance, strength, endurance, body mass index, hand-eye coordination, and agility can be improved through physical education and play activities (Gökmen and Karagöl, 1995).

Perceptual Motor Development: All skills consciously help trigger bodily responses. Perceptual skills are learned abilities, and this learning process constitutes a very important part of physical movement activities. It is stated that for the two targeted characteristics in students to reach the intended level, motor knowledge transfer and perceptual events must interact with each other (Vannier and Foster, 1973).

Social-Emotional Development: Another goal of movement education is for students to be at peace with themselves, to be able to react to stimuli, and to be able to renew themselves so that they can advance their movement abilities. Students should realize that they can behave more comfortably, safely, and simply in the park, at home, and in society.

Educational games are not only for Physical Education and Games classes. They are games planned to achieve the lesson objectives for all other courses. Students both spend their free time in a meaningful way and take on an educational responsibility. Educational games are seen as a model for advancing the mental and physical abilities of the student participating in the game by utilizing feelings of fun and excitement (Hazar, 2000).

Developing Learning Capacity: In terms of science and language development,

Physical Education and Games classes can be beneficial for students' activity skills. If a student has difficulty learning an abstract concept described in a theoretical class, they can learn it by engaging in different physical activities or events (Çamlıyer, 1999). A six-year study conducted in Quebec demonstrated that students who engaged in five hours more physical activity than average achieved higher academic scores than their peers. It was observed that students who participated in sports and physical activity classes in their daily lives were more prepared to learn than other students in Canada. It was seen that students who had a good time with their peers were less irritable and performed more harmoniously with other students (Leblanc and Dickson, 2005).

The student's habit of consciously using their free time is defined as the student acquiring desired behaviors and spending time doing various activities. The purpose of students acquiring the ability to make good use of their free time can be expressed as looking at life through a happier lens and achieving psychological and social satisfaction. It is a natural way of spending free time for students to engage in physical activities during the time they set aside for themselves. It is as important to teach students that they need to set aside time for themselves as it is to explain to them how important studying is (Çamlıyer, 1999).

Physical Education and Games is an important complement to education, and its primary goal is to maximize each student's personal abilities through movement skills training. Achieving this goal will be possible through psychological and movement training. Physical Education and Sports education are complementary subjects in general education (Yavaş and İlhan, 1996). Advancing students' physical abilities is a goal specific to physical education classes. The human body's movement mechanism is actively formed by muscles and passively by bones. Physical activities are essential for muscle and bone development. Since Physical Education and Sports classes in schools are conducted for scientific purposes, improvements in the functions of internal organs occur as a result of the student's metabolism adapting to physical activities and becoming more resilient and suitable for them. As a result, students in society are observed to have increased endurance against fatigue by adapting to changing situations. For individuals in society to be able to perform all positive activities, the individuals that make up society must have acquired the habit of exercising regularly (Brewlow, 1990).

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Smoking Addiction and Exercise

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To Cite This Chapter:
Bilgic, A. (2025). Smoking addiction and exercise. In F. Alincak (Ed.), *Current studies in sports science* (pp. 121–132). ISRES Publishing.

Introduction

While addiction has long proliferated as a personality disorder, in recent years it has begun to be recognized as a brain disease. Research shows that many neurochemical and neurophysiological changes that lead to addiction occur in the brain. Although many things in life can become addictive, some categories have a higher potential for freedom; These include leftovers and cigarettes. According to Egger and Rauterberg, addiction means wanting everything very much and being dependent on it, expecting power and help from it. In foreign sources, addiction is defined with the terms "addiction" and "dependence"; The inability to stop repeating a certain behavior is explained as the substance retention and control system (Egger,1996). Cigarette, which is made by wrapping tobacco leaves in a thin paper, is a substance that is consumed by inhaling the smoke after burning. The active ingredient is a dark liquid called nicotine. Nicotine increases the release of epinephrine, norepinephrine and serotonin in the brain; Additionally, withdrawal symptoms occur if not taken for 90 to 120 minutes. Before 1492, indigenous people in the Americas produced tobacco for religious rituals and medicinal purposes. It is thought that cigarettes reached Europe from America through Spanish sailors in the 18th century. Nowadays, addiction disease, which is extremely important for individuals and public health, is becoming more and more common and affects people of all ages. As research shows how serious cigarette addiction is, it is a situation that should not be ignored. According to research conducted by the World Health Organization in 2021, 1.5 billion people worldwide smoke. Every year, 8 million people die from smoking-related diseases, and smoking ranks first among preventable causes of death. Additionally, WHO predicts that smoking-related deaths may double in the next 8 years. In Turkey, according to 2019 data of TÜİK, 55.5% of the population consists of people who currently use tobacco or have used it before. It is stated that approximately 80 thousand people die every year in the country due to diseases related to tobacco use.

Aim of the Study

The purpose of this study is to reveal the relationship between cigarette addiction and exercise.

Effects of smoking on individuals

Occlusive diseases of the brain, heart and leg vessels are closely related to smoking. Coronary diseases are 4 times more common and aortic aneurysm is 5 times more common in smokers. 95% of Buerger's disease is caused by smoking. Smoking causes vasoconstriction, arteriosclerosis, hypertension and increased blood clotting tendency. Additionally, brain hemorrhages increase significantly due to smoking. 25% of myocardial infarctions are related to smoking, and the risk of infarction increases in direct proportion to the number of cigarettes smoked (Emri,1994).

When smoking is combined with other risk factors (cholesterol, excess lipids, hypertension, diabetes, birth control pills), the danger increases even more and the risk of heart diseases increases. Especially women who smoke and use birth control pills have a 30 times higher risk of myocardial infarction than women who do not smoke and use pills (Candan,1984). Smoking is an important factor that increases the risk of lung cancer. This risk varies depending on the individual's smoking duration, age of onset, number of cigarettes smoked per day, and the amount of tar in the cigarette (Book on Cancer Education in Schools,). Nicotine and tar settle in the lungs, causing narrowing of the airways and difficulty breathing. Therefore, there is a close relationship between chronic lung diseases and smoking. Conditions such as bronchitis and emphysema, with reduced respiratory capacity and shortness of breath, are 75% associated with smoking. Individuals who smoke generally have increased cough and phlegm. Additionally, babies whose parents smoke have a higher risk of pneumonia and bronchial asthma(Kasatura,1998). Leukoplakia is frequently seen on the lips and mouth in smokers. These changes may pose a risk of cancer in the future. An increase in the number of esophageal cancer cases is observed in those who consume alcohol along with smoking. The damaging effect of smoking on the lower gastric valve mechanism causes frequent air swallowing. Stomach and duodenal ulcers increase in proportion to cigarette consumption. The healing process of ulcers takes longer and the risk of recurrence increases. Additionally, ulcerative colitis is more common in smokers, while Crohn's disease is twice as common in smokers. The risk of developing gallstones also increases in smokers (Somantı,1997). Smoking negatively affects the oxygen intake and blood supply of all tissues and organs, causing systemic damage. This situation disrupts the functions of the body's immune system and weakens body resistance. As a result, the defense mechanism weakens and the susceptibility to infections increases (Emr,1994). In smokers, there is a decrease in bone mineral density and therefore an increased risk of fracture. Bone mineral density of people who smoke a pack of cigarettes a day decreases by 2% every 10 years. It is stated that this effect is dose-related, that is, the duration of smoking is more important than the number of cigarettes smoked (Beyazova, 2000). According to the National Cancer Institute, 250 of the thousands of chemicals found in cigarettes have harmful effects and cause 69 different types of cancer. The majority of these cancers are seen in elderly individuals. The most common types of cancer caused

by smoking include:
Lung Cancer: More than 80 percent of lung cancer-related deaths are attributed to smoking.
Mouth and Throat Cancer: Harmful substances found in smoke can contribute to the development of cancer in the mouth and throat.
Kidney Cancer: Individuals who smoke have twice the risk of developing kidney cancer compared to non-smokers.
Stomach Cancer: It is stated that approximately 20 percent of stomach cancers occur due to the effects of chemicals from cigarettes.
Liver Cancer: Even though smoking does not come into direct contact with the liver, it can cause cancer development in this organ.

The American Cancer Society states that cigarette smoke causes nearly half (48.5%) of deaths from 12 different types of cancer, including the cancers mentioned above(Centers For Disease Conrol,2004). Moreover, classical studies demonstrate covalent binding processes of carcinogens or reactive electrophilic metabolites with cellular macromolecules (including DNA). Although nicotine is an addictive substance, it is not considered a direct carcinogen. However, by creating and maintaining addiction, it exposes smokers to long-term exposure to tobacco smoke, which increases their risk of cancer (Maier, 2011). Smokers breathe in a mixture containing carcinogenic and toxic substances with every breath. Tobacco smoke contains more than 7,000 chemicals, at least 69 of which can cause cancer(U.S. Department of Healt and HumanServices, 2006).

There is strong evidence that smokers generally have higher amounts of DNA adducts in their lungs and other tissues than in non-smokers. Although many of these adducts have not yet been fully identified, several studies have identified specific carcinogenic DNA adducts in the tissues of smokers. If DNA adducts and their metabolites produced by tobacco smoke can escape repair systems and become persistent; DNA polymerase enzymes may cause an incorrect nucleotide to be placed opposite this insert. This may lead to incorrect coding and therefore genetic mutations during DNA replication(Global Initiative for Chronic Obsstructive Lung Disease, 2013). Some components or metabolites of tobacco smoke can directly bind to cellular receptors, activating protein kinases, growth receptors, and other pathways, which may contribute to carcinogenesis. Additionally, cigarette smoke contains substances that can lead to inflammation; this may lead to increased pneumocyte proliferation, nuclear factor-kappa B (NF-kB) activation, and tumor development. Number of cigarettes smoked per day, cotinine measurements in biological samples, and other indicators of smoke exposure still play an important role in estimating total smoke exposure and population risk (Chen,2011). In conclusion, smoking appears to increase the risk of lung adenocarcinoma. It can be said that the increased risk of adenocarcinoma is due to changes in cigarette design and composition

since the 1950s. Although it is difficult to determine which design changes contributed to this increase, there is strong evidence that filters and increased levels of tobacco-specific nitrosamines played a role. Additionally, the observed decline in squamous cell carcinoma parallels the decreasing prevalence of smoking (CDC,2012).

Causes of Smoking Addiction

There are many factors that affect smoking. Studies show that variables such as low socioeconomic level, frequency of smoking among peers during adolescence, social and cultural differences, presence of smoking individuals in the family, low level of parental monitoring and low academic achievement affect this situation. These risk factors are especially relevant during adolescence for both boys and girls to start smoking. However, in some cases, these factors are observed to have a greater impact on girls than on boys. For example, smoking among female students can be associated with gaining popularity through peer influence and the desire to be included in the group. Additionally, some girls may use cigarettes to control weight.

Nicotine is known to play a critical role in cigarette addiction. However, it is emphasized that behavioral, psychological, environmental and social factors are also effective in cigarette addiction. A typical smoker inhales approximately 200 doses of nicotine when he smokes a pack of cigarettes a day, inhaling each cigarette an average of ten times. No other drug is consumed with such high frequency. This conditioning and the effect of nicotine make addiction inevitable. A user who smokes a pack of cigarettes a day will receive a total of 1 million nicotine doses for 14 years. This constantly recurring situation causes withdrawal symptoms to appear rapidly and addiction to develop (WHO, 2010). Behavioral factors include habits such as smoking after meals, smoking with coffee, smoking while driving or talking on the phone. Over time, individuals may associate many activities with smoking, making this situation indispensable. In addition, the act of moving a cigarette from hand to mouth, called “hand habit”, has a more reinforcing feature in women than in men(Jha et al,2006). Smokers believe that smoking has a calming effect. The fact that withdrawal symptoms disappear by smoking the last cigarette before going to bed and smoking the first cigarette the next day reinforces the idea that cigarettes have a calming function. According to Jarvis, smokers think that they are treating themselves with cigarettes because they have experienced this process thousands of times.

Psychological causes of smoking addiction

Many theories examine mental factors in starting to smoke. According to these theories, some beliefs and thoughts are associated with smoking. There are common beliefs that smoking is used for joy, pleasure, calming and self-confidence. Social motivations may also influence smoking; These motivations aim to connect with other individuals, adapt, increase self-confidence, and facilitate social situations (Brown, 2011). It has been shown

that having friends who smoke, especially in early and middle adolescence, is highly associated with smoking behavior in later years. In a more specific study, it was reported that 64% of smokers had most of their friends smoking (Allen, 2008). In this context, smoking is seen as a tool to help fit in with social groups. Additionally, smoking may facilitate social interaction for students, reduce social anxiety, and help individuals shape their social environments (Stromberg et al., 2007). Smoking has been shown to help initiate conversations with friends or strangers, function to reduce problems, and facilitate communication with potential romantics (Brown, 2011). Research highlights the belief that smoking may reduce stress and be associated with self-esteem. Other studies show that our emotional thoughts, such as the belief that "smoking is enjoyable," have an impact on smoking behavior. Public order is a factor that influences individuals' thoughts about smoking; A person's relationships with his immediate environment contribute to the development of beliefs and behaviors. Studies show that parental smoking doubles the likelihood of children smoking (Bal, 2019). Parents' attitudes towards smoking are also an important factor affecting children's behavior. Additionally, the smoking behavior of a person's family members and friends has also been determined to have an impact on cigarette use. According to a study conducted in the USA, individuals who are prone to problems, have low school success, do not participate in school sports, use alcohol and drugs, and have low self-confidence are more likely to smoke. In short, the attitudes of the social environment in which a person lives are reflected in the attitudes of children (Bal,2019).

Yazıcı and Sahin(2005) state that smokers develop a positive or negative perception of cigarettes through social and mental learning. It was found that individuals in the preparation stage received higher scores than those in the pre-contemplation and thinking stage (Bardak, 2016). Another psychological reason for smoking is the concept of self-efficacy. According to Bandura (1982), self-efficacy is a necessary quality in the development of self-confident behavior. Additionally, another psychological reason for smoking is perceived stress level. This factor, which is used without questioning in daily life, has an important place in every aspect of human life.

Exercise, Physical Activity, Sports Performance

Although the terms "physical activity" and "exercise" are often used interchangeably, there are distinct differences between these terms in the field of kinesiology. Physical activity refers to all the energy expended by movement and is any body movement produced by skeletal muscles that results in energy expenditure above resting level (Thivel, 2018). This definition includes household and outdoor chores, occupational activities, walking, cycling, shopping, sports, planned exercises, and other activities of daily living (Kruk, 2019). The term "exercise" is used to describe regular, repetitive and planned physical activities that aim to improve or maintain physical fitness (Rogers,2010). Examples include brisk walking, cycling, aerobics and competitive sports. Physical activity can

be examined under four main headings in terms of improving physical fitness: strength, endurance, balance and flexibility. To evaluate any physical activity, it is important to consider the components of frequency, duration and intensity (Kruk, 2019).
Frequency, refers to how often an activity is done and is measured in weekly sessions.
Duration is the time frame in which the activity takes place and is usually expressed in minutes.
Intensity describes the amount of energy a person expends during activity and is generally divided into three levels: mild, moderate, and vigorous.
The intensity of physical activity is evaluated based on the metabolic equivalent (MET) of each activity. 1 MET is the amount of energy spent at rest. The MET value indicates the ratio of the metabolic rate of an activity to the resting metabolic rate. For example, running is considered 7 METs and rest is considered 1 MET; In this case, running requires 7 times more energy than resting. Light activities are considered below 3 METs, 3-6 METs are considered moderate intensity, and over 6 METs are considered vigorous intensity (WHO, 2010).

Light activities include activities such as sleeping, watching television, light housework, walking at a low tempo, and writing. Moderate activity increases heart rate to 64-76% of maximum (Warburton, 2007). Such activities include dancing, leisurely cycling, volleyball, and gardening. Violent physical activities, on the other hand, work large muscle groups, increasing the heart rate to 77-93% of maximum and causing a significant increase in respiratory rate. Examples of such activities include running, brisk cycling, weight lifting, and basketball(Kruk,2009). Sports performance is defined as the sum of mental and physical activities that an individual achieves during sports activities and can be improved by regular training (Dinç, 2019). Nowadays, with the increasing number of individuals doing sports, sports performance and the parameters related to this performance are becoming increasingly important. While performance is generally considered as a short-term and limited aspect of behavior, it can also be described as an action towards the accomplishment of a specific job (Tiryaki,1991).
Additionally, performance; It is defined as a concept that includes the biomechanical, physiological and psychological elements necessary for physical activity. In this context, the athlete's biomotoric, physiological and psychological performance level is concretely described (Kuter,1997). Factors affecting athletic performance are quite diverse and these factors can be divided into two groups: internal and external. Both groups can positively or negatively affect athletes' performance. Intrinsic Factors are elements that are present in the genetics of the organism and that change over time and are unlikely to be affected by external factors or at all. These factors include age, anatomical structure, gender, special nervous system, locomotor system, metabolism level, organ and energy systems and nerve-muscle conduction rate. External Factors, on the other hand, are factors that are not related to the genetic structure of the organism and can have a greater impact than

internal factors. These factors include economic situation, positive or negative feedback from commentators, audience pressure, rest intervals, training programs, injuries, athlete's sexual life, family factors, social life, climatic conditions, time difference, weather and sleep quality. Many external factors can be changed and directed by certain methods under appropriate conditions (Bayraktar, 2009).

Effects of Smoking Addiction on Exercise and Sports Performance

Various factors such as a person's innate genetic characteristics, muscle fibril structure, exercise type and level, exercise model, age and smoking duration can affect aerobic capacity due to the effect of smoking. Smokers are more intolerant to exercise and finish exercise in a shorter time. Non-smokers can maintain a maximal level of exercise for longer than smokers (Özer, 2001). The negative effect of smoking on exercise performance is less seen in young individuals with high aerobic capacity. Smoking generally reduces the performance of individuals. It was determined that especially those who smoked at least 15 cigarettes a day in the last year had more difficulty in low-level activity than non-smokers. Smokers stop exercising earlier than non-smokers due to reasons such as fatigue, exhaustion, shortness of breath and leg pain (Gordon,1987).

In a study conducted on individuals who smoked 3 cigarettes per hour in the last five hours, maximal oxygen consumption, oxygen pulse, heart rate volume and anaerobic threshold values were found to be low. Additionally, lower maximum heart rate has been observed in smokers. At maximal exercise level, these people finish the exercise in a shorter time. Research shows that nicotine affects body weight by changing body energy balance (Laustiola,1991). Nicotine increases resting energy expenditure(Özer, 2001). There is a significant difference in oxygen consumption between smokers and non-smokers; smokers have lower oxygen consumption values (Klause,1983).

Under the influence of smoking, the use of carbohydrate stores decreases during exercise and at rest, which leads to less consumption of glycogen in the muscles. Research shows that smoking reduces maximal respiratory capacity, reduces the oxygen capacity of the blood, and this negatively affects sports performance. When a cigarette is smoked, 10% of the red blood cells degenerate and the amount of oxygen taken into the lungs decreases. This causes decreased performance and rapid accumulation of lactic acid in the bloodstream, leading to fatigue. In such a situation, the athlete's heart has to pump more blood to the tissues, which causes blood pressure to rise and, as a result, sports performance decreases. According to the study of Cooper et al., performance is inversely proportional to daily cigarette consumption and duration of smoking habit, and the response to training is worse in smokers (Akgün,1986). As a result, while maximal respiratory capacity increases in individuals who train regularly, one of the negative effects of smoking over time is a decrease in respiratory capacity. In this context, it is understood that smoking seriously impairs sports performance (Akgün,1986).

The Relationship Between Smoking and Exercise

The individual acquires various genetic characteristics at birth. In addition to these innate genetic factors, factors such as muscle structures, variety and intensity of exercises, age, gender and smoking duration determine the aerobic capacities of individuals. Individuals who consume nicotine have difficulty exercising and are less resistant to physical activities. They also tend to quit the exercise they started before completing it. Non-smokers can maintain maximum activities for longer periods of time than smokers (Özer,2001). Physical tests are crucial for football players. Along with tactical preparation and mental status, they evaluate athletic performance. Physical preparation is also a method of injury prevention. Moreover, the correct physical preparation of an athlete is closely linked to achieving desired performance. Physical tests assess the player's status, and based on them, the coach will know whether they can rely on the player in competition or even during training (Cağdanlıoğlu, Biçer and Vural, 2021). The negative effects of smoking on exercise performance are less common in young individuals with high aerobic capacity (Klausen,1983). Research shows that smoking leads to a decrease in individuals' performance capacity (Perkins,1991). It has been stated that individuals who smoke fifteen cigarettes a day for a year have difficulty exercising, even at low intensity, compared to non-smokers. During exercise, they tend to quit earlier than expected due to complaints such as fatigue, difficulty breathing, exhaustion, and pain in the legs and upper extremities (Gordon,1987).

Another study found that individuals who smoked three cigarettes within five hours had very low maximum oxygen consumption, oxygen uptake, pulse levels, heart stroke volume and anaerobic threshold levels. When comparing smokers and non-smokers, low heart rate and difficulties in reaching maximum exercise level are observed, and early quitting is also common. In addition, it has been determined that the chemicals in cigarette smoke negatively affect body weight by disrupting the energy balance in the body (Nadel,1961). Nicotine increases energy consumption in individuals at rest. Significant differences in oxygen consumption are observed between smokers and non-smokers; Smokers generally have lower oxygen consumption levels. Cigarette addiction minimizes the use of carbohydrate stores both during exercise and at rest, resulting in lower utilization of glycogen levels in the muscles (Ferannını,1983).

Research shows that smoking reduces maximum respiratory capacity, lowers blood oxygen levels and negatively affects athletic performance. Smoking causes 10% of red blood cells to degenerate. This leads to lower oxygen levels in the air taken into the lungs and a decrease in performance. As a result, symptoms of fatigue occur with the rapid accumulation of lactic acid in the blood. In such a situation, athletes are forced to pump more blood to the tissues, causing blood pressure to rise; Therefore, sports performance also decreases. One study stated that performance was inversely proportional to daily smoking and duration of smoking habit, and that smokers had worse training responses. As a result, maximum respiratory capacity increases in individuals who train regularly.

One of the negative effects of smoking over time is the decrease in respiratory capacity. As can be seen, smoking negatively affects the vitality and health provided by sports (Akgün,1986).

Effects of Exercise on Smoking

There are studies examining the benefits of exercise in quitting smoking and reducing the harmful effects of smoking. It has been observed that the desire to smoke decreases in individuals who smoke and participate in physical activity for 5 minutes. However, no decrease in this desire was observed in individuals who were inactive or only did light exercises. It has also been found that the desire created by a lit cigarette decreases (Turkish Cancer Research and Control Association, 2000).

There has been no research on how much exercise individuals should do to quit smoking, reduce its harmful effects, or eliminate the desire to smoke. The following points can be taken into consideration when including physical activity in programs to reduce the desire to smoke:

+ Individuals who aim to quit smoking can participate in 1-2 week exercise programs.
+ These exercise programs should be combined with treatment methods to eliminate the desire to smoke.
+ The starting level of exercises should start from the lowest level and smokers should be guided by an expert (Allen, 2008).

The effect of physical activity on quitting smoking or reducing the desire to smoke is promising. Previous research has shown a relationship between smoking habits and exercise in adults. For example, a study observed a 44% decrease in smoking rates among students who engaged in physical activity in the first 3 years of high school. In another study, while the probability of smoking for students interested in more than one sport was 3%, the probability of smoking for those interested in only two or fewer sports was found to be 22%. These results provide findings supporting that individuals who engage in physical activity are less likely to smoke. Therapy sessions or social support may be provided for quitting smoking; Physical activity programs may also be effective among these aids (Stormberg, 2007). One issue that needs to be clarified is whether physical activity directly affects the likelihood of smoking or whether the reduction in smoking rate is due to another factor of physical activity. However, it should be clearly stated that unconsciously increasing physical activity may negatively affect the positive results obtained (Dinç,2019).

Conclusion

As a result, in various studies, it is estimated that different types of exercises and physical activities have a reducing effect on smoking addiction and the physiological factors that cause the feeling of smoking, and that more detailed explanations will be provided on exercise and smoking addiction with new research in the future.

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Respiratory Assessment in Performance Sports

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To Cite This Chapter:
Vural, M. (2025). Respiratory assessment in performance sports. In F. Alincak (Ed.), *Current studies in sports science* (pp. 133–140). ISRES Publishing.

Introduction

In performance sports, the physiological factors that determine physical capacity are primarily addressed in terms of the musculoskeletal system, cardiovascular endurance, or the efficiency of energy systems. However, modern sports science shows that the respiratory system plays a much more central and dynamic role in these processes than previously thought. The increased ventilatory demand during intense exercise transforms respiration from a passive process that merely transports oxygen to the body into an active regulator of metabolic balance. The capacity of the respiratory muscles to respond to increased demand is crucial for maintaining the continuity of gas exchange and managing physiological stress during exercise. Indeed, current research indicates that respiratory muscle endurance and ventilatory control mechanisms are among the key parameters determining the sustainability of high-intensity performance (Illi et al., 2012; Shei, 2018; Aliverti, 2016; Álvarez-Herms et al., 2019).

This importance becomes even more pronounced in elite athletes. The respiratory system is not only a structure where oxygen and carbon dioxide exchange occurs, but also a physiological "distributor" mechanism that determines the distribution of blood flow directed to skeletal muscles working during intense effort. The "steal phenomenon" that occurs with excessive loading of the respiratory muscles can limit performance capacity by reducing blood flow to the lower extremity muscles. This situation demonstrates that the efficiency of the respiratory muscles is a critical factor not only in terms of maintaining ventilation but also in the context of competitive blood flow relationships between muscles. Fatigue in the diaphragm and accessory respiratory muscles during exercise can lead to early fatigue in peripheral muscles, increased metabolic cost, and a drop in performance earlier than expected (Nicolò et al., 2020; Johnson et al., 1992; Dempsey & Romer, 2006). There are studies on strengthening the muscle structure to counteract fatigue through training that targets the respiratory and diaphragm muscles, particularly to tolerate the fatigue that occurs in these muscles (Vural et al., 2024).
Therefore, respiratory assessment methods have evolved beyond being merely a clinical or physiological monitoring tool in today's performance sports; they are now utilized for multidimensional purposes, such as shaping training periods, creating athletic endurance profiles, understanding fatigue mechanisms, and determining the effects of

respiratory muscle training. Thanks to modern assessment protocols that measure the functional capacity of respiratory muscles, determine ventilatory thresholds, and reveal the relationship between respiration and exertion, the limiting factors affecting athletes' performance can be analyzed from a more holistic perspective.

This section addresses the role of the respiratory system in performance in detail, relating it to its physiological foundations. It explains respiratory assessment methods in light of current scientific data and comprehensively reveals the place and contributions of respiration-focused approaches, which are gaining increasing importance in modern sports science literature, in performance sports.

Contribution of the Respiratory System to Performance

Respiratory Mechanics and Changes During Exercise

As exercise intensity increases, there is a marked increase in both the frequency and tidal volume of ventilation to meet the body's increased metabolic demand. This rapid increase in ventilatory response significantly increases the mechanical workload of the accessory respiratory muscles, particularly the diaphragm, and substantially increases the energy consumption of these muscles. Although the metabolic cost of respiratory muscles is often overlooked during prolonged efforts, it is well known that oxygen consumption by the diaphragm and accessory muscles increases dramatically during high-intensity exercise. Therefore, the development of fatigue in respiratory muscles is a physiologically inevitable outcome, particularly in endurance performances where sustainability is critical (McConnell, 2013). This fatigue in the respiratory muscles is not limited to reducing the mechanical efficiency of ventilation; it also triggers a specific series of autonomic responses known as the respiratory muscle metaboreflex. The primary purpose of the metaboreflex is to protect the respiratory muscles by reorganizing the oxygen and blood flow required by the fatigued muscles. However, this regulation implies a systemic reprioritization, and as a result, blood flow to the working lower extremity muscles is reflexively restricted. This decrease in blood flow results in reduced oxygen delivery to the leg muscles, a rapid increase in metabolic stress, and an early limitation of performance. Previous studies have clearly demonstrated that this mechanism is a key determinant of performance loss, particularly during high-intensity endurance exercise (Babcock et al., 2002; Harms et al., 1997).

The Importance of Ventilator Thresholds in Terms of Performance

In endurance sports, performance evaluations based solely on maximal oxygen consumption (VO_2max) are now considered limited when viewed through the lens of modern sports science's multidimensional approach to performance. The VO_2max value indicates an athlete's theoretical aerobic capacity. However, it is not among the strongest

predictors of sustainable performance in competition. Ventilatory thresholds (VT1 and VT2), on the other hand, are emerging as more sensitive and functional parameters for performance prediction. These thresholds reflect the holistic response to the metabolic and respiratory demands of exercise (Wasserman et al., 2020; Kowalski et al., 2023; Rożek-Piechura et al., 2020). These points are not solely a result of aerobic capacity. They are also an interactive output of lactate dynamics, metabolic endurance, energy use efficiency, and ventilatory control. Therefore, ventilatory thresholds play a critical role in shaping a sport-specific performance profile.

The practical significance of ventilatory thresholds varies depending on the nature of the sport. For athletes such as long-distance runners, triathletes, and endurance cyclists, achieving a high percentage of VT2 is a fundamental physiological determinant for maintaining a sustainable race pace. This intensity zone represents the range where oxygen utilization and energy production processes can be sustained in the most balanced manner, making it a direct determinant of performance (Wasserman et al., 2020). In contrast, performance in sprint disciplines depends on short bursts of high-intensity effort above the ventilatory threshold (VT2), which requires sprinters to have strong ventilatory capacity and rapid ventilatory adaptation. In this context, threshold analysis also provides an important physiological reference by defining the zone where anaerobic energy systems become active. Therefore, ventilatory threshold analysis has solidified its status as an indispensable scientific tool utilized across endurance sports and a broad spectrum of other athletic disciplines, from high-intensity interval training to team sports. This approach not only enables precise individualization of training plans and competition strategies, but also ensures objective monitoring of the athlete's development. The superiority of threshold data over VO_2max is unequivocal in modern sports science, as it most accurately represents the multidimensional physiological foundations of optimal performance.

Respiratory Assessment Methods

Classic Respiratory Function Tests: Spirometry

Spirometry is widely used to assess respiratory function in clinical and sports environments. Parameters such as forced expiratory volume (FEV_1), forced vital capacity (FVC), and peak expiratory flow (PEF) provide information on airway structure and function. These measures mainly assess lung health; in most performance athletes, values exceed population norms, limiting their predictive value for maximal exercise capacity or competition performance (ATS/ERS, 2021). Still, spirometry provides essential baseline data for interpreting other respiratory assessments, making it a key reference in performance analysis (Xavier et al., 2025).

Respiratory Muscle Strength: MIP and MEP Measurements

Maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) are

direct, valid, and reliable measures of the strength of the breathing muscles. These measurements show how well the breathing muscles work, by showing the highest pressure the main breathing muscles (like the diaphragm) and the muscles that help with breathing in (MIP) or out (MEP) can create.

MIP is especially important in athletes because strong breathing-in muscles help them handle harder breathing during intense exercise. Stronger breathing muscles mean they work less hard during activity. This makes breathing more efficient, helping athletes maintain their endurance for longer periods before their breathing muscles become fatigued (Brown et al., 2014; Rodríguez-Anderson, 2018).

Therefore, MIP and MEP are crucial for assessing the effectiveness of athletes' breathing muscles and for managing their breathing needs during exercise.

Ergospirometric Assessment (CPET)

Ergospirometry, also known as cardiopulmonary exercise testing (CPET), is one of the most comprehensive methods of evaluating cardiorespiratory function in athletes. During the test, multidimensional physiological data, including oxygen consumption (VO_2), carbon dioxide production (VCO_2), ventilatory parameters, respiratory thresholds (VT1 and VT2), ventilatory efficiency (VE/VCO_2), heart rate response, and exercise tolerance, are obtained simultaneously. This comprehensive dataset reveals how the cardiovascular, respiratory, and metabolic systems perform together during exercise, providing the most reliable assessment of an athlete's true physiological capacity. The most significant advantage of CPET is its ability to objectively determine an athlete's physical limits based not only on maximal values, but also on metabolic transition points and ventilatory control mechanisms. CPET thus provides a strong foundation for individualizing training programs in performance sports, planning competition strategies, and monitoring athletes' adaptations over time (Wasserman et al., 2020; Shen, 2023).

Respiratory Muscle Endurance Tests

Various test protocols are used to evaluate the endurance of the respiratory muscles during prolonged exertion. These tests typically involve measuring sustained maximal inspiratory pressure, time to exhaustion, or sustainable performance against a specific inspiratory resistance. These methods reveal the functional endurance profile of the respiratory muscles, i.e., how long they can perform effectively under a given ventilatory demand.

Respiratory muscle endurance is a critical performance determinant, particularly in endurance sports, as effective functioning of the diaphragm and accessory respiratory muscles over a sufficient period during high-intensity, prolonged exertion directly impacts ventilation sustainability and continuous oxygen delivery. If the respiratory muscles fatigue early under this mechanical load, ventilatory efficiency decreases, and overall performance can be limited by triggering the respiratory muscle metaboreflex,

which reduces blood flow to the peripheral muscles. In this context, measurements of respiratory muscle endurance are crucial for determining the point at which an athlete will experience ventilatory strain during exercise (Illi et al., 2012).

Furthermore, data obtained from these tests provide an important basis for evaluating the effectiveness of inspiratory muscle training programs, creating personalized respiratory training strategies, and optimizing performance in endurance athletes. Therefore, respiratory muscle endurance assessment has become an integral component of modern performance analysis approaches.

Performance- Orianted Breathing-Focused Interventions

Inspiratory Muscle Training (IMT)

IMT is a systematic training method aimed at increasing respiratory muscle strength and endurance in athletes. Meta-analyses conducted in recent years have shown that IMT positively affects performance, particularly in high-intensity training and sports requiring repeated sprints (Afonso et al., 2021). IMT programs typically involve 4–8 weeks of training at 30–60% MIP intensity.

The main effects of IMT are:

- reduced ventilatory cost,
- delayed respiratory muscle fatigue,
- improved endurance economy,
- reduced perceived exertion during intense effort.

Inspiratory Muscle Warm-Up (IMW)

IMW is a technique applied shortly before starting exercise that aims to increase the neuromuscular readiness of the respiratory muscles. The literature shows that IMW protocols can produce short-term but significant effects on maximal speed, explosive power, and repeated sprint performance (Wüthrich et al., 2013; Grampi et al., 2020).

Conclusion

Modern sports science clearly demonstrates that explaining performance solely through traditional measures focused on the cardiovascular or musculoskeletal systems is insufficient; the respiratory system plays a crucial role in sustaining competitive performance. The strength and endurance of respiratory muscles, as well as the functional capacity of ventilatory control mechanisms, directly affect critical physiological processes, including the efficiency of oxygen delivery during exercise, metabolic balance, fatigue management, and intermuscular blood flow distribution. Therefore, respiratory assessments have evolved from being complementary elements in modern performance analysis to becoming a fundamental component that determines performance.

Methods such as spirometry, MIP/MEP measurements, respiratory muscle endurance tests, and cardiopulmonary exercise testing (CPET) discussed in this study offer the

opportunity to evaluate athletes' physiological capacities using a multidimensional approach. Spirometry determines the baseline level of basic respiratory functions; MIP and MEP measurements reveal the strength profile of the respiratory muscles, while endurance tests evaluate the tolerance of these muscles to prolonged loads. CPET, on the other hand, constitutes the most comprehensive analysis tool, integrating all these data to reveal ventilatory thresholds, oxygen consumption, ventilatory efficiency, and metabolic transition points. Thus, the athlete's actual performance capacity can be defined more accurately based not only on maximal values but also on physiological thresholds that determine sustainable performance.

Regular respiratory assessments enable the proper management of training loads, objective monitoring of athlete development, and individualization of competition strategies. In particular, determining ventilatory thresholds enables scientific planning of competition pace in endurance sports, while evaluating respiratory muscle profiles underscores the need for training approaches that enhance ventilatory economy and fatigue tolerance. Key takeaway: Targeted respiratory assessments and training are essential for optimizing performance and strategy in athletes.

In addition, inspiratory muscle training (IMT) and inspiratory muscle warming (IMW) applications, whose effectiveness has been widely demonstrated in the literature, improve exercise economy and delay respiratory muscle fatigue by enhancing the performance of respiratory muscles. Integrating these interventions into training periodization can create significant physiological gains, providing athletes with a competitive advantage. Therefore, the inclusion of respiratory-focused intervention strategies in modern performance programs offers multifaceted benefits, not only improving performance but also reducing injury risk, improving fatigue management, and increasing metabolic stress tolerance.

Consequently, the systematic and comprehensive application of respiratory assessment methods enables the most accurate analysis of athletes' performance capacity, the optimization of training load based on scientific principles, and a clearer understanding of the decisive role of respiratory muscles in physical endurance. In modern sports applications, the respiratory system should be considered not only as a physiological infrastructure element but also as a direct determinant of performance; assessment, monitoring, and training strategies should be structured accordingly.

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Overtraining and Burnout in Individual Sports

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To Cite This Chapter:
Demiryolu, M. B. (2025). Overtraining and burnout in individual sports. In F. Alincak (Ed.), *Current studies in sports science* (pp. 141–149). ISRES Publishing.

Introduction

To be successful in sports, individuals must have well-developed biomechanical characteristics and a high level of sport-specific technical and tactical skills (Brewer, 2017). Sports, categorized into team and individual disciplines, require specific anthropometric, demographic, physiological, psychological, and technical characteristics inherent to their nature. Although this need remains generally the same up to a certain level, it increases beyond a certain level for various reasons, such as increasing age and competition level in individual sports, and increasing team performance, rising to a higher level, and increased competition with other athletes on the team in team sports (Bishop and Girard, 2013). Athletes must meet this need according to their sport. To do so, they are required to train on specific days of the week and complete specific technical and tactical training appropriate to their sport. The sports in which athletes generally perform best, fully express themselves individually, and demonstrate their highest level of skill are individual sports such as swimming, wrestling, modern pentathlon, taekwondo, and athletics (Nevill, Atkinson, and Hughes, 2008). Individual sports consist of activities that require intense focus and concentration, involve a great deal of responsibility, and depend on performance for success or failure, with a high level of competition (Başer, 1998). The high level of responsibility causes athletes participating in individual sports to experience more stress than those participating in team sports. Because they must solve most problems arising from their sport alone during competitions or the competition period, they may feel lonely. If they fail to learn how to cope with stress, the problems they encounter can significantly impact their daily lives, leading to various physiological and psychological impairments (Neil et al., 2011). Instead of overcoming this feeling of loneliness and the resulting impairments, continuing to train or compete in sports can lead to overtraining, characterized by the inability to continue training due to physiological reasons, and burnout syndrome, which is related to motivation and psychological factors (Pacewicz, Smith, and Frank, 2025). Although these two important concepts are used similarly, they address different points and appear as two separate syndromes.

Over Training

Overtraining can be defined as a decline in biophysiological performance in athletes who,

after training at or above their maximum performance level for an extended period, subject their bodies to high-intensity training for an excessively prolonged period (Weinberg and Gould, 2010). The literature suggests that the concepts of overtraining and excessive exertion should be evaluated separately, as it is correct to consider these two concepts independently (Kreher and Schwartz, 2012). The concept of overtraining is defined as a temporary decline in performance that occurs during the recovery process necessary for performance improvement, following an increase in training intensity required to elevate the athlete's performance level to higher levels (Lehmann et al., 1999). This short-term decline in performance capacity is regained through a brief recovery period, leading to higher performance outputs, and is known in the literature as physiological adaptation or supercompensation (Carfagno and Hendrix, 2014). Overtraining, on the other hand, is defined as the chronic physiological and psychological decline in performance resulting from continued high-intensity and high-volume training without properly addressing the fatigue caused by an imbalance between training and rest (Bompa and Buzzichelli, 2019). Within this framework, previous research shows that respiratory muscle fatigue, neuromuscular decline, and reductions in inspiratory strength may occur during periods of excessive loading—findings supported by studies examining inspiratory muscle training and acute inspiratory warm-up effects (Vural et al., 2024; Bilgiç, Özdal & Vural, 2022). Although there are many definitions of the concept of overtraining, it is generally used synonymously with the concepts of fatigue, exhaustion, or burnout. However, there are important points that distinguish these concepts from one another (Kreider, Fry, and O'Toole, 1998). When defining overtraining, it has been observed that many scientists have subjected it to different classifications. According to Kuipers, the concept of overtraining can be divided into two aspects: mechanical and psychological. Mechanical overtraining is defined as injuries or damage to the locomotor system and damage to skeletal muscles due to excessive loads, while psychological overtraining is thought to result from the athlete being exposed to factors that cause intense stress (sociodemographic factors, family, economic problems, etc.) and the heavy training undertaken to improve the athlete's level during this process (Kuipers and Keizer., 1988). At the same time, Kuipers stated that overtraining is often developed by the coach, who ignores the fatigue it causes in the athlete without paying attention to the training and rest ratio, leading to exhaustion, and that this exhaustion can become chronic, ultimately causing overtraining (Kuipers and Keizer, 1988). In 2013, Meeusen and colleagues stated that the concept of overtraining can be divided into two categories: functional and non-functional overtraining (Meeusen et al., 2013). Functional overtraining is defined as the process of adapting to training, where high-intensity training is followed by adequate rest, leading to an optimal increase in performance. Non-functional overtraining, on the other hand, is defined as injuries that cause serious physiological and psychological symptoms when adequate rest is not provided after high-intensity training (Halson, 2017). The distinction between non-functional overtraining and functional overtraining is difficult, but it is

generally thought that the symptoms caused by non-functional overtraining syndrome are more severe (Jurgen, 1994). As another classification, scientists have divided the concept of overtraining into sympathetic and parasympathetic overtraining, stating that overtraining originates from the autonomic nervous system (Vrijkotte et al., 2019). This classification is the most comprehensive classification in the literature. Sympathetic overtraining occurs when athletes are subjected to stimuli of high intensity beyond their normal capacity, resulting in excessive fatigue in athletes during training periods where rest is not adequately provided, or when symptoms such as rapid heartbeat, sweating, irritability, restlessness, and nervousness are observed after high-intensity training, similar to Base Dow disease (Jurgen, 1994). Symptoms of sympathetic overtraining originating from the autonomic nervous system include:

- Emotional changes (quick temper, crying easily)
- Excessive emotional stress
- Weight loss
- Sleepiness
- Smelly sweat and sweaty hands
- Decreased Appetite
- Loss of Libido
- Increased Basal Metabolism
- Restlessness
- Lack of Coordination in Movements
- Increased Blood Pressure and Body Temperature
- Inability to Recover Quickly After Exercise
- Increased Resting Heart Rate
- Increased risk of infection as a result of disorders in the cardiovascular, cardiorespiratory, neurological, and endocrine systems (Günay and Cicioğlu, 1998).

As mentioned above, sympathetic overtraining, which exhibits common symptoms, is often observed in young athletes who transition to professional status at an early age, accompanied by a decline in performance. It is not difficult to treat and is a syndrome that can be easily corrected with appropriate programming and expert medical advice (Günay and Cicioğlu, 1998). Parasympathetic overtraining occurs as a result of chronic fatigue in the body, which can develop after periods of high-intensity training, and its treatment is known to be quite challenging (Jurgen, 1994). Parasympathetic overtraining can lead to low blood pressure, increased anemia, and various digestive system disorders in athletes. The symptoms of parasympathetic overtraining in athletes are as follows:

- Low performance and difficulty in recovery
- Fatigue and persistent pain
- Decreased skill, coordination, and technical level upon returning to training
- Inability to recover despite prolonged rest periods and low blood pressure (Günay

and Cicioğlu, 1998)

Studies suggest that parasympathetic overtraining can occur even without excessive training load, is generally seen in elite athletes, and can be eliminated with long-term treatment (Lehmann, 1999). The emergence of the concept of overtraining can be explained in many etiological, physiological, psychological, and neurological ways, and it is important to evaluate this concept from a pathophysiological perspective. When examining the pathophysiological causes of the concept, we encounter numerous theories. These are:

- Cytokine Theory
- Autonomic Imbalance Theory
- Glycogen Theory
- Central Fatigue Theory

(Smith, 2000; Carfagno and Hendrix, 2014). To understand whether an athlete is overtrained, it is first necessary to know their sport, the problems they are experiencing, changes in their mood, levels of fatigue and muscle pain, dietary habits, sleep levels, training intensity or the level of increased training intensity at competition level, and whether they are using any specific medications (Hawley et al., 2003). With this information, along with the athlete's biochemical markers (blood parameters, CK, lactate level, hormonal markers) and various tests (emotional assessment questionnaires, stress and recovery questionnaires, anxiety and motivation questionnaires, etc.), it is possible to determine whether they are overtrained (Dinçer and Ertuna, 2020). Various methods are used to help overtrained athletes return to specific training periods. First, it is possible to reduce the overtraining process and prepare the athlete for a new training period by having the athlete enter the necessary rest period and using various rehabilitation exercises, rapid recovery exercises, a regular nutrition process, glutamine supplementation, and drug treatment to prevent further performance loss during this period (Brukner, 2012; Hiscock and Mackinnon., 1998). For the athlete to successfully navigate this process, the athlete, coach, and family must maintain high levels of communication and progress through it together. In cases where the process does not progress together, the athlete's overtraining can become chronic, leading to burnout syndrome and potentially causing serious discomfort, which may even lead the athlete to quit the sport.

Burnout

The concept of burnout was first addressed in a sporting context in 1984 in a study conducted by Caccese and Mayerberg on coaches. It is believed that the media played a significant role in spreading the concept worldwide by focusing on the decline in performance and dramatic drop in performance levels experienced by world-renowned athletes, despite their numerous achievements following intense training, and by publishing various news stories on this topic (Caccese and Mayerberg, 1984). According to the concept of burnout, which was attempted to be explained in 1984, this concept

should be examined in three dimensions:

- Emotional Exhaustion
- Depersonalization
- Decline in Athletic Performance

It has been discovered that burnout is formed when an athlete is affected by events they have directly experienced (Caccese and Mayerberg, 1984). In a study on burnout among swimmers, an individual sport, it was explained that athletes defined this concept as a loss of sense of achievement, loss of feelings for the sport, reluctance to participate, anger, and withdrawal from the sport both physically and psychologically (Raedeke, Lunney, & Venables, 2002). Following this explanation, scientists concluded that the first dimension of burnout, emotional exhaustion, is related to intense training and competition reaching unmanageable levels. The second dimension, cynicism, is related to the athlete's attitude of not caring about their work, viewing the sport as worthless, and increased indifference towards the sport, resulting in an increase in anger. Finally, the dimension of reduced performance is thought to be related to the athlete's inability to achieve personal goals despite their ambition, skill, and talent, along with a decreased sense of achievement following a lack of success despite intensive training in the sport (Goodger et al., 2007). At the same time, Schaufeli and Buunk contributed to the literature in 2003 by summarizing burnout with the following five symptoms:

- Emotional Symptoms (Depressive mood, sudden mood swings, irritability, nervousness, etc.)
- Cognitive Symptoms (Feelings of helplessness, impaired attention and coordination, memory loss, etc.)
- Behavioral Symptoms (Absenteeism from training, poor performance during training, etc.)
- Physical Symptoms (Illness before or after training, persistent fatigue, weakness, etc.)
- Motivational Symptoms (Loss of sense of achievement, unhappiness during training, feeling of failure, loss of competitive spirit, etc.)

(Schaufeli & Buunk, 2003). Recent studies show that burnout is a concept that emerges when an athlete no longer enjoys the sport they love as much as before or no longer derives pleasure from it, leading to both physiological and psychological discomfort that progresses into a syndrome and ultimately results in quitting the sport (Özdemir and Cömert, 2023). Despite similar studies, at the beginning of the 2000s, burnout was examined in three dimensions, and it was determined that there are three causes for the formation of burnout:

- Emotional Exhaustion (hopelessness, depressive feelings, and loss of motivation)
- Incompetence (It is thought to arise when athletes question themselves due to their performance and success falling short of their expectations in their sport.)
- Depersonalization (Athletes withdrawing into themselves, weakening their social

relationships in their daily lives)
(Raedeke and Smith, 2001). Supporting this, studies conducted during the COVID-19 pandemic showed that athletes experienced significant psychological stress, decreased training motivation, and mental health deterioration (Akgün, Biçer & Vural, 2021; Cagdanlıoğlu, Biçer & Vural, 2021). These findings align with the concept that environmental and psychosocial burdens may accelerate burnout.

It is thought that burnout syndrome in athletes is not only affected by the intensity of training or competition, but also by certain external factors. High levels of stress in the athlete's environment can lead to anxiety and, as a result, burnout. An intense competition schedule or more extensive training periods than necessary can cause fatigue in athletes, and this fatigue can lead to negative emotional states, subsequently causing them to withdraw from social environments and social support. Separately, athletes who have to balance their personal and social lives outside of their athletic identity are thought to be at increased risk of depression, not only due to decreased athletic performance but also due to the negative impact on their social relationships as a result of the social or personal problems they experience (Smith, Pacewicz, & Raedeke, 2019). Increased psychological, cognitive, and physical symptoms can affect an athlete's athletic ability, leading to them quitting sports (Larson, Young, McHugh, & Rogers, 2020). Athletes, especially in individual sports where they experience loneliness and bear all the responsibility during competition, face an intense and exhausting process involving long competition periods, intense and demanding training schedules, family and friend relationships, and coping with personal, physical, cognitive, and psychological problems. During this process, the athlete's coach, manager, family, friends, and other members of their social circle must work together in complete harmony. It is considered that the athlete's coach should maintain a balanced progression of the rest-training ratio required by the sport, utilize various recovery strategies during competition periods, ensure the athlete is satisfied both financially and emotionally in their professional sport, and provide extra motivation during planned important competition periods.

Conclusion

For an athlete to reach a professional level and achieve success on the international stage, it is essential that they continue training. Despite advances in training science, the intense training programs athletes undergo during competition periods cause fatigue. It is known that when adequate rest periods or proper recovery exercises are not provided after fatigue sets in, athletes suffer from certain physiological and psychological injuries. Particularly in individual sports, where athletes train alone, take full responsibility, and achieve success individually, numerous factors affect the athlete, including the responsibilities assigned, social pressure, the need to be self-sufficient financially and emotionally, the ability to cope with psychological pressure, and the necessity to motivate oneself. When athletes cannot withstand both intense training and these external factors,

they may experience overtraining (overtraining syndrome) in physiological terms and are unable to continue training. When rest and training frequency are not completed, overtraining can become chronic, leading to serious injuries and even causing athletes to quit the sport. Along with these physiological and psychological disorders, the athlete experiences a loss of motivation, decreased performance, and a diminished sense of the sport's importance, ultimately leading to burnout syndrome. This can lead to various psychological disorders, and the athlete may regain their health through psychological treatment methods. Consequently, it is necessary to monitor the athlete's physical and psychological exhaustion or overtraining at certain intervals through various tests, carefully examine the dynamics of the athlete's social and cultural environment, and ensure that the rest periods required for the technical and tactical training of the individual sport are controlled by the coach. During the preparation phase for the competition period, it is essential to design the program appropriately in accordance with the athlete's performance level, development level, and demographic characteristics, such as gender and age. Additionally, the coach should monitor the athlete's readiness through various physiological and psychological performance tests at regular intervals. Club managers, coaches, athletes' families, and athletes aiming for success in international competitions in individual sports are advised to implement the practices outlined above.

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