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Foreword

In recent years, physical activity has been widely accepted as a cornerstone of health, well-being, and quality of life. However, traditional exercise paradigms, which are often limited to indoor spaces or highly structured environments, have shown limitations in meeting the diverse physical, psychological, and social needs of different population groups. In response to these limitations, green exercise—defined as physical activity performed in natural settings—has emerged as a powerful and holistic approach that integrates movement with nature's healing properties. This book, *Green Exercise: Adapted Physical Activity in Natural Environments*, aims to provide a comprehensive scientific and practical framework for understanding how nature-based physical activity can be adapted for individuals with disabilities, older adults, and other special populations. Green exercise offers measurable benefits beyond physical health, including cognitive performance, emotional regulation, stress reduction, and overall well-being. These effects are increasingly supported by evidence from the fields of exercise science, environmental psychology, neuroscience, and public health. The main focus of this book is adapted physical activity, emphasizing inclusivity, accessibility, and individualization. Natural environments such as forests, parks, coastal areas, and green urban spaces offer flexible

and scalable settings where physical activity can be modified according to functional capacity, health status, and personal needs. In this context, practices such as forest bathing (Shinrin-yoku) are examined not only as cultural or recreational activities but also as scientifically grounded interventions with psychophysiological significance. In addition to theoretical foundations, this book brings together hypothesis-driven perspectives, methodological considerations, and applied models to guide researchers, practitioners, and policymakers. Combining theory and practice, the book aims to contribute to the development of evidence-based interventions and inspire future research in the rapidly expanding field of nature-based exercise. Ultimately, this work advocates for a paradigm shift: a transition from viewing exercise as a purely mechanical action to understanding movement as an experience deeply connected to the natural world. We hope this book will serve as a reference for academics, health professionals, educators, and students aiming to design more inclusive, effective, and sustainable nature-based physical activity programs.

Contents

Introduction

It has been almost four years since the onset of the new coronavirus shock. With governments declaring states of emergency, people were forced to stay at home. As people were confined to their homes, they began working from home. This spared them the commute to work and allowed them to save more time. While this time savings should have had a positive effect on individuals, new stress factors began to emerge as societies failed to adapt to working from home and were unable to make good use of the extra time. Scientists suggest nature as the easiest and most reliable way to overcome these stress factors. Although not widely known around the world, "nature reduces stress" has been researched by many academic institutions and scientifically proven.

Physical activity is a well-known behavior for supporting health and preventing various chronic diseases. Although the benefits of physical activity are widely known, most people do not get enough physical activity. Over the past decade, the health benefits of spending time in nature, partly through physical activity, have become increasingly recognized. This has led to new partnerships between health, parks and recreation, public lands, and environmental organizations to increase time spent in natural settings and physical activity.

Regular physical activity provides a wide range of health benefits throughout life. These include primary and secondary prevention of chronic conditions such as cardiovascular disease, diabetes, certain cancers, and osteoporosis. Immune function improves, pain control increases, the risk of falls decreases, and life expectancy increases. Physical activity has been shown to have a positive effect on various aspects of mental health, including mood, mild cognitive impairment, anxiety, dementia, and depression. The Physical Activity Guidelines for Americans recommend that adults engage in 150-300 minutes of moderate physical activity or 75-150 minutes of vigorous physical activity per week for health benefits, and that children and adolescents engage in 60 minutes or more of moderate to vigorous physical activity per day. There may be a dose-response relationship between health benefits and up to 300 minutes per week of moderate and vigorous physical activity. However, an online survey conducted two years after the 2018 guidelines were published showed that less than a quarter of American adults were aware of these guidelines. Indeed, despite nearly 30 years of physical activity guidelines, recent CDC data showed that more than a quarter of Americans did not engage in any leisure-time physical activity in the past month, and only 24% met both aerobic and muscle-strengthening guidelines. Given the limited progress made in increasing physical activity, new approaches may be needed to motivate inactive people to become active.

There is growing evidence and acceptance of the health benefits of spending time in nature. Like physical activity, contact with nature offers a wide range of benefits, from improving cognitive function and mood to pain control, strengthening the immune system, improving birth outcomes, and reducing mortality rates. These benefits have been extensively studied. As biologist EO Wilson suggests in his biophilia hypothesis, there may be evolutionary origins

to our tendency to benefit from contact with nature. Multiple mechanisms are likely at work in delivering these benefits, including stress reduction, attention restoration, social connections, and enhanced immune function. One possible pathway is physical activity: natural environments are attractive, even inspiring, settings for walking, running, cycling, and other active lifestyles for both utilitarian and recreational purposes.

Exercising in nature is more beneficial than exercising in a gym. According to a new study, exercising in green spaces improves mood, lowers stress levels, and increases heart rate compared to exercising in the city or indoors. Twenty-five young men participated in the study and had to walk at the same pace in three different environments: a natural area, an urban route, and an indoor gym. After each walk, their moods, stress levels, and physical exertion were measured and the results were analyzed. Participants felt significantly more relaxed after walking in nature, and their stress hormone cortisol levels dropped. They also reported feeling happier and less tired. Studies clearly show that exercising in nature provides much greater mental benefits than exercising in urban or indoor environments.

CHAPTER 1

Green Exercise and Physical Activity

1.1. Green Exercise

Green exercise is defined as physical exercise performed in a natural environment. It is known that physical exercise is performed to obtain physical and psychological benefits for health. The concept of green exercise has emerged within well-established fields such as environmental psychology, which tends to focus on the psychological and physical effects of observing nature and well-known studies on the psychological benefits of physical exercise, including attention restoration theory. The potential role of green exercise in physical and mental health has been the subject of increased interest since the early 21st century, particularly through various programs funded by research conducted by Jules Pretty and Jo Barton from the University of Essex.

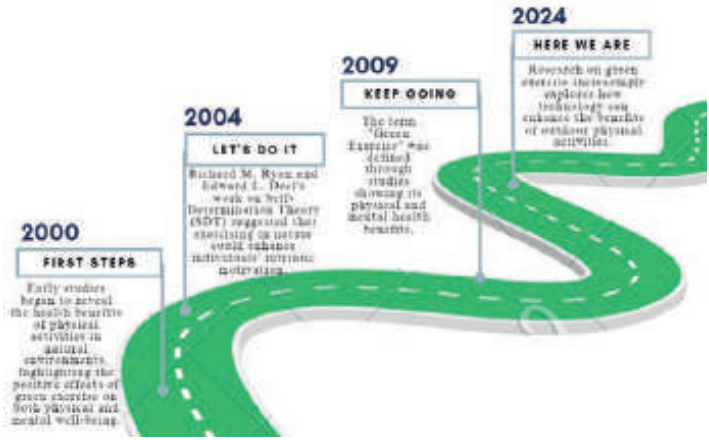

Figure 1. Developmental Framework of Green Exercise

High levels of physical inactivity in high-income countries have become a cause for concern due to their contribution to the development of many significant health problems (cardiovascular diseases, cancer, obesity, etc.). Traditional efforts to improve physical activity through health education and social marketing have had limited effects. Increasing efforts to boost physical activity are following a suggestion approach that considers the role of the environment in determining health behaviors such as physical activity (Rhodes & Nasuti, 2011).

Green spaces can be one of the environmental influences that encourage physical activity by providing a safe, accessible, and attractive place for exercise such as walking, running, cycling, or ball games. It is assumed that those with greater access to green spaces in their living environment can be expected to achieve higher levels of physical activity (Sallis & Owen, 2002). Some scientific studies have been conducted to determine whether there is a relationship between green space and physical activity. While some studies found a positive

relationship between green space, access to green space, and physical activity (Epstein et al., 2006; Giles-Carti & Donovan, 2002; Roemmich et al., 2006; Coombes et al., 2010; Gomez et al., 2010; Sugiyama et al., 2010), while other studies have found weak relationships or no effect (Maas et al., 2008; Foster et al., 2009; Witten et al., 2008; Giles-Corti et al., 2005; Hillsdon et al., 2006). The studies conducted address a wide variety of communities, including adults, children, and vulnerable groups with mental illness. The decrease in time spent in nature and the difficulty of accessing parks and playgrounds have led to a decline in physical activity levels. Researchers emphasize that exercise in natural environments, defined as "green exercise," contributes significantly to health (Bayrakdar & Yıldız, 2020).

Additionally, the term "parasympathetic nervous system dominance" has recently begun to be used on the internet, TV, and social media. Parasympathetic nerves are autonomic nerves that begin to activate when emotions calm down. They have the function of relieving fatigue and stress. Research was conducted at Derby University in the United Kingdom on activating the parasympathetic nerves through "contact with nature." The research found that the activation time of the parasympathetic nerves when interacting with nature is 0.71 seconds. The literature shows that the effect is significant when this time exceeds 0.5 seconds. Another study conducted at the University of Amsterdam proposed the hypothesis that "even if it is fake, it is effective as long as it looks natural." People were shown photographs related to nature. The subjects' parasympathetic nerve activation increased, and their heart rates began to decrease. A study conducted at the University of Sussex indicated that the sounds of wind and animals increase parasympathetic nerve activation.

Experts recommend converting your smartphone and computer screens to natural images. They also recommend

listening to natural sounds (animal and wind sounds, etc.) downloaded to your phone instead of music when commuting to and from work. The above expert recommendations support the findings mentioned in the previous paragraph. We can easily find as many nature images as we want on Google and find many natural sounds on YouTube.

Let's move away from nature photos for a moment and include a leafy plant in our environment. The stress-reducing effect of plants has been proven in various studies, and it has also been reported that they increase happiness and concentration.

The convergence of technology and nature has become even more apparent amid the complexities of our lives. One such intersection is green exercise, physical activities performed in natural settings, which are noteworthy for their multifaceted benefits on physical health, mental well-being, and environmental awareness. Traditionally, green exercise has rescued individuals from the technological immersion of contemporary life by reconnecting them with natural landscapes and encouraging sustainable lifestyles. However, as technological advances continue to permeate various aspects of daily life, the integration of sports technologies into green exercise applications presents both new opportunities and unique challenges. In our fast-paced world, we struggle to integrate physical activity into our daily lives. When we find the time, we tend to head to indoor spaces and gyms. However, a growing body of research shows that exercising outdoors, often referred to as green exercise, provides greater physical and mental health benefits than exercising indoors. From reducing stress levels and blood pressure to regulating blood sugar and improving overall well-being, green exercise offers a refreshing alternative to indoor exercise and instantly improves mood.

Figure 2. Green Exercise and Intersection Points

The integration of sports technology into green exercise activities signifies a transformation that significantly alters how these exercises are perceived and experienced. For example, wearable devices have evolved beyond simple pedometers into sophisticated tools that can track heart rate variability, calorie expenditure, and even sleep patterns. In the context of green exercise, these data-driven insights can help users optimize physical activities aligned with specific fitness goals such as endurance, strength, or overall well-being. Despite the benefits of the digitalization of green exercise, it raises questions about the potential balance between technological engagement and the intrinsic values of nature-based experiences. Therefore, while sports technologies have the potential to enhance green exercise, the lack of equal access remains a critical concern. However, the proliferation of electronic devices also brings new environmental costs, such as electronic waste and the carbon footprint associated with the production and disposal of devices. Therefore, in addition to the functionality of sports technologies, innovation in life cycle management is important for achieving health and fitness goals without compromising environmental integrity.

1.1.1. Sports Technologies Used in Green Exercise

The use of wearable technologies in the fields of physical activity, exercise, and sports has increased significantly in recent years. These technologies are seen as a practical tool for individuals to monitor their physical condition, especially in green exercise applications. Wearable technologies are generally defined as devices that are worn on the body or integrated with the body. Through such devices, basic health indicators such as heart rate, step count, energy expenditure, and sleep patterns can be monitored in daily life. The most commonly used wearable technologies include smartwatches, activity trackers, and health monitoring devices. Smartwatches can provide users with feedback on their physical activity level and exercise intensity, in addition to their communication functions. Smart clothing, on the other hand, allows movement patterns and muscle activity to be monitored through sensors integrated into the textile surface. Health monitoring devices are mainly used to measure physiological variables such as heart rate, blood pressure, and oxygen saturation. The fundamental feature of wearable technologies is their ability to transfer data to a digital environment and work in an integrated manner with mobile applications thanks to their microprocessor-based structures. The activity trackers introduced to the market in the early days formed the starting point for technological developments in this field. Over time, with the addition of screen-based systems, mobile applications, and more advanced sensors, their areas of use have expanded. Today, it can be said that these technologies have become an important tool not only in the field of sports and fitness but also in terms of health monitoring and lifestyle management.

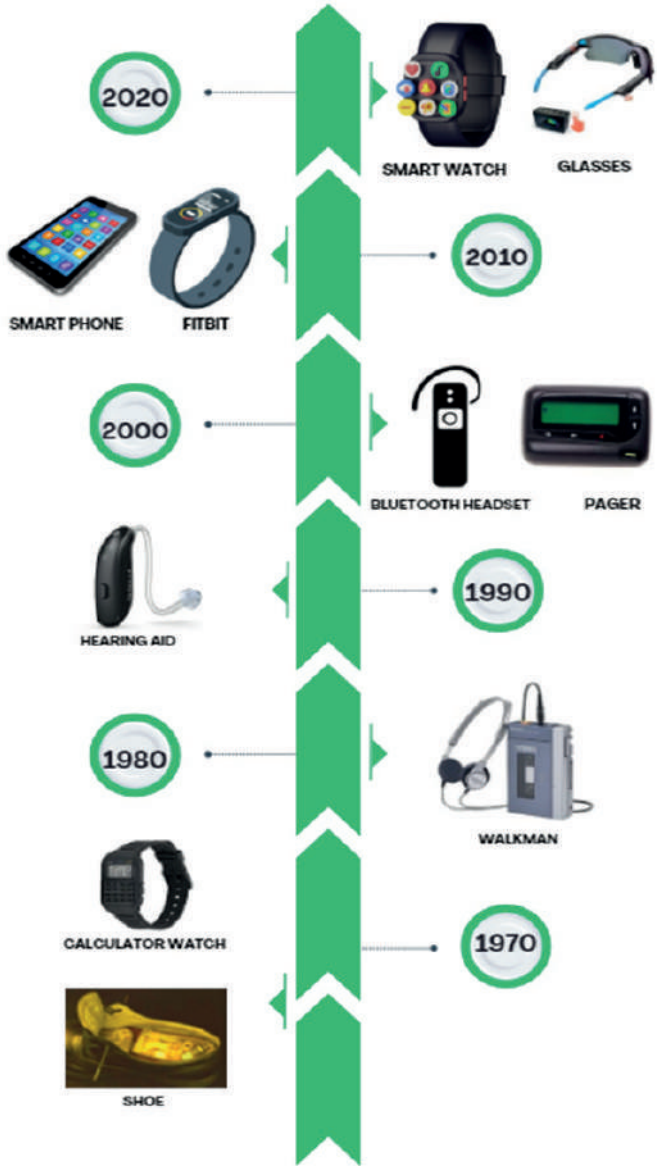

Figure 3. The evolution of wearable technologies over the past 50 years

1.2. Physical Activity

Physical activity is a movement-based behavior that supports health and prevents various chronic diseases. Physical activity is also accepted as a method of expressing the energy expended because of skeletal muscle movement. Physical activity encompasses all activities performed at any time of the day. Furthermore, physical activity increases energy expenditure and is an important regulator in controlling body weight. It includes both voluntary exercise and activities integrated into daily routines. This integrated activity includes planned, structured, or repetitive activities for improving physical fitness. (For example, walking, cleaning, working, etc.).

Lack of physical activity is associated with a number of adverse health outcomes. Conversely, increased physical activity has been found to improve physical and mental health as well as cognitive and cardiovascular health. Physical inactivity has increased, especially in the age of information technology. Consequently, people's eating habits have changed, and fast-food consumption has become commonplace. Furthermore, as a result of physical inactivity and increased fast food consumption, negative problems such as cardiovascular diseases, obesity, skeletal muscle problems, diabetes, and hypertension have begun to emerge. To increase physical activity:

- General programs in schools
- Active transportation
- Active urban design
- Health services
- Public education and mass media
- Sports for all

- Programs are available in workplaces and throughout the community.

Summermatter Cycle

It is a physiological concept that describes the complex relationship between physical activity/inactivity and energy expenditure. This hypothesis was proposed in 2012. This concept provides evidence-based explanations for why dieting is often unsuccessful and leads to the yo-yo effect. A key element of the Summermatter cycle is that the decrease in energy intake resulting from dieting or fasting initially leads to successful weight and fat loss. At the same time, reduced food availability promotes active movement, which further accelerates body and fat mass loss and consumes ATP, glycogen, and intramyocellular lipids in skeletal muscle. Energy scarcity ultimately suppresses thermogenesis in skeletal muscle to conserve energy. Once energy becomes available again, this initially adaptive program supports the replenishment of energy stores and weight gain.

The concept of the Summermatter cycle has found a wide range of applications in body weight management for timing exercise interventions and preventing compensatory weight gain (the yo-yo effect). Recent advances in obesity treatment (e.g., GLP-1 and GIP agonists) have further increased interest in the Summermatter cycle. Treatments with incretins such as semaglutide cause not only fat loss but also muscle mass loss. Suppressed thermogenesis, as defined by the Summermatter cycle, explains weight and fat regain in patients who discontinue incretins. Furthermore, this concept is used by elite athletes to optimally coordinate training sessions and energy intake.

Misuse of Physical Activity Terminology

Physical activity, exercise, and sports are often used interchangeably and refer to physical activity performed

during leisure time to improve and maintain physical fitness, performance, or health. Physical activity is generally not the same concept as exercise. Exercise is a planned, structured, repetitive activity aimed at improving or maintaining one or more components of physical fitness. In contrast, physical activity includes exercise, but it can also be unplanned, unstructured, random, and purposeless. The intensity of physical activity ranges from a sedentary lifestyle to intense physical activity. A 2021 study showed that people who started successful physical activity programs continued most of these programs for at least three months.

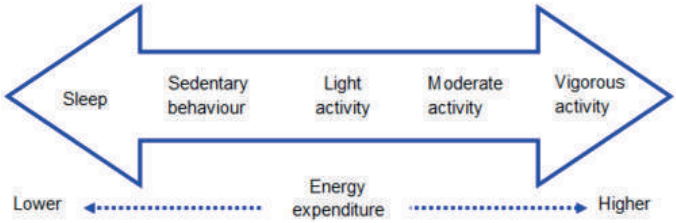

Figure 4. Energy Expenditure

Physical activity can range in intensity from a slight muscle twitch to sprinting. In practice, physical activity can be thought of as a continuum ranging from sedentary lifestyles to high-intensity exercise. This intensity is broadly categorized based on energy expenditure using metabolic equivalents (METs). These categories are:

- Sedentary lifestyle
- Light activity
- Moderate activity
- Vigorous activity.

The table below provides examples of physical activities at each intensity level. Depending on the individual and the activity, activities may overlap intensity categories or fall entirely outside them.

Table 1. Physical Activity Recommendations

Intensity	Example Activities
Sedentary Behaviour	Sitting, lying down
Standing	Standing still
Light Physical Activity (LPA)	Walking slowly, crawling around the house.
Moderate Physical Activity (MPA)	Brisk walking, running, light swimming, climbing stairs
Intense Physical Activity (IPA)	Fast running, fast cycling, sprinting

Physical activity is one of the cornerstones of public health and the prevention and treatment of noncommunicable diseases. Numerous studies in the literature have demonstrated the potential beneficial effects of physical activity in the prevention and treatment of many conditions, such as obesity. Physical activity has been shown to reduce anxiety as a state (non-continuous individual physical exercise), anxiety as a personality trait (continuous performance of specific physical activities, "exercise"), and the psychophysiological symptoms of anxiety—blood pressure and heart rate

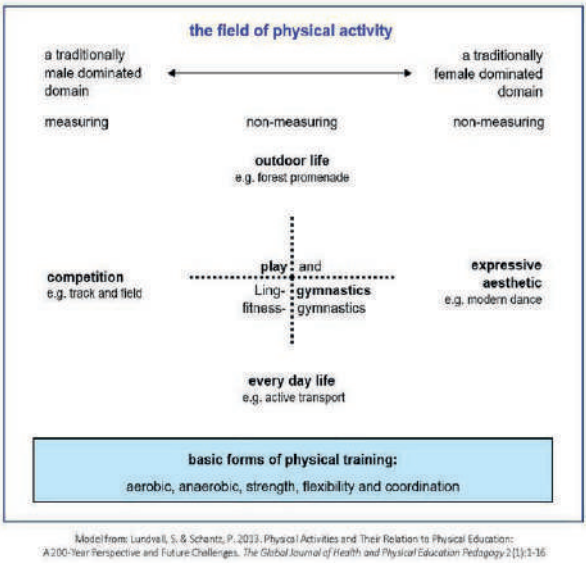

Figure 5. Physical activity domains (Source: Lundvall & Schantz, 2013).

According to a study modelling the physical activity domain in terms of clusters of movement cultures with different meanings, different forms of physical activity in leisure time can be divided into different activity clusters that share a common denominator in the form of meaning. We can see this clearly in the model above. These distinct forms of meaning consist of the following:

- Competition and championship
- Encounters with nature
- Aesthetics
- Fitness gymnastics and games
- Daily exercise

- Training methods (aerobic, anaerobic, strength, flexibility, and coordination)

Physical Activity Recommendations

The World Health Organization (WHO) recommends the following.

For adults aged 18-64:

Adults aged 18-64 should engage in at least 150 minutes of moderate-intensity aerobic physical activity throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activities.

1. Aerobic activity should be performed in sessions of at least 10 minutes.
2. 3. For additional health benefits, adults should engage in at least 300 minutes of moderate-intensity aerobic physical activity per week, or at least 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activities.
3. 4. Muscle-strengthening exercises should be performed on 2 or more days per week, targeting major muscle groups.

Adults aged 65 and older

1. Adults aged 65 and older should engage in at least 150 minutes of moderate-intensity aerobic physical activity throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activities.
2. Aerobic activity should be performed in sessions of at least 10 minutes.

3. For additional health benefits, adults aged 65 and older should engage in at least 300 minutes of moderate-intensity aerobic physical activity per week, or at least 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activities.
4. Adults in this age group with low mobility should engage in physical activity 3 or more days per week to improve balance and prevent falls.
5. Muscle-strengthening exercises should be performed at least 2 days per week, targeting major muscle groups.
6. If adults in this age group are unable to engage in the recommended amount of physical activity due to health issues, they should be as physically active as their abilities and condition allow.

Children and Adolescents Aged 5-17

Children and adolescents aged 5-17 should engage in at least 60 minutes of moderate-to-vigorous physical activity daily. Physical activity lasting longer than 60 minutes provides additional health benefits.

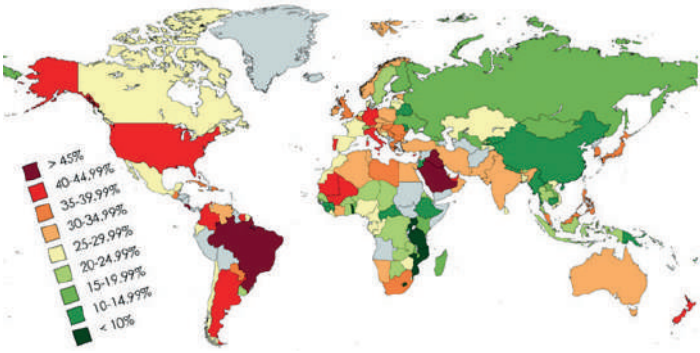

Figure 6. Insufficient physical activity among adults (Source: WHO, 2016)

When examining levels of physical inactivity on a global scale, the WHO regularly monitors trends in physical inactivity. A recent study found that approximately one-third (31%) of the world's adult population, or 1.8 billion adults, are physically inactive . In other words, they do not meet the global recommendations of at least 150 minutes of moderate-intensity physical activity per week. This represents a 5% increase between 2010 and 2022. If this trend continues, the proportion of adults not meeting the recommended levels of physical activity is expected to rise to 35% by 2030.

Globally, there are significant differences in physical inactivity levels by age and gender.

- Women are on average 5 points less active than men. This has not changed since 2000.
- Physical inactivity levels increase in both men and women after the age of 60.
- 81% of adolescents (aged 11-17) were not physically active.
- Girls in adolescence were less active than boys in adolescence; 85% (78% of boys) did not meet WHO guidelines.

Many different factors determine how active people are and the overall levels of physical activity in different population groups. These factors may relate to individual or broader social, cultural, environmental, and economic determinants that affect access to and opportunities for being active in safe and enjoyable ways.

The World Health Organization's current information on physical activity is as follows.

- Regular physical activity provides significant benefits for both physical and mental health.

- In adults, physical activity contributes to the prevention and management of noncommunicable diseases such as cardiovascular disease, cancer, and diabetes, reduces symptoms of depression and anxiety, improves brain health, and can increase overall well-being.
- Physical activity in children and adolescents supports bone health, promotes healthy muscle growth and development, and improves motor and cognitive development.
- Thirty-one percent of adults and 80 percent of adolescents do not meet the recommended levels of physical activity.
- The global target set to reduce physical inactivity levels among adults and adolescents is a 10% reduction by 2025 and a 15% reduction by 2030, compared to the 2010 baseline year.
- If physical inactivity levels are not reduced, the global cost of physical inactivity to public health systems between 2020 and 2030 is estimated to be approximately $300 billion (approximately $27 billion per year).

CHAPTER 2

Forest Bathing

2.1. Forest Bathing (Shinrin Yoku)

Clear your mind of everything. Allow your mind to become still. As you observe the cycles of self, everything in the universe rises and falls. They grow, develop, and then return to the source. Returning to the source is the path of nature, which is tranquility...

Lao Tzu

The state of our mind shapes the state of our life. This section will describe the practice of Forest Bathing (Shinrin Yoku), a simple way to relax our mind, revitalize our body, and rediscover our self. The section will answer important questions about the principles and practice of forest bathing. Fascinating insights from Japan as a society show us why forest bathing has become particularly important in today's turbulent times and how we can benefit from it.

Many of us are internally aware of the nourishing benefits of being in nature. Time spent outdoors can have a positive effect on our well-being and creativity. It can also contribute to a general sense of joy, relaxation, and balance. Indigenous and ancient communities have connected with nature for over 50,000 years, showing a steadily increasing interest in Mother Nature as a healer. Forests have long been recognized as "natural pharmacies," offering a rich source of plants and microbial material with known medicinal and nutritional properties. It is believed that a healthy forest ecosystem helps regulate infectious diseases, and there is growing evidence that exposure to urban green spaces, plants, and natural wood materials may have a health-promoting effect.

Figure 7. Visual presented by the author for Forest Bathing

The island nation of Japan in the Far East has a unique culture that has stood the test of time. It is also a country at the forefront of technological advancement and ranks among the world's most developed nations. Japan has one

of the world's most demanding work environments. In fact, they have even coined a term for death caused by overwork (karoshi). The pressure to perform at work is so high that they have very little time for personal life. Japan's urban cities have a peculiar obsession with hyper-digital culture and technology. In the internet age, many Japanese spend more time online and have less social interaction. They face higher levels of anxiety and stress. However, depression and loneliness are also on the rise. The country is also located on a seismic fault line prone to devastating earthquakes and tsunamis, which disproportionately traumatize the Japanese people. Neuropsychiatric disorders are estimated to contribute to 24.6% of the overall disease burden in Japan (Mental Health Atlas, 2011). However, over 70% of Japan is still covered by forests. The Japanese Ministry of Agriculture, Forestry, and Fisheries introduced the idea of Shinrin Yoku in the early 1980s. Shinrin yoku means taking a forest bath to relax and enjoy the forest atmosphere. The forestry department identified a wonderful opportunity that would help reduce people's stress levels and increase the demand for forest cover, which the forestry department needed. Thus, Shinrin yoku (forest bathing) emerged. Japanese people, under the stress of competitive metropolitan life, have been drawn to the healing atmosphere of forests to participate in various relaxing activities (Lemopoulos et al. 2019).

In Japan[1] , there is much to say about the central role played by Zen Buddhism. Zen Buddhism encourages practitioners to learn to gather their scattered minds and fix their attention, thereby making it easier to see events more clearly and with a fresh perspective. When a gap forms

1 Zen is the Japanese name for a Nalanda Buddhist school whose origins trace back to the Dhyana school in India. Zen is distinguished among other Buddhist schools by the importance it places on meditation for the purpose of enlightenment.

between our experiences and how we respond to them, we can respond with greater wisdom and care. Some theories, such as the attention restoration theory (Kaplan & Shope, 1985)[2] and the stress recovery theory (Ulrich et al. 1991)[3] , indicate that stress decreases within minutes of entering a green space. When individuals begin to relax physically, blood pressure stabilizes, stress hormones in our blood decrease, muscle tension decreases, and mental health benefits also come into play. We begin to think more clearly and coherently. Our vitality increases and our mood begins to lift. That said, when you immerse yourself in the forest, it becomes easier to achieve a peaceful state of mind. By paying attention to our senses and moving consciously in the forest, we not only reap all the benefits of meditation for our minds, but we can also strengthen our immunity and achieve a good level of health for our bodies.

Shinrin Yoku is now increasingly practiced outside Japan. In Europe, the United States, and Australia, guides trained in Nature and Forest Therapy share the practice of Shinrin Yoku and the Art of Connecting with Nature in guided group walks.

Looking at the example of South Korea, approximately 85% of the population lives in urban areas. The country is undergoing rapid urbanization and technological advancement. It has one of the fastest internet speeds in the world. South Korea is seeing a rapid decline in the number of marriages and birth rates. According to Korean statistics, in 2017, about one-third of all households were single-person households, and nearly 90% were exposed to feelings of loneliness.

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2 The Attention Restoration Theory is an analysis of the types of experiences that lead to recovery from fatigue. It states that natural environments are rich in the characteristics necessary for restorative experiences.

3 It predicts that if individuals are under stress, natural environments will have a stress-reducing or restorative effect, but that many urban environments will hinder recovery.

Florence Williams, author of Nature Fix, says: Perhaps no one embraces the healing effects of nature more enthusiastically than South Koreans. Many suffer from work stress, digital addiction, and intense academic pressure. According to a survey conducted by electronics giant Samsung, more than 70 percent of the country says their jobs, which, as everyone knows, require long hours, overwhelm them.

Stretching across Korea are the Baekdu-Daegan mountains. Covered in lush forests filled with aromatic Hinoki trees, they offer a soothing escape from the hustle and bustle of city life. For thousands of years, these mountains have stood like sentinels, calmly observing the passage of time and the journeys of people. These mountains influence the air, ecology, and water systems that support agriculture and feed the entire nation. In ancient times, wise elders called these mountains the energy backbone mountains. They believed that the Baekdu-daegan continuously nourished the fundamental life energy of Korean soil. These enchanting mountains boast an extensive network of hiking trails, ideal for forest bathing and forest therapy. The fascinating, intriguing, and beautiful aspect of these trails is how they connect Korea's nature, culture, rural life, and cuisine. The map below at[4] shows some of the trails located in these mountains. Today, these mountains and forests are the inspiration for Korea's ambitious National Forest Plan. The goal is to "realize a green welfare state where the entire nation prospers." Over the years, Koreans have succeeded in scientifically identifying many of nature's healing benefits. What is commendable is how they have incorporated this knowledge into creating systems and spaces for forest bathing and forest therapy.

4 Image sourced from https://www.bdna.or.kr/contents.do?idx=7.

Figure 8. Map of a recreational forest in South Korea

Shinrin-Yoku, translated into Turkish as "forest bathing," means immersing oneself in the forest atmosphere and breathing in the forest during a slow walk. It is also a practice of consciously exposing ourselves to nature using our senses to obtain a range of benefits for our physical, mental, emotional, and social health. Developed in Japan in the 1980s, it is a therapy that has become a cornerstone of preventive healthcare and healing in Japanese medicine. Studies have shown that participants experience reductions in stress, anger, anxiety, depressi , and insomnia. In fact, after a 15-minute forest bath, blood pressure drops, stress levels decrease, and concentration and mental clarity increase. Taking a forest bath in nature allows the stressed parts of your brain to relax. Positive hormones are released in the body. You feel less sad, angry, and anxious. It helps prevent stress and burnout. It helps combat depression and anxiety. Forest bathing is said to boost immunity and lead to fewer illnesses, as well as faster recovery after injury or surgery. Nature has a positive effect on our minds as well as our bodies. It is also said to improve heart and lung health and increase focus, concentration, and memory.

Everyone can practice Shinrin-Yoku in five steps by following the steps below in a nearby forest or park.

1. Leave your phone, camera, or other distractions behind so you can fully immerse yourself in the practice.
2. Leave your goals and expectations behind. Wander aimlessly, allowing your body to take you where it wants to go.
3. Take occasional breaks to look more closely at a leaf or notice the feel of the path beneath your feet.
4. Find a comfortable spot to sit and listen to the sounds around you. Notice how the behavior of birds and other animals changes once they get used to your presence.
5. If you go with others, make an agreement not to talk until the end of the walk so you can share your experiences.

To elaborate on these points: first, we need to find a suitable place for the practice. We need to make sure we leave our phones behind. We should walk aimlessly and slowly. We don't need any devices. Our body should be our guide. You should listen to where it wants to take you. Follow your nose and don't rush. It doesn't matter if you don't get anywhere. You're not going anywhere. You're enjoying the sounds, smells, and sights of nature. The key to unlocking the power of the forest is the five senses. Let nature capture you through your ears, eyes, nose, mouth, hands, and feet. Listen to the birds singing and the breeze rustling through the leaves of the trees. Look at the different shades of green of the trees and the sunlight filtering through the branches. Smell the forest and breathe in the natural aromatherapy of phytoncides[5] . Feel the freshness of the air as you take a

5 The scent of aromatic compounds released by plants.

deep breath. Release your feelings of joy and tranquility in the forest. This is our sixth sense and state of mind. You can now feel that you are connected to nature and have crossed the bridge to happiness.

Like pine trees, some trees also release oils and compounds to protect themselves from microbes and pathogens. These molecules, known as phytoncides, are also good for our immunity. Breathing forest air increases the level of natural killer cells in our blood. Natural killer cells are used in our bodies to fight infections, cancers, and tumors. So spending time with these trees is a special form of forest bathing.

This practice is not an exercise, walk, or run. It is simply being in nature, connecting with it through our senses of sight, hearing, taste, smell, and touch. Shinrin-yoku is like a bridge. By opening our senses, it fills the gap between us and the natural world. We have never been so far removed from merging with the natural world and so separated from nature. It is estimated that by 2050, 66% of the world's population will live in cities. According to a study sponsored by the Environmental Protection Agency ( ), the average American spends 93% of their time indoors. However, despite all these negatives, even spending very little time in nature has a positive effect on our health. A two-hour forest bath will help us disconnect from technology and calm down. It will reduce our stress and help us relax.

When it comes to calmness and relaxation, there is no one solution that suits everyone; it varies from person to person. It is important for people to find a place that suits them. Research shows that spending time in places with natural scenery is more relaxing. Everyone has a place that reminds them of their childhood or happy times in the past

in a rural setting. These places should be special to you, so your connection with nature will be stronger.

Due to the hustle and bustle of the week, it can be difficult to slow down and relax. People live such intense lives in the midst of their work and daily routines that after a while, they don't know how to just sit still. In such cases, walking with a guide who is a trained forest therapist can help you feel more relaxed and find the right environment that suits your needs. However, it is easy to take a forest bath even without a guide. There are many different activities that can help you relax in the forest and connect with nature. Some of these include walking in the forest, yoga, eating in the forest, spa therapy, Tai-chi, meditation, breathing exercises, aromatherapy, art classes, Nordic walking, and plant observation. Shinrin-yoku is a practice suitable for all fitness levels.

Forest bathing can be done anywhere in the world. It can be done anywhere there are trees, in hot or cold weather, in the rain, in the sunshine, or in the snow. We don't even need a forest. Once you learn how to do it, you can practice shinrin yoku anywhere, in a nearby park or garden. The recommended duration for forest bathing is at least 2 hours per week.

The Stages of Forest Bathing

Attention: Beginners and young children start with simple activities that focus on objects in nature to capture our attention and slow us down. We must train ourselves to direct and control our attention in order to control the direction of our thoughts and feelings.

Awareness: When we reach a calmer state of mind, we can increase our awareness. Deep in the forest, the cycle of transformations that all life goes through can be felt. Things we are or have yet to become. Like a seed on the ground. Like

a child in the womb. Increasing our awareness is to grow our connection with all life.

Answers: Our mind reaches a state of calm, allowing it to purify itself with renewed energy and generate surprisingly creative solutions. It begins to ask the right questions rather than just searching for answers. The forest provides us with new insights that enable us to understand life more deeply and ignites the light that sparks learning. It is the beginning of a journey of self-discovery.

Not everyone has a forest in their backyard. In fact, most people who live and work in cities have to travel a reasonable distance to get close to a forest. But it should not be forgotten that nature is everywhere. We can consider taking a forest bath and trying sensory-based exercises in any city park near us. For those who cannot go to city parks or are restricted due to disability, sensory-based nature therapy activities can even be done within the confines of their homes. Bring elements of nature indoors. You can use your creativity to connect with nature even in a closed space. Forest bathing is best demonstrated as a form of protection and a way to maintain a healthy mind and body. Forest bathing does not replace medical advice or counselling for those who are seriously ill. However, with a trained therapist, forest therapy can be an important part of treatment and recovery (Iwasaki et al. 2019).

Furthermore, today, "most people come because they have heard about forest bathing and are curious about it," and it has become "popular among the public, like yoga." Although forest bathing is suitable for all people, it is noted that it is preferred more by women. It is noted that most of the women who participate already meditate and have a strong love of nature. They understand that Shinrin-Yoku involves mindfulness and a connection with nature. For this reason, women come out of curiosity to see what it is all about.

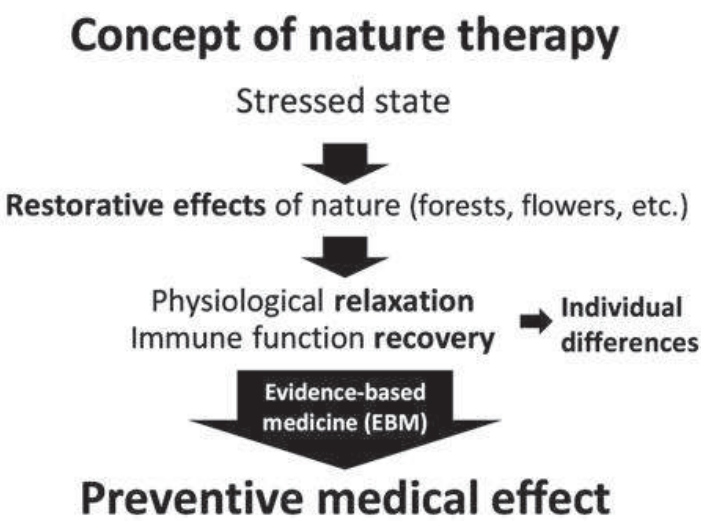

Figure 9. The Concept of Nature Therapy (Song et al. 2016)

Kaplan and Kaplan (2016) determined that nature therapy, especially forest bathing, has a direct effect on increasing the parasympathetic nervous system with the help of the five senses, leading to a state of relaxation and contributing to becoming a person with high awareness (Figure 1). Individuals who live in and interact with green spaces report feeling more energetic, having better overall health, and possessing a more meaningful sense of purpose in life (Sifferlin, 2016). According to current scientific findings, nature has significant benefits for the human brain. Historically, Cyrus the Great built lush gardens in Iran's crowded cities 2,500 years ago to improve human health and promote a sense of "tranquillity" in crowded cities. In the 16th century, the Swiss German physician Paracelsus said, "The art of healing comes not from the physician, but from nature" (Williams, 2016). This information has led researchers to investigate the modern health benefits of people exposed to nature and green spaces.

There are studies investigating the therapeutic benefits of forest bathing, especially in Asian countries. Participants in a "forest therapy" program in the Seoul Metropolitan area experienced a significant reduction in pain and depression levels (Han et al. 2016). Song and colleagues (Song et al. 2016) found that male Japanese students who walked for 15 minutes in a city park during the fall season experienced a decrease in stress levels and heart rate. There are findings showing that improving health through indoor green plants is effective and that hemoglobin levels increase (Igarashi et al. 2015).

Our mental health is important to us. For most people, the true value of our minds only becomes clear when things go wrong. When an individual experiences any mental health issue, they may have to spend a lot of time, effort, and money to recover. Finding the right help and guidance is not easy. A large part of human evolution has taken place in nature. The connection to nature is inherent in our behavior and is written into our genetic code. We have greatly reduced our interaction with the outdoors over the last 200 years. Returning to nature brings us to a state of heightened sensory awareness, a sense of calm, leading to peace and happiness.

In conclusion, Japan's story teaches us that material wealth and economic progress are not enough to create a healthy and happy life. To build health and happiness, we must prioritize these things over materialistic pursuits and actively work to achieve a balanced life. The entire process of starting a beautiful life begins by listening to the state of your mind. Ultimately, the state of your mind designs the state of your life.

Benefits of Forest Bathing Meditation

- It helps us get rid of unwanted thoughts
- It helps us get rid of feelings of anger, anxiety, and sadness

- It boosts self-confidence
- It helps us let go of fear and doubt
- Relieves stress and burnout
- Provides better sleep quality
- Strengthens the ability to control desires and overcome addictions
- Leads to peace and happiness
- It helps us build empathy and improve relationships
- Assists in making important decisions.

South Korea has divided its forest wellness program into 7 different stages based on the human life cycle in order to reach a wide range of people.

Birth: One of the greatest benefits of forest bathing is the reduction of anxiety, panic, and worry. South Koreans, who have the lowest fertility rate in the world, show great respect for expectant mothers. By creating special prenatal classes and forest meditation sessions in nature, they not only help parents alleviate their anxiety and worry but also establish nature as a space where families can bond with each other.

Childhood: Many forests in Korea have 'forest playgrounds for children'. There are open areas in nature where children can safely interact and play in a forest setting. To take this a step further, it has been decided to open schools where children are educated and taught in conjunction with nature. According to a study, time spent in the forest made children happier, less anxious, and more optimistic about their future. Many Koreans have lived in cities for so long that they feel out of place in the forest. "Children and the younger generation don't really have experience in nature; many think the forest is dirty or scary. It is said that if we don't change their minds now, they will never have a chance.

Adolescence: It creates a balance between nature, technology, and human interaction. It creates ways for young people's anxieties, energies, and aggression to be expressed in a healthier way. According to an interesting experiment called the Happy Train, students who were aggressive at school were taken to a national forest for two days and taught to be better. This experiment worked. Why did it work? Because no one teaches us humility and respect better than nature. By combining regular programs under the theme of 'Education in the Forest,' many schools help their students understand the natural world and its magical creatures. Considering the video game craze in South Korea, there are also some digital detox programs for young children. The goal is to inspire awe, wonder, and admiration for the beauty of the natural world. Within nature's boundaries, the mind can truly unlock the doors and keys to creativity.

Early Adulthood: There is a network of forest walking trails throughout the country, easily accessible from city centers. Bukhansan National Park, near the capital Seoul, attracts millions of visitors each year. These walks serve to escape the city's noise, pollution, and crowds, while also allowing walkers to elevate their moods and energy levels through various activities. Testing one's strength and endurance on a walking trail is a great way to build resilience.

Middle-Aged: Considering how effective forest bathing is against the negative effects of stress and burnout, it is not surprising that many people turn to nature for their breaks and vacations. With two-thirds of Korea consisting of forests, escaping city life and returning to the laws of nature makes it easy to seek a new life while enjoying the peaceful tranquillity of wonderful outdoor spaces.

Seniors and Older Adults: Access to nature is one of the most important goals for any society. Spending time in nature

works wonders for both mental health and physical immunity. With more time on their hands, simple activities or walks in nature help seniors avoid loneliness and depressive thoughts.

After Death: With a holistic worldview of the cycles of life and death in traditional Korean philosophy, a unique 'National Tree Burial Forest' has been created. In Korea, this is an environmentally friendly way to bid farewell to your loved ones. The ashes and remains of the body will give life to a seed, which will grow and give life to a tree. Over time, trees such as pine, oak, wild cherry, and many other local species will become part of a healing forest. This method will provide a space for future generations to immerse themselves in forest bathing and reflect on their own journey within the cycle of life.

The Korean government operates national recreational forests in 37 regions across the country. In a typical recreation forest like Jangseong Healing Forest, hundreds of visitors come every month, including three to four groups per day for healing purposes, ranging from cancer patients to children with allergies, prenatal groups, and all kinds of illnesses. Participants can engage in activities such as nature bathing, guided forest meditation, tree work, and tea ceremonies, depending on the program. South Korea is establishing a nationwide network of healing forests. In addition, the Forest Service is constructing a $100 million forest rehabilitation complex complete with an addiction treatment center, a 'barefoot garden', a botanical garden, a suspension bridge, and a 50-kilometer trail. [6] features an official map of Jangseong Healing Forest. What is commendable is Korea's vision of integrating nature into their lifestyle. Chungbuk University has launched a "forest rehabilitation" degree program. Programs

6 The Jangseong Healing Forest map is taken from https://jangseong.fowi.or.kr/en/introduction/facilities2.do.

in the department include forest wellness specialists, forest interpreters, kindergarten instructors, forest trail instructors, forest rehabilitation instructors, and much more. The goal is to implement multiple forest therapy programs to maximize the healing effects of nature throughout society.

Figure 10. Weather information for recreational forests throughout South Korea

The daily climate conditions of forests in South Korea are shared with the public. Weather, temperature, precipitation, and other information are shared daily via a website.

Green Gym is another activity that is growing in popularity these days. Green Gym was developed by The Conservation Volunteers (TCV) and Dr. William Bird from the UK. Green Gym is a wonderful concept for improving the local green environment through light physical activities such as tree planting, pruning, and branch removal. It brings people together to connect with nature and each other.

Examples of Forest Therapy and Forest Products Programs

First and foremost, forest walks. Walking is defined as the simplest form of rehabilitation and a full-body exercise. Walking can prevent lifestyle-related diseases. Individuals walking in the forest also enjoy the scenery, fresh air, and natural environment.

Then relaxation. The forest is calm and peaceful. Resting in the forest inspires natural peace in our bodies and minds. It also balances our nervous system.

Thirdly, rehabilitation. Walking in the forest is a possible rehabilitation program for individuals who have been immobile and isolated for a long time as a result of illness or accident, to reintegrate into society.

Fourth, therapeutic and occupational activities in the forest. Carrying logs and branches, clearing weeds, and planting trees are typical examples of occupational therapy.

Fifth, counselling. Counselling in the forest relaxes and sensitizes clients. Forest features such as landscape aesthetics, wind, scent, and birdsong sometimes provide useful clues for

solving our problems and provide an ideal environment for traditional counselling approaches.

Examples of Forest Therapy

Individuals who engage in forest bathing activities for long periods and repeatedly have achieved positive treatment outcomes for some mentally, psychologically, and physically disabled patients. Their communication has also changed positively. Some experimental studies suggest that walking in the forest can reduce stress hormones, improve the immune system, and balance the nervous system.

Log transport or tree planting as part of teamwork are also used as one of the forest therapy exercises. These activities have been proven to be effective and restorative, especially for people with mental or memory impairments. Additionally, in Japanese culture, trees and forests are sometimes worshipped as natural deities. Such forests always provide a counselling space for people with psychological issues. Trees also have great potential for healing. For example, some trees provide medicine, herbal tea, and scents that have specific healing effects. Forest therapy also involves drinking and eating natural resources. In Japan, cherry blossom tea is used for celebrations. Berry tea is effective in lowering high blood pressure.

Recommendations for Beginners in Forest Bathing Therapy

When practiced regularly, it offers numerous health benefits. Forest bathing creates strong bonds between people and natural environments, making it an important foundation for ecological awareness and activism.

Step 1: Check if there is an instructor/guide in your area

A trained guide helps you learn the basics so you can develop a strong practice on your own. You may be surprised at how beneficial it is to have a guide and an organized group.

Although forest bathing is simple, learning how to slow down and tune in to your senses can be quite challenging. Guides also organize group walks. They research the best trails. One of the core experiences of a guided walk is how guides encourage you to reflect on your experiences and share them with others. Guides can also provide you with food since they know wild plants and can serve it to you during conversation at the end of the forest bathing session.

Step 2: Learn the General Guidelines

- Instead of viewing the forest as an activity area, let yourself be immersed in it.
- Keep your focus on your sensory experiences. Avoid overthinking.
- Minimize any efforts to accomplish anything.
- Ideally, your walks should last 2-4 hours. This provides enough time for your mind and body to slow down and relax.
- You won't go very far, usually just 1 km or less.
- Your primary goal is not to exercise. It's more like playtime with a meditative feel. If you find yourself working out, pause for a moment and then slowly start moving again.
- You can do forest bathing in any natural setting, but ideally, your walks should take place in a wooded area with streams and meadows, away from human-made noises like traffic or construction.
- The trail should be accessible and easy to walk on.
- There should be no technological barriers between your senses and the forest.

- Don't let concepts like "mindfulness" or "walking meditation" convince you to try to experience anything other than what the forest offers.
- Do not allow yourself to be influenced by the experiences of others or by the results described in research studies, such as feelings of fear. Allow each walk to be its own experience. Avoid trying to relive previous positive or negative experiences.

Step 3: Find a suitable place for forest bathing

Close to Home: To develop a consistent forest bathing practice, start by exploring trails closer to home, so you can easily return home in any weather conditions.

Easy and Simple Path: Find a path that is easy and enjoyable to walk on without requiring too much physical effort.

Resting Spots: Along the path, find pleasant spots where you can sit alone and relax for a reasonable amount of time.

Access to Natural Waterways: Generally, find a place where you can safely enjoy the scenery along a natural stream.

Mixed Experience: Trails that include both forest and open meadows are best. Pay particular attention to the boundaries where the forest meets the meadow; these are often where you will find the greatest diversity. You can also take forest baths by the sea, in deserts, and in almost any natural environment.

Step 4: Arrival

Arriving is much more than just showing up at the start of the path. It means noticing three things.

1. Where you are. Stop in one place, look around, and comment aloud on everything you notice about that place. Keep doing this until you feel a deeper awareness of where you are right now.

2. Your body. Pay attention to your body. Feel how you are standing. Pick up a stone (about the size of an apple) and move it slowly; feel the movements in your muscles, tendons, and bones.

3. Tune into your senses. Your senses are the ties that bind you to the forest. Stand in one place for at least 15 minutes and integrate the forest with your senses. Closing your eyes may help. Feel with your skin first. Allow enough time for awareness to develop. You will notice sensations that were not obvious at first. Then turn your attention to hearing. Try to hear the quietest sound nearby and the bird song furthest away. Then, open your mouth and breathe in loudly enough to blend the sound of your breath with the sound of the forest. Let this combined sound be a way to reduce any sense of separation you may feel between yourself and the forest. As you continue to breathe through your mouth, pay attention to the tastes and textures of the air. Then breathe in through your nose and discover as many scents as you can distinguish. Finally, slowly open your eyes.

Step 5: Slow Walking

Walk slowly for at least 15 minutes, noticing what is moving in the forest. Even if everything appears completely still, there is always movement. Trees sway in the breeze, birds fly, squirrels scurry through the branches, grass bends, insects crawl. Streams constantly change their shapes and tones. There is movement within you as well. Your inner movement cannot help but reflect the movement of the world around you, and the reverse may also be true. The soothing sound of a breeze will be reflected as calmness within you. Conversely, your calmness will encourage squirrels and birds not to flee when you approach. If you begin to feel your

attention wandering, stop completely and focus on something nearby, noticing how it moves.

Step 6: Befriend the Forest

Pay attention to the tree, rock, flower, or other entity in the forest that interests you most. Approach it in a friendly manner. Introduce yourself by speaking loudly. Offer it your friendship. Take time to listen to it as a friend. Pay attention to what emerges in your imagination, which is often influenced by the natural world; perhaps your new friend will send you a series of images, memories, bodily sensations, and ideas as a kind of conversation. By talking and listening, allow your friendship to mature in the rich realm of your imagination until you feel the conversation is complete.

Step 7: Sit in Your Place

Choosing where to sit is a simple yet powerful practice. It is one of the best nature connection methods for supporting healing, developing awareness of oneself and others, and deepening connections with the world beyond humanity.

The longer you sit, the more you notice. You can sit for fifteen minutes before noticing the tiny flowers growing in front of you. It may take twenty minutes for a shy fox to stick its nose out of the bushes to better smell an unusually still human. As a result of inner stillness, other beings may respond by revealing themselves more easily. Twenty minutes is a good minimum time for sitting.

Step 8: Give Back

Mutual exchange increases awareness of the many ways we are connected to the world. It supports the development of relationships. Don't aim to both give and take on all your forest bathing trips. You can do this anytime, anywhere, by following this simple method:

1. Pay attention to what is happening around you. Quietly acknowledge something and explain what you have received from it. For example, a tree with places to rest in its shade.
2. Find something to offer. This could be a gesture or a song; perhaps you want to write a note and hide it somewhere only the world can read it.

CHAPTER 3

Hypotheses and Theories

3.1. The Biophilia Hypothesis (Biophilia)

The word biophilia comes from Greek. It is derived from the word philia, which means "love." The word literally means "love of life and living things." Humans have a deep-rooted love of nature as an instinctive and natural urge engraved in their DNA. The biophilia hypothesis suggests that humans have an innate tendency to connect with nature and other life forms. Edward O. Wilson introduced the "biophilia hypothesis" in his book Biophilia (1984). He defined biophilia as "the urge to connect with other life forms." Furthermore, biophilia emerges as a concept that can be adapted to application areas such as architecture, interior design, and urban design, stemming from the field of psychology, philosophy, and biology, reflecting humanity's desire to connect with nature.

The biophilia hypothesis has been developed as part of evolutionary psychology theories since ancient times. Taking an evolutionary perspective, people's attraction to nature can be partly explained by the evolutionary history of living in

natural environments. Despite this, in recent human history, we have transitioned to an urbanized lifestyle. Yet, despite increasing urbanization, the Covid-19 pandemic, which has affected the entire world, has prompted people to begin migrating back to rural and natural areas. As long as people turn to nature, identify with it, and desire to connect with it, the connection between humans and nature will continue. These connections are not limited to just one component of nature. The concept of biophilia explains the positive feelings towards nature, such as growing plants, visiting zoos, keeping pets, and being able to walk peacefully in green spaces and natural areas surrounded by nature. For example, the biophilia hypothesis also underlies people's admiration for natural life and nature photography. Especially with the Covid-19 pandemic, people have unconsciously placed biophilia at the center of their lives. It is observed that the most shared and liked photos and videos on social media are usually posts that involve nature and animals.

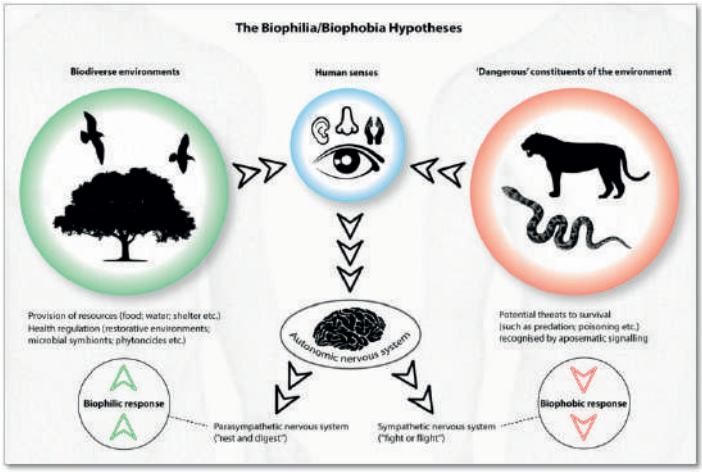

Figure 11. Biophilia Hypotheses (Source: https://insapedia.com/biyofili-ne-demek-biyofilik-tasarim-nedir/)

"Biophilia" is an innate affinity for life or living systems. The term biophilia was first used by Erich Fromm to describe the psychological orientation of being interested in everything that is alive and vital. Wilson has suggested that biophilia defines "the connections that humans subconsciously seek with the rest of life." He also suggested that the possibility of humans having deep connections with other life forms and nature as a whole may be rooted in our biology. He states that both positive and negative (including phobic) relationships towards natural objects (species, phenomena) as opposed to artificial objects are evidence for biophilia. Although first named by Fromm, the concept of biophilia has been proposed and defined many times. One of these, Aristotle, defined it as "love of life."

The biophilia hypothesis is concerned with how traces from the past affect modern humans and how people create living environments that make them feel close to nature. According to the biophilia hypothesis, the sustainability of physical and mental health and productivity, the health of the human body, mind, and spirit, which evolved through natural processes, depends on the quality of human interaction with nature. The biophilia hypothesis supports the idea that humans have preferred nature over cities since ancient times. Prehistoric cave paintings and ancient Egyptian tomb paintings depict plants, animals, and human figures together, showing that humans' connection to other living organisms dates back to ancient times. For example, ruins in Pompeii show that 2,000 years ago, people grew plants in their homes and gardens. Another example is that the Egyptians buried their deceased with their cats.

Biophilic Design

In architecture, biophilic design is a sustainable design strategy that involves reconnecting people with the natural

environment. It can be seen as a necessary complement to green architecture, which reduces the environmental impact of the built world but does not address the human connection to the natural world. Caperna and Serafini define biophilic design as architecture that can satisfy our innate need for connection with life and vital processes. Biophilic spaces are defined as environments that enhance life and support sociological and psychological components. These environments have positive health effects on people, including reducing mental health problems in stressful areas such as prisons, reducing chronic pain, improving memory, and lowering blood pressure. As an example of this being studied in medical settings, having a window overlooking live plants has been shown to help speed up the recovery process for patients in hospitals. Similarly, having plants in hospital rooms also speeds up the recovery process.

Biophilic design is defined as an approach that aims to increase people's well-being by restoring the broken connection between humans and nature, the architects of the urban living environments created by humans, thereby enabling people to be psychologically and physically healthy.

Principles of biophilic design:

1. The principle of sustainability, the continuity of the connection with nature
2. The healing power principle, which aims to make people feel better by utilizing the healing power of nature
3. The principle of connection, the bond felt with the environment and spaces
4. The principle of connectedness, the existence of interconnected and integrated architectural solutions

5. The interaction principle: ensuring the spread of a sense of responsibility and closeness between humans and other living organisms

The selection of design parameters to be used when implementing biophilic design varies depending on the conditions of the project, the function of the building, landscape uses, project size, changing economic and logistical factors, and cultural and ecological conditions. The effective implementation of biophilic design requires adherence to the principles outlined above. Most importantly, design parameters should not be applied piecemeal or in isolation, but rather in a way that mutually reinforces and complements each other. The effective use of the biophilic design approach in practice depends on adherence to the principles outlined above. When considering the selection of design parameters to be used in practice, they vary depending on ecological conditions first, followed by land use, site conditions and function, site size and economic factors, and cultural and sociological factors. Design parameters should not be applied in isolation from each other; rather, they should be applied in a way that mutually reinforces and complements each other.

Biophilic design aims to satisfy these internal adaptations related to nature in the modern built environment and, in doing so, to improve people's physical and mental health and well-being.

The 14 Models of Biophilic Design

1. Visual Connection with Nature
2. Non-Visual Connection with Nature
3. Non-Rhythmic Sensory Stimulation
4. Thermal and Airflow Variability

5. Presence of Water
6. Dynamic and Diffuse Light
7. Connection to Natural Systems
8. Biomorphic Forms and Patterns
9. Connection Between Nature and Materials
10. Complexity and Order
11. Probability
12. Shelter
13. Mystery
14. Risk – Danger

Biophilia and Conservation

Advances in technology mean we spend more time in buildings and cars, separating us from nature, but biophilic activities increase the time spent in nature. Therefore, people continue to have a strong urge to reconnect with nature. When connecting with nature, plants, animals, and less attractive wilderness areas can be protected, preventing the disruption of ecosystems. Therefore, reconnecting with nature has become even more important in the field of conservation. For example, smart designs can be implemented for greener cities that integrate ecosystems, such as more usable green spaces in and around cities and biophilic cities. These cities can also be part of wildlife corridors to help other animals with their migration and land needs. As seen in the figure below, the migration routes of animals, which are part of their natural lives, are constructed with natural designs. This also ensures the safety of the animals.

Figure 12. Design examples for animal crossing points (Source: https://www.yesilodak.com/ekolojik-kopruler-ve-vahsi-yasam-gecitleri-her-yil-binlerce-hayvani-kurtariyor)

Biophilia: Does Visual Contact with Nature Affect Health and Well-Being?

Throughout history and in the present day, behaviors reflecting a fondness for nature have been observed. For example, tomb paintings from ancient Egypt and remains found in the ruins of Pompeii prove that people brought plants into their homes and gardens over 2,000 years ago. Furthermore, trees are planted and parks are created in many cities to improve the environment. The tendency to incorporate elements of nature into cities appears to be a universal human trait. It is evident that the man-made environment tends to distance people from a natural setting and that people are knowledgeable enough to do something about it. This behavior is considered a response to the biophilic nature of the human mind. It is noted that gardens are considered an important part of the environment because they accelerate the healing process, and evidence of this can be seen in Europe's

first hospitals and monasteries. Significant research has been conducted on the effects of connecting with nature and adding living plants to our living environments. The idea that the results are positive and that access to nature can aid recovery and even help prevent ailments is emphasized. It is thought that adding natural elements to living spaces will lead to significant positive developments in cognitive and emotional abilities. At the same time, it has effects on stress levels, health, and well-being.

Theoretically, if plants in a natural environment have an effect, indoor greenery should also have an effect. However, potted plants disconnected from nature are expected to be less effective. The general trend in the literature supports this claim.

A growing number of studies point to the beneficial effects of nature on our health by reducing stress and promoting healing. Nowadays, policymakers, employers, and healthcare providers are increasingly considering how to plan for and manage people's need for nature. In a study of 20,000 people, a team led by Mathew White from the University of Exeter's European Centre for Environment and Human Health reported that people who spent two hours a week in green spaces (either in one go or intermittently in local parks or other natural environments) were significantly better off health-wise and psychologically than those who did not spend time in nature. According to the study, published last June, evidence suggests that there is no benefit for people who do not exceed the two-hour threshold. As a rapidly expanding field of research, the latest study by White and his colleagues revealed that nature has powerful physical, mental, and emotional effects on human health.

It has been noted that spending time in nature is an antidote to stress as long as people feel safe. Nature can lower blood

pressure and stress hormone levels, reduce nervous system arousal, strengthen the immune system, increase self-esteem, reduce anxiety, and improve mood. Attention deficit disorder and aggression decrease when in nature, which helps speed up the healing process.

With increasing concerns resulting from the use of smartphones and other technologies, health professionals, researchers, and government officials have set goals aimed at integrating nature into people's daily lives. Researchers and politicians are currently discussing "park deserts" in urban areas. Parks are being added to and developed in cities. Large windows are being built in schools and other institutions to provide access to trees and green space. "Forest schools," a tradition in Scandinavia where much of the learning takes place outdoors or in natural environments, have increased by 500% since 2012. Washington state became the first state to license open-air preschools where play and learning take place outdoors. A seven-year project mapping U.S. parks to identify areas in need of park space has been completed. Senior Vice President of the project, Adrian BENEPE, said, "We mapped 86% of the nation and looked at who lives within a 10-minute walk of a park and who doesn't." Project managers have a "10-minute walk" campaign with mayors across the US to ensure that all people have this kind of access.

3.2. Stress reduction theory

It is stated that natural environments support stress relief, while urban environments tend to hinder the same process. It has been noted that being in a non-threatening natural environment and observing natural elements such as vegetation or water leads to a decrease in blood pressure and a drop in heart rate. Furthermore, it helps us get rid of negative thoughts and feelings by lowering stress levels. Ulrich states that because humans developed and evolved in natural environments, unlike

urban environments, interaction with such environments can be positively adapted for modern humans. Giving a stress response involving a high level of physical arousal in a non-threatening natural environment would be incongruous. This is because this process will cause fatigue and lead to chronic cardiovascular and endocrine disorders that negatively affect health. Stimulating environments with high levels of visual complexity, noise, density, and movement, such as cities, can negatively affect people by producing stressful and exhausting levels of psychological and physiological arousal. Nature tends to be less dense and less visually complex than many urban environments. Therefore, it is known to have relatively positive stress-reducing effects on people.

Today, more than 50% of the world's population lives in cities, and this figure is expected to exceed 70% by 2050. Numerous studies have shown that cities are associated with a higher risk of mental health problems compared to rural areas (approximately a 40% risk of depression, a doubling of the risk of schizophrenia, and increased anxiety and stress). This is attributed to the lack of sufficient green space in cities. In cities, we are constantly on the move and continuously stimulated by many different stimuli. These include noise, crowds, traffic, smells, lights, etc. As can be seen, stress factors are diverse. These stress factors lead to chronic stress, which has a significant impact on our health. Worldwide, 450 million people are affected by "mental health" problems, which are considered one of the fundamental public health issues and place a considerable burden on the global economy.

According to the World Health Organization (WHO), mental health problems affect a large proportion of workers in the workplace, particularly one in five workers. Stress is recognized as one of the main problems identified and is also known to be associated with cardiovascular, gastrointestinal, immunological, and neurological disorders. Today, excessive

workload, management pressure, conflict with colleagues, uncertainty about the future of your role, noise, and a disruptive work environment are all known sources of stress.

Figure 13. Process dynamics of the personal and environmental aspects of fatigue and recovery/restoration (Source: Rydstedt & Johnsen, 2019).

Before looking at possible responses to the challenges outlined above, it is useful to learn more about what happens from a physiological perspective when we encounter a stressful situation. Stress can be defined as our body's response to a situation that is perceived as threatening or challenging to our health. This response is directly linked to our autonomic nervous system, which is responsible for controlling involuntary or visceral functions such as heart and respiratory rate, digestion, urination, and pupil response. When faced with a stressful situation, our brain responds and our body enters "fight or flight" mode via the sympathetic nervous system. It also accelerates heart rate and sweat production. It slows down the digestive system. It activates the secretion of hormones such as cortisol and adrenaline. After the stress is over, our body enters "rest and digest" mode through the parasympathetic nervous system, slowing down the heart rate.

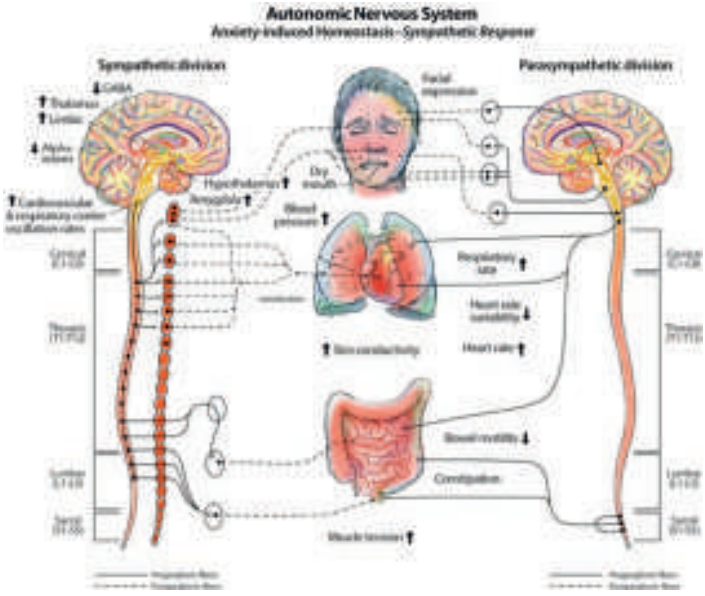

Figure 14. A 3D space consciousness model integrating the neurological and physiological processes underlying conscious experience (Source: Jerath et al., 2015)

Our body responds to all kinds of stimuli and other stressors in the same way as described above, leading to a chronic state of stress. The consequences of this state on our health are much more serious than when we face intermittent intense stress.

Fortunately, certain environments can help us limit our exposure to stress and the associated mental and physical health risks, especially those found in nature. In 1991, researcher Ulrich developed the Stress Reduction theory to explain our emotional and physiological responses in the presence of natural elements, based on numerous studies conducted primarily in hospital settings. This theory states that looking at a landscape containing natural elements such

as greenery or water creates positive feelings and emotions such as interest, pleasure, and calmness, and also has a healing effect, allowing us to easily overcome stressful situations.

The belief in nature's restorative and therapeutic effects in mitigating the harmful effects of the city dates back centuries. For example, as in ancient Rome, people have noted that being in contact with nature can be helpful in coping with noise and urban problems. This statement has been supported by numerous empirical studies conducted in recent times in hospitals, prisons, concrete buildings, offices, and even schools.

The benefits of nature can explain this situation in terms of human evolution by transforming Ulrich's stress reduction theory into what is also known as the "psycho-evolutionary" theory. Humans only moved into cities and buildings a few centuries ago. For most of human history, people lived outdoors. It is said that because our bodies cannot adapt to the new environment in such a short time, our closeness to nature (biophilia) and our tendency to respond positively to the 'savanna' type continue. Since the beginning of humanity, water, potential food sources, shelter, trees, caves, and rocks that provide surveillance opportunities have been natural environments that have enabled us to survive. Since this type of environment contributes to human well-being and survival, it is said that engaging with nature inspires pleasure, calmness, and emotions in modern humans, prevents negative feelings, and helps us distance ourselves from daily sources of stress. Various studies have shown that living near green (trees, plants, etc.) and blue (sea, lake, river, etc.) landscapes reduces individuals' stress levels, improves their mood, and increases their overall life satisfaction. It is reported that such environments provide physiological relaxation by activating the parasympathetic nervous system and lowering cortisol levels.

3.3. Attention Restoration Theory

The Attention Restoration Theory suggests that spending time in natural environments can help restore mental focus and reduce cognitive fatigue. It is a prominent theory in environmental psychology and proposes that exposure to natural environments can significantly increase an individual's capacity for concentration and focus. Interest in the positive effects of natural environments on human health and well-being has been growing in recent years, both at the practical and policy levels. Attention Restoration Theory (ART) is often used to explain how these benefits arise. However, the strength of empirical evidence regarding how this mechanism works is still a matter of debate. According to cognitive psychology, the ability to focus on a demanding task is called "directed attention." This capacity is limited and can be depleted over time. Attention fatigue occurs when an individual is forced to focus on an uninteresting task while simultaneously suppressing distracting stimuli. This fatigue can lead to weakened decision-making processes, reduced self-control, and cognitive imbalances that can cause various health problems in the long term.

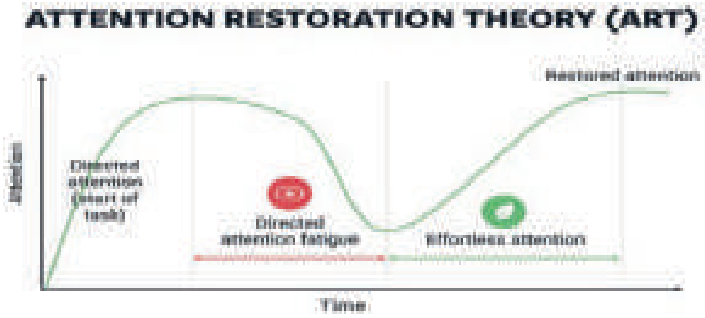

Figure 15. Attention Renewal Theory (Source: https://iccpp.org/wp-content/uploads/2022/09/Attention-Restoration-therapy-ART.pdf)

The graph visually represents the functioning of the Attention Regeneration Theory, which explains the regenerative effect of green exercise on attention processes. Although the level of attention is high at the beginning of cognitive activities that require task-focused attention, directed attention fatigue emerges over time as a result of continuous mental effort, and a decline in performance is observed. At this point, the individual needs cognitive rest to regain their mental resources. Green exercise, i.e., physical activity in natural environments surrounded by vegetation, open air, and natural sounds, supports this renewal process by stimulating an effortless form of attention. The soft elements of interest offered by nature allow the individual's attention system to be involuntarily reorganized, thereby increasing attention capacity, mental clarity, and focus. As a result, the graph shows that green exercise restores attention levels after cognitive fatigue and contributes to the restoration of mental functions.

Today, a large portion of the world's population lives in urban areas. Urban life places a heavy burden on mental resources due to the abundance of stimuli that require constant attention. The Attention Restoration Theory suggests that one of the most effective ways to overcome this fatigue is through contact with nature. According to the theory, individuals should spend time in natural environments and escape the pressure of directed attention in order to renew their cognitive resources.

This theory states that individuals need to take advantage of four key experiential components to regain their attention capacity: distancing themselves from daily stressors, experiencing a sense of expansive environmental scope, engaging in activities aligned with intrinsic motivation, and interacting with softly captivating stimuli. The combination of these elements triggers involuntary attention, allowing directed attention to be renewed. While activities such as

worship or relaxation can also provide relief, nature has a particular advantage due to its aesthetic structure. Time spent in natural environments is thought to offer individuals opportunities for internal reflection, reduce mental clutter, and contribute to the organization of unresolved thoughts.

The initial development of the theory arose from observations and qualitative analyses of human-nature interactions. Over time, this approach has been linked to general psychological models of attention processes and directed attention fatigue has been considered a phenomenon associated with problem-solving difficulties, inattention, and mental exhaustion. Current cognitive research shows that there are different neural and behavioral mechanisms between directed attention and involuntary attention. Directed attention requires more mental effort due to the need to suppress distracting elements. In contrast, more basic attention processes such as arousal and orientation consume fewer cognitive resources and are therefore less affected by the stresses of modern life. In this regard, exposure to nature is expected to improve attention performance, particularly in cognitively demanding tasks. Higher-level cognitive processes, such as working memory or problem solving, may show greater improvement with the restorative and rejuvenating effects offered by nature. In contrast, nature's effect may be limited in simpler and more automatic tasks. Numerous observations support the idea that living in natural environments or being regularly exposed to nature has positive effects on self-discipline, decision-making, emotional balance, and self-control. These findings show that contact with nature not only renews directed attention but also strengthens the individual's cognitive and emotional integrity.

Systematic reviews conducted in recent years have addressed the effects of exposure to nature on cognitive performance in a more comprehensive manner. While some

studies show a marked improvement in attention and memory performance after exposure to nature, others have found that this effect may vary depending on the nature of the task and the measurement method. These findings demonstrate that the mechanisms by which nature restructures attention processes are multidimensional and highlight the importance of Attention Restoration Theory.

CHAPTER 4

Adaptable Physical Activity Through Green Exercise

Over the past 20 years, interest in the natural environment and its effects on health has increased. Physical activity interventions in blue and green natural environments, in particular, are being researched as a potential strategy to enhance recovery in individuals with chronic conditions and protection in those without chronic conditions.

As defined in Section 1, green spaces can be defined as open areas covered with vegetation, including parks and gardens. Additionally, blue spaces are primarily accessible environments consisting of water, such as rivers, lakes, and the sea. One of the greatest challenges of the future will be to create livable, human-scale cities by providing health conditions, and achieving this will be fundamental to preserving natural environments. Recent systematic reviews indicate that individuals, particularly those with mental or physical disorders, can gain health benefits from using and being exposed to natural outdoor environments. Experimental research suggests that outdoor exercise may be a viable

alternative to indoor exercise and that exposure to a natural environment is associated with higher levels of physical activity and lower mortality rates. It is also noted that physical activity in natural environments provides additional benefits compared to physical activity in indoor environments.

As mentioned above, evidence of health benefits may be of great importance to health professionals, urban planners, and policymakers in helping to translate existing evidence into interventions and policies aimed at improving health. Furthermore, the knowledge base is limited in terms of exposure or proximity assessment of green and blue spaces, considering green or blue separately, or including an unhealthy population.

Green Exercise Adaptable Physical Activity

Green exercise refers to physical activity performed in nature, while adaptive physical activity ensures that these activities are made accessible, safe, and sustainable by considering age, gender, disability status, and environmental conditions. It is particularly important for individuals with disabilities, the elderly, and those with chronic illnesses.

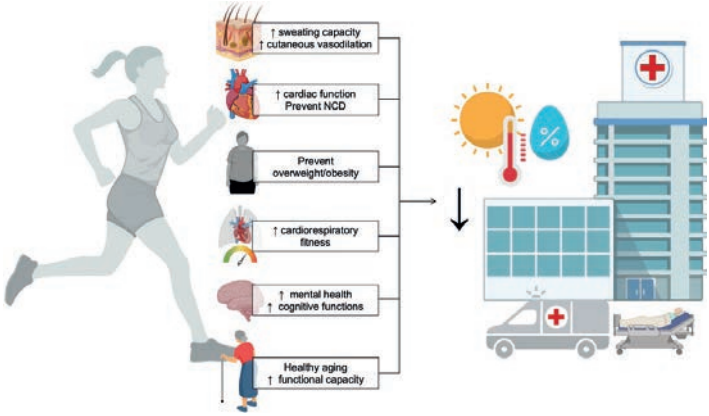

Figure 16. Increasing and Decreasing Values as a Result of Regular Physical Activity (Source: Deshayes & Périard, 2023).

Regular physical activity is not only essential for achieving physiological adaptations but also serves as a significant protective factor against non-communicable diseases and obesity. It also helps maintain cardiovascular fitness and cognitive capacity. When all these factors are considered, research findings indicate that engaging in physical activity in natural green and blue environments provides additional benefits beyond these.

According to research, green exercise offers individuals physical, mental, and even spiritual rewards. It has particularly positive effects on health, well-being, and performance. Engaging in physical activity in nature has many advantages over performing the same activity indoors or on city streets:

- Stress reduction
- Enhanced cognitive function
- Improved attention and concentration
- Improved mood
- Reduced anxiety
- Increased self-confidence
- Feeling lively and energetic
- Delaying aging
- Reduction in pain
- Less fatigue for the same amount of physical activity
- Improved sleep quality
- Mindfulness and present awareness

Research on athletic performance has identified the following advantages for athletes who train in green spaces:

- Performance improvement

- Satisfaction, fulfilment, contentment
- Less effort is expended when running outdoors compared to running on a treadmill
- Delaying aging, a sense of renewal and revitalization
- Improved mood
- Delaying fatigue

Researchers examined the performance of 128 athletes at four locations rated for greenness. The results show that performance increases as the amount of greenery increases. According to the results of another study, combining environmental interventions with physiological and performance outcomes is expected to provide coaches and athletes with new opportunities to design training sessions and programs for optimal physiological effects.

It is emphasized that modern life has eliminated natural physical activity from daily life and that we need to integrate exercise into our daily routine to maintain health. It is thought that modern life has also eliminated most activities performed in natural conditions. According to research conducted in the United States and Canada, people spend 87% of their days indoors, 6% in cars, and 7% in natural environments. This result not only reduces outdoor exercise but also exposure to fresh air and sunlight, affecting circadian rhythms that regulate sleep, appetite, mood, and energy levels. Based on significant scientific evidence, the World Health Organization recognizes the link between urban green spaces and group-based physical activity and the resulting improvements in health and well-being. The European member states of the United Nations have committed to providing every child with access to green spaces where they can walk or cycle to school, play, and engage in physical activity.

4.1. Adaptable Physical Activity During the Pandemic

Given the clinical characteristics of the pandemic, patients confined to bed have struggled to perform daily living activities or regular physical activity. Considering the numerous positive effects of physical activity, adapted physical activity (Figure 17) throughout all stages of an individual's recovery process is important for improving cognitive decline and physical and psychological well-being in individuals affected by the pandemic.

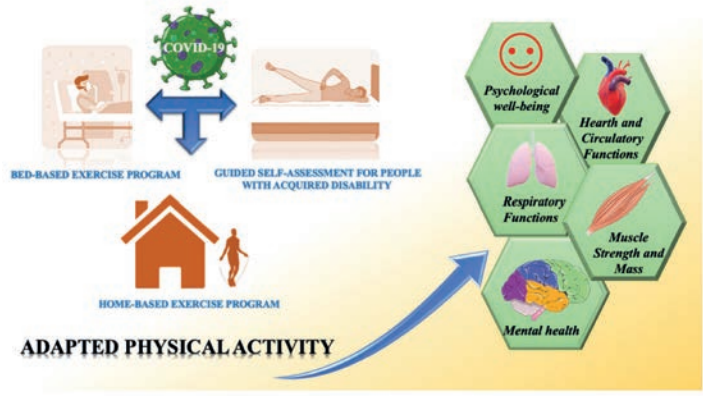

Figure 17. Adaptable Physical Activity (Source: Maugeri & Musumeci, 2021)

After an adaptive physical activity program, it is vital to gradually return to physical activity through an adapted or personalized home-based or nature-based physical activity program managed by a sports scientist to maintain mental and physical well-being. The primary goal here is to regain the fitness level prior to infection. Furthermore, regular physical activity has systemic positive effects on the entire body as a result of its effects on the brain. Physical activity promotes

the release of endorphins, which enhance and improve psychological well-being.

4.2.Health Outcomes of Physical Activity with Adaptive Nordic Walking

An interesting approach with therapeutic benefits used to ensure individuals' full recovery is Nordic walking. This activity is typically performed in healthy environments such as mountains, seaside, and rural areas. Nordic walking is more intense than walking at a steady pace because it requires people to use large muscle groups in their shoulders, abdomen, legs, and arms. This type of exercise works the entire body because it also engages the legs and arms, resulting in greater energy expenditure compared to normal-paced walking, as shown at . Nordic walking is one of the green and blue exercise practices.

Figure 18. Nordic Walking (Source: https://www.lovevda.it/en/database/7/healthy-route/torgnon/nordic-walking-equipped-route/2962)

It is an adapted activity that develops and improves our respiratory, metabolic, and cardiovascular systems. Nordic walking specifically works the upper body muscles and increases overall energy expenditure compared to normal walking. Furthermore, the poles used in Nordic walking reduce stress on the joints. Therefore, Nordic walking prevents degenerative cartilage disorders such as osteoarthritis by improving motor functions and strength.

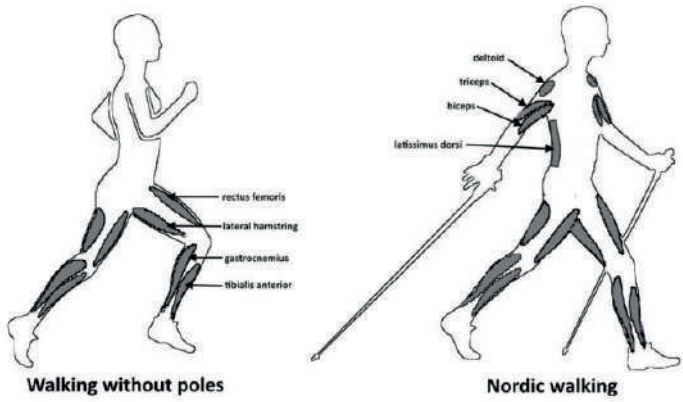

Figure 19. Comparison of muscles affected by Nordic walking and running (Source: Sharma et al., 2017)

According to a recent study, exercise using Nordic walking poles has been found to help individuals with heart disease increase their speed compared to high-intensity or continuous fast-paced walking. Physical activity, especially physical activity in green environments, has many proven benefits for heart health, including lower blood pressure and reduced risk of obesity and type 2 diabetes. For individuals with heart disease, regular exercise can help improve blood flow, prevent heart attack risk, and increase cardiorespiratory fitness. The study tested (i) high-intensity interval training, (ii) high-intensity

interval training with the addition of Nordic walking poles, and (iii) continuous moderate to high-intensity walking without the addition of poles. One hundred and thirty patients with heart disease were randomly assigned to one of the three exercise programs for 12 weeks. They were then followed for an additional 14 weeks to see which group performed better in terms of mental health, quality of life, and functional capacity, as measured by how far they could walk in a six-minute walk test. Over the 26-week study period, functional capacity, based on distance covered in the six-minute walk test, improved in all three groups.

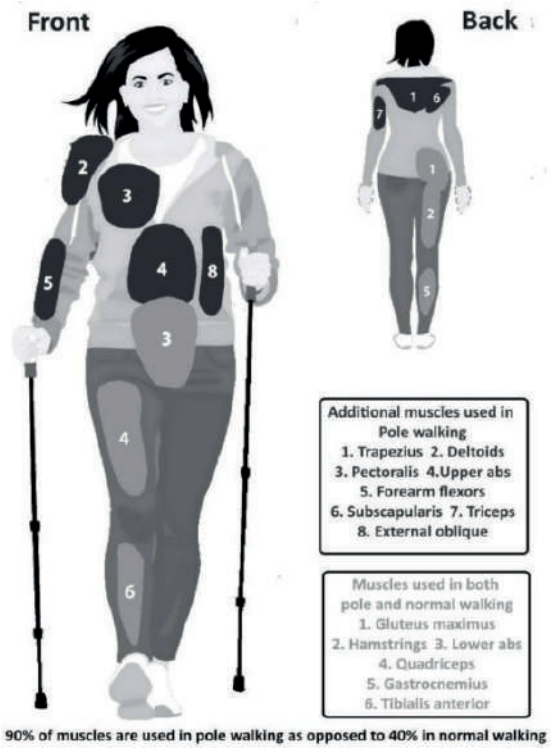

Figure 20. Additional muscles used in pole walking compared to American Nordic walking (Source: Sharma et al., 2017)

Participants in the Nordic walking group walked an average of 695 meters in six minutes. This represented an improvement of approximately 19% compared to baseline. The HIIT group walked 645 meters, showing a 13% improvement. The walking group walked 628 meters and showed a 12% improvement. These results clearly demonstrate the effect of walking exercises performed with Nordic walking poles. Finally, the use of Nordic poles in moderate- and high-intensity walking is a simple and accessible option for increasing walking capacity, raising energy expenditure, working the upper body muscles, and improving other functional parameters such as posture, gait, and balance. All of these can increase walking speed.

CHAPTER 5

Adaptable Physical Activity in Natural Environments For People With Disabilities

Physical activity in natural green spaces contributes to improving the physical, physiological, and psychological capacity of individuals with disabilities, as well as environmental awareness, self-confidence, and socialization. Experts emphasize that there are unlimited physical activities that can be performed in nature.

Individuals with intellectual disabilities generally have a more sedentary lifestyle than individuals without disabilities. There are many factors that may contribute to this situation; (i) skeletal-muscular system problems, (ii) balance and coordination difficulties, and (iii) lack of accessible programs and areas for people with disabilities are some of them. Even if physically demanding, physical activity can provide physical and mental benefits for individuals with intellectual disabilities. Intellectual or developmental disability is defined as limitations in adaptive behaviors and mental functions

(reasoning, learning, problem solving, etc.). These limitations affect the individual's daily social and practical skills. Specific conditions may include autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), or Down Syndrome, which are specific genetic or learning disorders.

Adaptive Physical Activity and Examples for Individuals with Down Syndrome

It has been found that making physical activity a social event and doing it with other people is a source of motivation for individuals with Down syndrome.

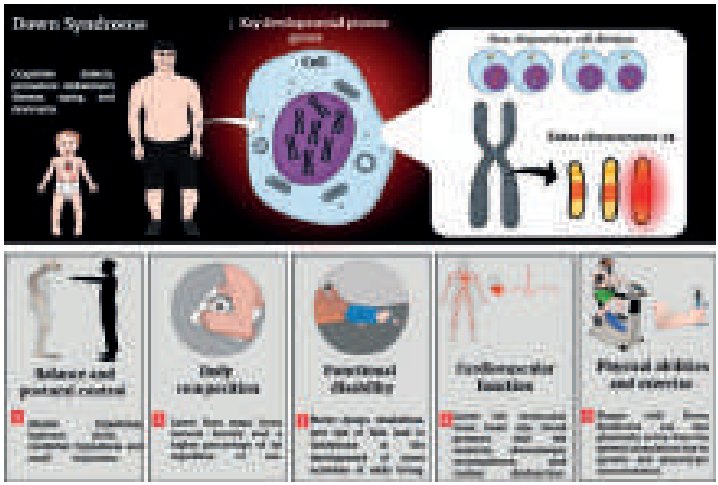

Figure 21. Effects of Down syndrome on structural and functional decline (Source: Melo et al., 2022)

Individuals with intellectual disabilities often have recurring health problems and motor coordination issues. For example, children with Down syndrome may experience balance and coordination problems. In particular, they may have weak muscle tone and skeletal/muscular system problems. It is argued that these issues need to be adapted to include

individuals with Down syndrome. For example, in exercise classes, it may be necessary to demonstrate the squatting movement in multiple ways to ensure that individuals with different abilities and disabilities can participate in the class. Lifestyle factors that support healthy aging in individuals with Down syndrome have become a focus for researchers. It has been determined that moderate physical activity for individuals with Down syndrome is associated with longer-term preservation of brain function. Although not specific to individuals with Down syndrome, understanding the benefits of physical activity is important because these individuals have a significantly higher risk of developing Alzheimer's disease later in life. The importance of physical activity is often emphasized to prevent and delay this condition. In one study, the research version of Fitbit was used to monitor physical activity in adults with Down syndrome. As a result, individuals with Down syndrome who engaged in more physical activity had made exercise a routine part of their lives. This group generally engaged in physical activity with others. For example, they participated in walks and group exercises with their roommates. Adapted physical activity recommendations for individuals with Down syndrome are provided below.

- Priority should be given to posture control exercises that use balance movements. Activities such as climbing and gymnastics are very suitable.
- [7]Resistance exercises should be used to counteract hypotonia. Gymnastics allows for this type of exercise and improves balance capacity.

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7 Hypotonia is characterized by a decrease in the resistance of a muscle to passive stretching. This condition is distinct from muscle strength; a person may be strong but have low muscle tone.

- Educational situations that diversify sensory information sources requiring environmental adaptation, foresight, and memory capacity should be approached. Artistic activities that enable choreography learning are very suitable, as are ball sports that require quick response and application and necessitate social interaction.
- Endurance capacity should be developed as quickly as possible through regular physical activity.

There are no contraindications for Down syndrome (Trisomy 21) other than motor sports, aviation sports, and diving, which are directly related to the intellectual disability caused b[8] . Individuals with Down syndrome can run, swim, or jump just like other children. Sports activities are recommended provided they are under proper supervision and medically fit.

5.1.Adaptable Physical Activity and Examples for Individuals with Autism

Video games have been designed to make balance training motivating and fun for autistic individuals, who often have problems with balance and joint movement. The video game consists of standing on a Nintendo Wii balance board while imitating tai-chi and yoga poses on the screen.

Differences in balance and joint movement have been identified between autistic and non-autistic children. For autistic children, difficulties in motor coordination are considered a high indicator of more severe autism symptoms and poorer application of daily living skills. One study found

8 Trisomy 21 is a chromosomal abnormality caused by an extra chromosome in the 21st chromosome pair and is associated with differences in cognitive development, decreased muscle tone (hypotonia), characteristic facial features, and certain systemic health conditions.

that six weeks of balance training led to changes in the brain and alterations in the severity of certain autistic behaviors. At the end of the training, participants showed improvements in balance and posture, as well as a reduction in the severity of autism symptoms. When designing a physical activity program for autistic individuals, the characteristics shown in Figure 22 should be taken into account.

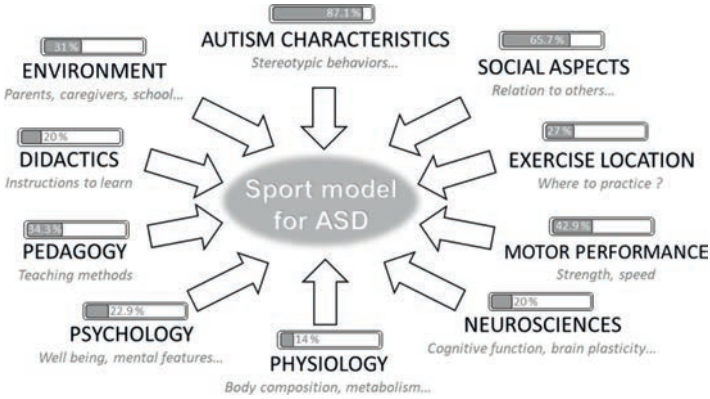

Figure 22. Factors to consider when creating an adapted physical activity program for individuals with autism (Source: Grosprêtre et al., 2024)

5.2. Family Participation in Physical Activity for Children with Disabilities

Family participation in physical activity for children with disabilities is very beneficial.

According to families with children with disabilities, there are very few play areas managed by professionals. Therefore, making physical activity fun and interesting for children depends largely on families. More specifically, this can be done by advocating for their children at school, communicating

their children's needs to the physical education teacher, or spending active time with their children. Finally, it focuses on making physical activity more accessible by educating the families of children with disabilities. These children or individuals spend most of their time with their families. Therefore, families can be an important source of motivation and facilitator for their children's physical activity.

It has been noted that family participation in physical activity is very beneficial for children with disabilities. This benefit actually began when staff members of an organization failed to show up. Due to staff shortages, parents were asked for help. At the end of the activity, families realized that they had been holding their children back, and that helping their children participate in sports enabled them to discover their untapped potential. One researcher stated, "Sometimes families don't know what to do; they tend to be overly protective." Considering all this, it has been stated that physical activity education is tailored to the families of children with autism. One study focused on identifying ways to increase the participation of families of children with disabilities in physical activities. An application was developed in collaboration with families that provides parents with training and adaptable equipment, as well as showing how to use the equipment and different types of adaptations to tailor the activity to different abilities. The application is called the Fit Families Program.

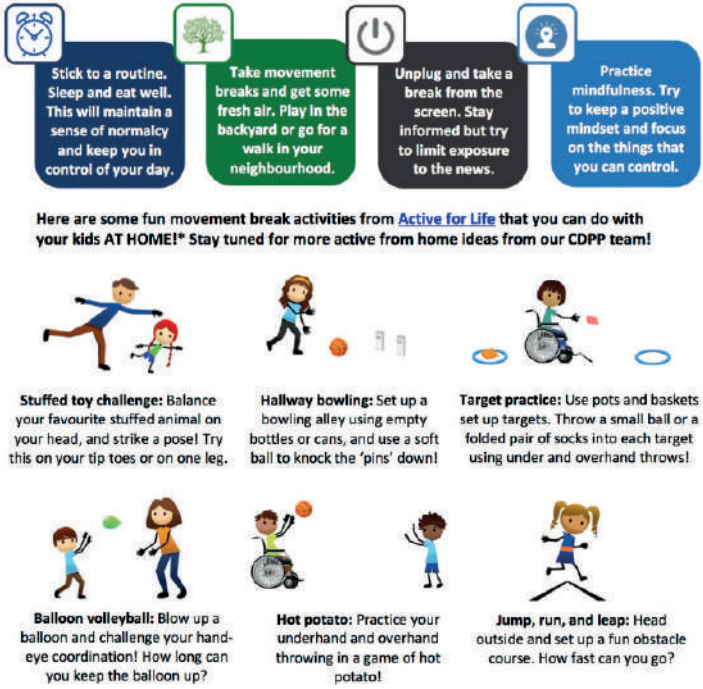

Figure 23. Images and activity descriptions (Source: Active for Life)

The World Health Organization (WHO) updated its guidelines and recommendations on physical activity in 2020 to include individuals with intellectual disabilities. According to these guidelines, the potential health benefits of physical activity for individuals with disabilities include improved cognitive abilities in those with disorders that impair cognitive function and improved physical function in children with intellectual disabilities. It is recommended that children and adolescents with disabilities engage in an average of 60 minutes of moderate to vigorous exercise per day. However, it is noted that even a small amount of physical activity is better than none at all. When we think about staying physically active, we may think of the gym, running tracks, or trendy

exercises, but there are ways to increase physical activity even in the most mundane tasks. It is stated that walking should be encouraged in children with disabilities. Walking is seen not only as increasing physical activity but also as reducing sedentary activities.

It is noted that there are daily activities where parents can step back when they feel their children are safe and can allow them time to try things. For example, this could be helping gather ingredients in the kitchen to make a simple meal or ensuring they do household chores appropriate to their developmental level. It could also be emptying the trash cans in the house. These are important details that increase children's mobility.

Therapy can help children with disabilities achieve physical activity goals.

Occupational therapy and physical therapy can be beneficial in making tasks more accessible for children with disabilities. Physical therapists have developed programs to help children with disabilities access their environment and participate in activities according to their personal characteristics, environment, and daily routines. Therapists help individual's complete activities they need or want to do in their daily lives. Researchers set out with the motto, "We will either work on the skill behind a task, or we will adapt a task or change something to make the task a little more accessible for the individual, or we will organize the individual's environment to ensure they are as independent as possible." Access to such therapies can help an individual acquire a skill they need to achieve their physical activity goals. The researchers' main advice to families is:

We should move away from the idea that "my child has a disability and therefore we need therapy, physical therapy,

or occupational therapy" and focus on determining what the real goal is and then seeking the help that may be needed.

5.3. The Benefits of Green Exercise for Adults with Learning Difficulties

Access to nature not only makes us feel good but also provides measurable health benefits. A national evaluation of a project to prevent and address mental health issues through green social prescribing has demonstrated the powerful effect of nature-based activities on people with mental health issues. In this project:

- Over 8,300 participants experiencing mental health issues took part in nature-based activities and reported improvements in their overall health.
- Physical activity levels increased significantly in one region. While 84% of participants were active the previous week, this rate rose to 95% after participating in a single nature-based activity.
- Participants' levels of happiness, anxiety, and life satisfaction improved significantly after interacting with nature.
- The report emphasizes the need for healthcare services to better integrate nature-based service providers into the mainstream social prescribing system.

Numerous studies have demonstrated the positive outcomes of "green exercise," which is physical activity performed in natural settings. A significant study from the University of Essex tested over 100 people under controlled conditions to examine how different environments affected their well-being during a 20-minute treadmill exercise.

- Exercise improves blood pressure, self-esteem, and mental health.

- Pleasant natural and urban landscapes led to even greater increases in self-esteem and mental health. Conversely, unpleasant landscapes or the absence of nature reduced the positive effect.

It emphasizes that contact with nature, even visual contact, enhances the effect of physical activity on our well-being. More extensive research supports this. Nature-based activities have been shown to have the following benefits:

- Reduced symptoms of stress, anxiety, and depression.
- Improved sleep quality, immune response, and heart rate variability.
- Enhanced cognitive function, attention span, and mental recovery.
- Facilitates physical activity by reducing perceived effort and increasing motivation.
- Encourages better nutrition and healthier lifestyle choices.
- The immune system is strengthened, and the risk of long-term conditions such as obesity, diabetes, and cardiovascular disease is reduced.

Despite nature's proven benefits, individuals with learning difficulties often face barriers to access. Insufficient funding, lack of accessible opportunities, transportation, and awareness prevent many from participating in meaningful outdoor activities. Natural England's report, Connecting People with Disabilities to Nature (2022), highlights the benefits of spending time outdoors for individuals with learning difficulties. Living with a disability often requires additional organization and time for daily tasks; therefore, the sense of freedom and escape from daily demands that being in natural environments provides can be particularly valuable.

5.4. Adaptable Nature-Based Therapy for Adults with Learning Difficulties

Nature is a powerful equalizer. In nature-based therapies, people are treated as individuals. In nature-based therapies, individuals with disabilities will experience the following.

- Increased self-advocacy and independence: This empowers them to have more control over their lives, understand their rights and options, and eventually require less support.
- Improved health and well-being: Higher emotional resilience, better physical health, increased mobility, healthier nutrition, and ideal body weight.
- Increased self-confidence and self-esteem: This fosters a stronger sense of self, pride in achievements, and greater belief in personal abilities.
- Greater social participation: It fosters friendships, teamwork, a sense of belonging to the community, and improved communication skills.
- Sense of purpose and value: Being part of something real, contributing to society, and experiencing meaningful engagement.
- Development of life and vocational skills: Provides greater independence, readiness for working life, and learning strategies that support personal progress.

Nature is for everyone, but people with disabilities face many barriers.

For people with disabilities, nature can provide a sense of freedom, social connection, and an escape from daily stress. Many people experience improvements in their mental and physical health even from brief interactions with nature. Accessible indoor spaces or nearby green areas

serve as important stepping stones for those with limited mobility, while more distant areas can offer adventure and a sense of confidence, but also present greater accessibility challenges. These challenges are often compounded by a lack of independence, limited social support, and practical accessibility barriers.

- Insufficient accessible infrastructure in natural areas, inadequate paths, and lack of affordable transportation options often limit participation. As a result, existing infrastructure in natural environments often fails to meet the needs of people with disabilities, making navigation difficult. Furthermore, challenges such as unpredictable outdoor conditions and inadequate environmental management can increase anxiety and vulnerability among people with disabilities.
- Beyond physical barriers, social stigma and stereotypical judgments can prevent people with disabilities from participating in nature activities. Misguided expert support can also sometimes be condescending, undermining confidence rather than boosting it.
- People with hidden disabilities, in particular, face unique challenges due to aspects of their condition that are often overlooked. Those living in economically disadvantaged areas and at higher risk of health problems have even fewer opportunities to access quality green spaces, highlighting the need for targeted support and social inclusion in these environments.

Common barriers to accessing nature underscore the need for inclusive environmental structures and management for individuals with disabilities. Furthermore, to ensure that the design and management of green spaces meet the needs and preferences of individuals with disabilities, it is essential to involve them in the review and oversight processes. Integrating

feedback from individuals with disabilities into these processes creates a more welcoming and accessible environment. As a result, it allows them to make informed choices before visiting.

5.5. Adaptable Physical Activities in Green Natural Areas According to Disability Types

General Activities: Nature walks on accessible trails for all groups, fresh air exercises, animal observation, green and blue nature photography, games played with simplified rules, gardening and plant planting activities, breathing therapy, artistic activities, nature listening activities, and mindfulness training are recommended. These activities can be adapted by specialists according to disability groups. Therapy-based applications in nature can be used for people with special needs.

Orthopedically Disabled Individuals: Strolls on wheelchair-accessible paths, seated physical activity, adaptations of bocce and table tennis, as well as gardening and animal care therapies can also be applied. Bocce and table tennis are also among the Paralympic sports.

Visually Impaired Individuals: Touch-based obstacle courses, guided nature tours, plant identification therapy through touch, aroma therapy, music-nature sound activities, and audio-guided games are adaptable for this disability group.

Hearing-Impaired Individuals: Adapted orienteering, group exercises using sign language, visual arts activities, drama activities focusing on body language, and silent yoga are among the activities that can be adapted for hearing-impaired individuals.

Individuals with Intellectual Disabilities: Nature games based on colors and shapes (e.g., finding a green color in nature or bringing a round stone from among stones), imitating animal sounds in nature, and gardening activities

(planting saplings, etc.) are among the activities that can be adapted for this group.

Individuals with Autism Spectrum Disorder: Sensory balance courses (e.g., walking on a straight line, walking on surfaces with different textures, low-height balance beams, etc.), individual activities in quiet environments (breathing exercises, observing natural objects, painting in nature, painting stones), nature-based routine walks at a slow pace with a guide (contact with nature), planting flowers in pots, watering the garden, and leaf collection activities are considered ideal for this group. Adapted yoga, tai-chi, stretching, and breathing exercises can be considered as calm and controlled sports activities.

Benefits: By providing psycho-physiological balance, it develops self-regulation skills, balances the sensory systems, increases inner peace by reducing excessive movement, and achieves body-mind harmony. With the strengthening of emotional regulation, the individual learns the message "I am safe" at the body level, increasing their sense of security. Emotions and the body become more controllable. Increased attention and focus enhance openness to learning. It ensures sustained attention without distraction. With the support of behavioral control, the frequency of problematic behaviors decreases and impulsivity diminishes. Appropriate responses increase, and transition and waiting skills develop. As feelings of confidence and predictability increase, the individual establishes healthier and safer relationships with their environment. Uncertainty decreases, and thus anxiety is not triggered.

Nature-based outdoor activities regulate the sympathetic and parasympathetic nervous systems in individuals with special needs, strengthening self-regulation and life adaptation throughout their lives.

CHAPTER 6

Aging and Green Physical Activity in Old Age

Aging is an inevitable process that causes changes in various dimensions of old age, including physical, psychological, and social aspects. If we evaluate it within a specific framework, biological aging can be assessed under the headings of cardiovascular and respiratory system changes, neurological changes, cognitive processes, and psychological dimensions.

Figure 24. Growth and Aging Process

- Biological aging: Characterized by a decrease in cellular renewal rate, increased oxidative stress, and we-

akened tissue repair mechanisms. Decreases in muscle mass and strength (sarcopenia), bone mineral density, and joint flexibility are common.

- Cardiovascular and respiratory system changes: This leads to a decrease in physical endurance, along with a decrease in maximum heart rate and aerobic capacity.
- Neurological changes: These manifest as a slowing of nerve conduction velocity, prolonged reflex times, and impaired balance control. This increases the risk of falls.
- Cognitive processes: May be affected by a slowing of information processing speed and a shortening of attention span, while experience-based knowledge and verbal skills may be relatively preserved.
- Psychological dimension: Differences between individuals are seen in life satisfaction, self-perception, and stress coping capacity; social isolation and loneliness can increase depressive symptoms.

6.1. Physical Activity Needs in Older Adults

It is recommended that adults and older adults be active every day. The recommended amount of physical activity is 150 minutes of moderate activity or 75 minutes of high-intensity activity. Moderate activity can include brisk walking, swimming, or cycling (activities that leave you breathless but still able to talk). High-intensity activity can include running or playing sports (an activity level that leaves you gasping for breath and unable to speak in full sentences). Many people are aware of these guidelines or at least know they need to be active. However, current activity levels show that about one-third of men and 50% of women do not meet these activity levels. It also shows that physical activity levels decrease significantly with age. The benefits of older adults

staying active cannot be overlooked. In the UK, 1 in 6 deaths is attributable to physical inactivity (the same as the death rate attributable to smoking). Being physically active reduces the following risks.

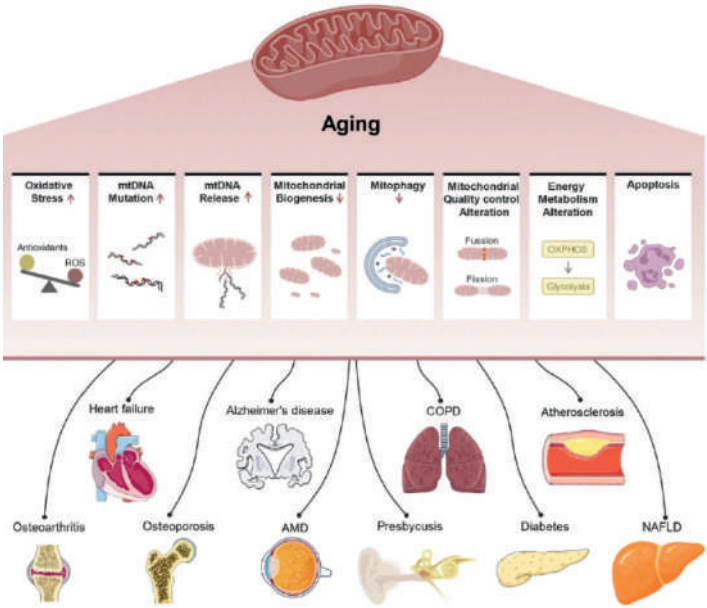

Figure 25.[9] Various diseases associated with aging (Source: Guo et al., 2022)

9 *Mitochondrial dysfunction contributes to various diseases associated with aging. With aging, increased ROS production in mitochondria leads to oxidative stress, causing oxidative damage to DNA (especially mtDNA), lipids, and proteins. The increased rate of mtDNA mutations causes errors or increased mutation frequency in the enzyme subunits encoded by mtDNA, impairing OXPHOS. mtDNA is released into the cytoplasm or outside the cell and participates in SASP secretion by activating cGAS-STING pathways. Decreased mitophagy mediated by the PINK1/parkin ubiquitin pathway causes impaired clearance of damaged mitochondria. Decreased mitochondrial biogenesis via PGC1 and NRF reduces the number of newly born mitochondria. During aging, changes occur in mitochondrial quality control; Drp1/FIS1-mediated mitochondrial fission decreases and MFN/OPA-mediated mitochondrial fusion increases, affecting mitochondrial shape and function. Mitochondrial dys-*

- A 30% reduction in the overall mortality rate
- Heart and vascular diseases caused by physical inactivity can lead to death in up to 35% of cases.
- Reduces the risk of type 2 diabetes by up to 45%.
- Reduces the risk of colon cancer by 30%.
- It reduces the risk of breast cancer by 20%.
- It can reduce the risk of dementia by up to 30%.
- It reduces hip fractures by up to 68% and
- Reduces depression by up to 30%.

Figure 26.[10] Potential Interventions and Treatments Related to Aging (Source: Guo et al., 2022)

function and mitophagy defects trigger Aβ and tau accumulation, leading to synaptic dysfunction and cognitive impairment during the development of Alzheimer's disease. The metabolic shift from oxidative phosphorylation to glycolysis causes changes in metabolite production. Mitochondrial pathway-mediated apoptosis is an important form of cell death. Mitochondrial dysfunction contributes to Alzheimer's disease, heart failure, diabetes, osteoporosis, osteoarthritis, presbycusis, NAFLD, COPD, age-related macular degeneration (AMD), and atherosclerosis by triggering oxidative stress, inflammation, apoptosis, and metabolic changes.

10 *Possible interventions and treatments against age-related diseases. Treatment strategies based on fundamental principles used in cell experiments, animal*

6.2. Strength and Muscle-Building Activities for the Elderly

In addition, according to an additional section of the physical activity guidelines that fewer people are aware of, it is recommended to do muscle strengthening exercises at least twice a week. With this strength-focused recommendation, approximately 2 out of 3 men and 4 out of 5 women do not engage in aerobic and muscle strengthening activities for optimal health. This type of physical activity is not performed very often, especially by women. The American College of Sports Medicine (ACSM) defines muscle strengthening or resistance training as "a form of physical activity that aims to improve muscle condition by working a muscle or muscle group against external resistance." Strength training means asking your muscles to perform against an external resistance. We can understand the importance of these activities when we get up from a chair, climb stairs, lift and carry heavy shopping bags, or pick up a small child. In all of these activities, our muscles work against external resistance. This resistance is sometimes our own body weight and sometimes an additional load. Healthy skeletal muscles enable us to perform all the activities we want to do in our daily lives. They allow us to move and regulate our metabolism. Maintaining healthy and

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experiments, and clinical studies are presented together. Daily lifestyle changes such as exercise, dietary interventions, and weight loss can prevent aging and support healthy aging and longevity by reducing the onset and progression of age-related diseases. Drug therapy is the primary strategy targeting aging. Anti-aging drugs exert their effects by reducing the number of aged cells, alleviating SASP, and exhibiting anti-inflammatory and antioxidant effects while affecting multiple signaling pathways. Modifying the metabolism or composition of the gut microbiota through drugs or microbiota transplantation may also prevent aging and age-related diseases. Additionally, cell replacement therapy, cell transplantation, gene therapy, and immunotherapy can be used to support healthy aging and longevity and treat age-related diseases. mTOR (mammalian target of rapamycin), NAD+ (nicotinamide adenine dinucleotide), SGLT2 (sodium-glucose cotransporter 2), ER (endoplasmic reticulum), BET (bromo- and extra-terminal)

strong muscles protects our body's posture and overall health. There is evidence in the literature that there is a very strong link between muscle strength and overall physical functioning, improved quality of life, and reduced risk of death at any age. The benefits of muscle strengthening programs include:

- Improved physical performance and movement control in functional tasks.
- Increased walking speed.
- Bone density increases.
- Increased independence in old age.
- Improved insulin metabolism.
- Fat in internal organs decreases.
- Blood pressure decreases.
- Cholesterol levels decrease.
- The risk of various chronic diseases such as type 2 diabetes, cardiovascular diseases, and osteoporosis decreases.
- Pain associated with various conditions such as back pain, osteoarthritis, and fibromyalgia decreases.
- Cognitive abilities improve.
- Self-esteem and mood improve.

We need to train our muscles regularly to keep them strong. We need to work with appropriate loads for our muscles to respond optimally. For example: body weight (calisthenics), free weights (dumbbells, kettlebells), barbells, resistance machines, resistance bands, or just household items (large water bottles, backpacks, etc.).

6.3. The Effect of Resistance Activities on Mental Health in Older Adults

As we age, more issues related to both physical and mental health arise. Research shows that regular physical activity, especially resistance training, can improve and maintain both physical and mental health in older adults. While the physical benefits of resistance training for older adults have been widely studied and documented, less attention has been paid to its potential impact on mental health.

In addition to the deterioration of our physical health, it has been found that our mental health also deteriorates as we age. Studies indicate that one-quarter of older adult's experience depression. Sleep problems, cognitive decline, and social isolation also become more likely, increasing the risk of mental health problems in later life. Physical activity is known to improve our mental health. The high energy feeling experienced after exercise is a prime example of this. Even if we don't enjoy exercising at the time, we generally feel better afterwards. This is because after exercise, the brain releases more happiness-related hormones such as dopamine and serotonin. Furthermore, feelings of self-efficacy and accomplishment also help improve our overall mood. There is strong evidence in the literature supporting the use of physical activity for diagnosed mental health problems. Large-scale research review studies show that exercise has a moderate positive effect on depression symptoms in the general population. For this reason, exercise has been included in the NICE guidelines for the treatment of mild to moderate depression. Controlled studies have shown that exercise is as effective as antidepressants. Exercise may also have a positive effect on other mental health problems in addition to depression. Research shows a link between exercise and improvement in conditions such as anxiety, schizophrenia, ADHD, and PTSD.

Studies evaluating the effect of physical activity on the mind in older adults have generally focused on aerobic exercise types. However, studies investigating the relationship between resistance exercise and mental health have recently begun. The literature shows that resistance exercises have many benefits for our physical health as we age. Significant improvements in depression levels have been observed in older adults after resistance exercises. Furthermore, a 12-week resistance training program consisting of strength exercises performed three times a week resulted in significant improvements in anxiety and depression scores in older women. A study involving women and men who participated in a 12-week strength exercise program reported significant positive effects on participants' anxiety and mood. Furthermore, it has been found that resistance exercises provide significant benefits for anxiety in men diagnosed with anxiety disorders.

6.4. Low-Intensity Physical Activity in Older Adults

It is known that light exercise for a few minutes a day, such as light gardening or walking the dog, can help older adults live longer. The finding that low-intensity physical activity is associated with a reduced risk of death is particularly important among older men, as most of their daily physical activities are of low intensity. The literature emphasizes the critical importance of 150 minutes of physical activity per week, even if done in short sessions. Current exercise guidelines recommend at least 150 minutes of moderate to vigorous physical activity per week, performed in sessions lasting 10 minutes or longer. However, researchers have noted that older adults do not always easily achieve this pattern. A study was conducted on more than 1,000 men with an average age of 78 to determine whether other forms of activity could contribute to reducing the risk of death. In the experiment, participants were asked to wear an accelerometer, a portable device that

continuously monitors the volume and intensity of physical activity during waking hours, for seven days. Accelerometer data showed that total physical activity volume, starting from light intensity, was associated with a reduced risk of death from any cause. According to the study, each additional 30 minutes of light-intensity activity per day was associated with a 17% reduction in mortality risk. While an additional 30 minutes of moderate to vigorous physical activity per day was associated with an approximately 33% reduction in mortality risk, the benefits of light-intensity activity were also substantial enough to potentially extend lifespan. The study noted that there was no evidence that performing moderate to vigorous activity in bouts of 10 minutes or longer was better than performing it in shorter bouts.

6.5. Nature-Based Physical Activity for Older Adults

Nature-based physical activities can support the health and well-being of older adults, but it remains unclear which physical activities are most effective for whom and in which contexts. The global population aged 65 and older is projected to double from 761 million in 2021 to 1.6 billion by 2050. The regions where this change is most pronounced are East and Southeast Asia, with low- and middle-income countries experiencing the greatest change and expected to account for one-third of the world's population aged 60 and older by 2050. In light of these data, understanding health factors, particularly the role of the physical environment, is crucial for promoting healthy aging. Exposure to nature has been shown to improve physical, cognitive, emotional, and social health. These findings have increased interest in nature-based physical activities to improve public health.

Nature-based physical activities are programs, activities, and strategies that engage people in nature-based experiences

for health and well-being. Examples include prescribed outdoor walks and therapeutic gardening. There are significant knowledge gaps regarding which nature-based physical activities yield the best results for specific individuals and contexts, as well as various intervention methods (e.g., forest walks, horticultural therapy) and settings (e.g., forests, lakesides). Health professionals struggle to identify the most effective approaches.

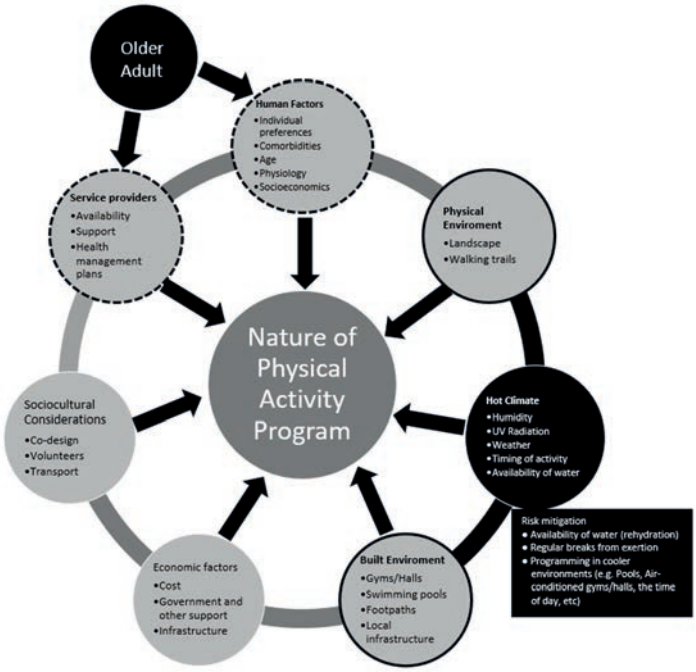

Figure 27. Considerations for Planning Physical Activity Programs for Older Adults (Source: See et al., 2021)

6.6. Healthy and Enjoyable Adaptable Nature-Based Physical Activities for Older Adults

Spending time outdoors plays a vital role in improving the health, well-being, and quality of life of older adults. From improving mood to increasing mobility, outdoor activities offer both physical and mental benefits necessary for healthy aging. In senior care or assisted living environments, these activities become even more accessible, safe, and enjoyable thanks to dedicated outdoor spaces, supportive staff, and wellness-focused programs. Nature-based experiences can be particularly restorative, energizing, and mentally invigorating for older adults. As we age, mobility decreases and social circles shrink. However, spending time in nature provides both stimulating and calming effects. Even spending a short time in nature has numerous benefits.

Spending time in nature provides incredible benefits for mental health. Clean air and sunlight have positive effects on mental health. Spending time outdoors regularly has been linked to the following:

- Reduction in symptoms of depression, anxiety, and worry: Exposure to nature helps regulate mood and sleep cycles. It can also increase levels of serotonin, a neurotransmitter that contributes to feelings of happiness and calmness.
- Less loneliness and isolation: Participating in nature-based group activities, even passively, helps older adults connect more with their surroundings and other people.
- Improved mental performance: Spending time outdoors supports attention, focus, and mental clarity, especially for older adults experiencing memory loss and cognitive decline.

- Higher emotional resilience: Being in nature encourages mindfulness and reflection, helping older adults manage stress and improve their emotional state.

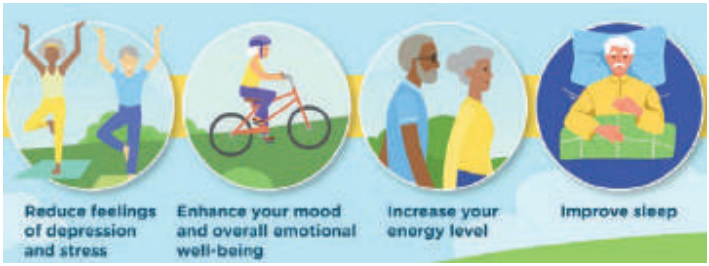

Figure 28. Mental health benefits of physical activity (Source:www.nia.nih.gov/exercise)

Physical activity in natural environments increases mobility, vitality, and overall energy. When examining the main physical benefits, improvements in heart health, vascular health, flexibility and balance, a strong immune system, and quality sleep are also observed.

Among physical activities that enhance mobility and strength, nature walks are at the forefront. A short walk in a garden, park, or residential area is considered one of the easiest ways to stay active. Walking improves blood circulation, strengthens muscles, and offers opportunities for quiet reflection. Choosing nature trails and walking during cooler hours of the day can make the experience safer and more comfortable. Gardening combines light physical activity with therapeutic benefits. Whether planting flowers, growing plants, or simply tending to greenery, gardening encourages movement, mindfulness, and a sense of accomplishment. For seniors, painting, drawing, or drying flowers outdoors allows them to express themselves in a calm environment. These

projects are suitable for individuals or groups and can be adapted to various skill levels and physical abilities. Observing birds, butterflies, or small animals increases relaxation and mental engagement. A quiet corner with binoculars or a nearby bird feeder can turn everyday moments into peaceful routines.

6.7. Physical Activity and Dementia

Regular exercise is associated with a reduced risk of dementia and can slow the catabolic phase by improving blood flow, neuroplasticity, and inflammation control. Moderate cardio exercises such as brisk walking should be combined with strength training 2-3 times a week and balance and flexibility exercises. The goal should be approximately 150 minutes of moderate physical activity per week, and it is recommended to do this in short daily exercise sessions. The cognitive and mood benefits include attention, memory, cognitive function, sleep, and reduced anxiety. According to some sources, less than 15% of adults aged 65 and older do the recommended amount of aerobic exercise. A sedentary lifestyle, especially in adults, is thought to cause many health problems such as diabetes, obesity, heart disease, and dementia. To elaborate further, dementia, a problem affecting millions of people worldwide and becoming more prevalent as the population ages, has emerged. There is no cure for dementia yet. However, research suggests that physical activity, especially physical activity in nature, may be beneficial for this condition. Studies have found that physical activity in green spaces is beneficial even for patients diagnosed with dementia.

Figure 29. The Effect of Physical Activity on Dementia

Numerous studies have reported the many benefits of physical activity. Recent research suggests that it provides benefits within the brain. A recent study has shown that physical activity supports brain plasticity and minimizes the risk of dementia. Brain plasticity, or neuroplasticity, refers to the brain's ability to change and adapt in response to new stimuli. This allows the brain to compensate for changes caused by age, injury, and disease. The study also found that physical activity increases the level of a protein called BDNF, thereby preventing the onset of dementia. Physical activity increases heart rate, accelerating blood circulation throughout the body, including the brain. During physical activity, the heart works faster and vasodilation occurs. This physiological response ensures that the oxygen and nutrients needed by the brain are transported more efficiently. Physical activity plays a critical role in maintaining healthy brain function. Furthermore, a recent study has shown that advanced age is not a barrier to benefiting from the positive effects of moderate aerobic exercise. In this study, a 15% increase in blood flow to the brain was observed in 16 women aged 60 and over who walked briskly for 30–50 minutes three or four days a week.

6.8. University of the Third Age

The first rejuvenation university was established in 1973 at the Faculty of Social Sciences in France by Prof. Dr. Pierre Vellas. University of the Third Age programs operate in association with a local university ( ). This academic model is used in many other countries, particularly in Europe. The university connection provides various opportunities, such as a highly qualified teaching staff, a wide range of course options, and opportunities for students and faculty to conduct research based on the professional, cultural, or historical experiences of older adults. U3As (universities of the third age) do not award diplomas, but rather certificates, and generally provide education in areas such as computer skills, languages, entrepreneurship, sports, fine arts, and crafts, according to the interests of student groups over the age of 55.

It is a social responsibility project that was first launched in Turkey in 2016 at the Department of Geriatrics, Faculty of Medicine, Ege University. The training is provided entirely on a voluntary basis, with approximately 300 faculty members teaching the courses. In Turkey, during the 2024-2025 academic year, Akdeniz University, Istanbul Nişantaşı University, Muğla Sıtkı Koçman University, Anadolu University, Cyprus Girne University, Malatya Turgut Özal University, Sivas Cumhuriyet University, Alanya Alaaddin Keykubat University, Muş Alparslan University, Yozgat Bozok University, Mersin University, Osmaniye Korkut Ata University, Tokat Gaziosmanpaşa University, Çanakkale 18 Mart University, Batman University, Kırşehir Ahi Evran University, and Erzincan Binali Yıldırım University in collaboration with the Ministry. According to the latest data, 6,320 individuals are continuing this training.

The 60+ Rejuvenation University projects, both nationally and internationally, aim to support healthy and social aging for individuals as they age, with a lifelong learning perspective.

Within the scope of this project, different universities across the country offer higher education programs for older adults with the goal of active aging. The 60+ Rejuvenation University program enables older adults to spend their time actively and meaningfully, make new friends, and continue their personal development within the framework of lifelong learning.

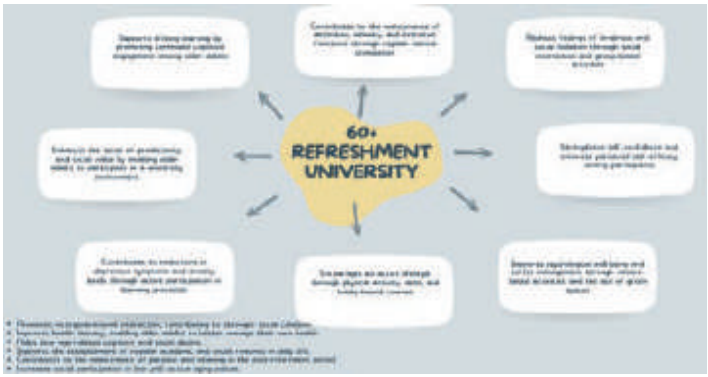

Figure 30. Benefits of the 60+ Rejuvenation University for Individuals

Scientists have discovered that older adults who continue to learn not only remain mentally sharper but also generally feel happier and more connected. Activities such as learning a language, photography, or spending time in nature can help our brains form new connections. The primary goal of rejuvenation university projects is to support active and healthy aging by helping the brain form new connections. This project has been implemented at many universities in Turkey.

With rejuvenation universities, older individuals prepare for the biological, sociological, and psychological changes that come with aging. The applications are determined according to the capabilities of the campuses. The courses consist of applications, theories, laboratory work, seminars, and workshops.

CHAPTER 7

Green Exercise-Based Adaptable Physical Activity For Children and Youth

Nature-based learning in early childhood integrates natural elements into lessons to strengthen children's connection with nature, raise environmental awareness, and support their comprehensive development. This section will explore the details of this method and present specific applications to effectively support children's future growth and development.

Nature-based learning is a 21st-century educational method that connects children with the natural world. It promotes a holistic approach to education by supporting children's physical, emotional, cognitive, social, and environmental well-being. This method stimulates curiosity through hands-on exploration, develops critical thinking, and enhances problem-solving skills. Children who play in green environments have been found to experience lower rates of anxiety, sadness, and attention deficit issues. In addition, outdoor activities can support cardiovascular health, coordination, and motor skill

development. Nature's rich sensory environment encourages imagination and creativity. NBL also equips children with the knowledge and values necessary for an environmentally conscious approach and lifelong learning. This method can be implemented entirely in natural environments or in a built environment with added natural elements. Nature-based learning in early childhood has been tested and recommended for over two centuries. It is particularly popular in forest kindergartens and is usually designed for young children. Today, with the increase in forums, conferences, and networks for educators and parents, interest in nature-based education is growing significantly.

Nature-based education, especially during early childhood, has a significant impact on children, including the following points.

- Supports cognitive development
- Academic performance improves
- Promotes social adaptation
- Supports social development
- Mental and emotional health improves
- Physical health is supported
- Sense of belonging and responsibility develops.

7.1. Nature-Based Physical Activity in Physical Education and Health Education

Richard Louv, in his book "Last Child in the Woods," highlights the potential harm that can result from children not being sufficiently exposed to the natural world. These harms include increased obesity, attention deficit, and depression. He also argues that today's youth are becoming disconnected from nature and has coined the term "nature deficit disorder." The

time children and young people spend actively outdoors helps them achieve numerous physical, mental, and social health benefits, including physical activity, self-confidence, leadership skills, social skills, motivation, academic achievement, mental health, and resilience.

A study in the literature provides hypothetical pathways for the mental, physical, social, and behavioral health outcomes resulting from nature experiences. We can examine this in the figure below (Figure 30).

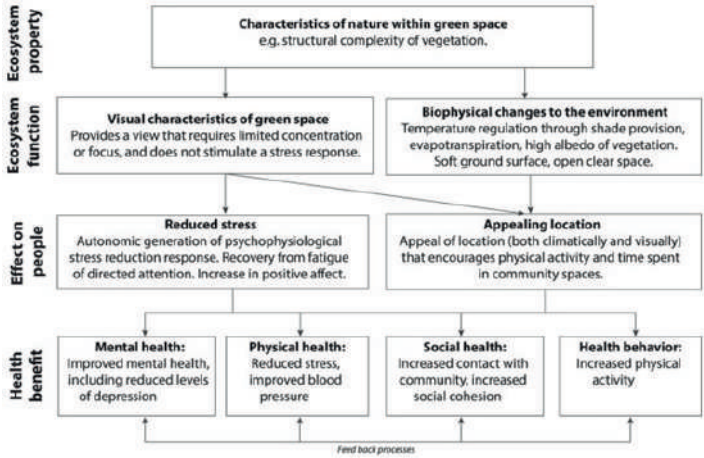

Figure 31. Hypothetical pathways of nature experiences (Source: Shanahan et al., 2016)

Exposure to nature is associated with positive effects in areas critical to urban life, such as mental and physical health, social well-being, and physical activity. The density of vegetation cover and the duration and frequency of exposure appear to be linked to reduced stress, mental renewal, and the creation of environments that support social-physical interaction. Moreover, the mechanisms through which

exposure to nature produces long-term and lasting health effects in terms of intensity and duration are not yet clear.

Research on physical activities in nature has long demonstrated the positive outcomes of learning in nature. Additionally, a possible way to achieve these outcomes is to incorporate nature-based physical activity into physical education. Physical education classes are important for improving the health outcomes of young people, are compulsory for most students, and are conducted regularly. Moreover, nature-based physical activity refers to physical activities that take place in natural settings, require minimal equipment, are acceptable to the majority of young people, are cost-free, and can be regularly implemented by physical education teachers. In this respect, the integration of nature-based physical activity into physical education classes can be considered not only a pedagogical choice but also a highly feasible health promotion strategy within the existing school infrastructure.

Below is an example of a nature-based physical activity for children and young people. This activity, called My Tree, can be adapted to most middle and high school physical education programs, requires little travel, and can even be played in a green area on the school grounds. The "My Tree" activity requires no equipment. It aims to connect with nature using the senses, is easy to implement, and is highly valued by students. In pairs, one partner leads the other to a selected tree (following a winding route). Ideally, participants should walk at least 20 meters. Guides slowly and carefully direct their visually impaired partners (with eyes blindfolded or closed) and warn them of obstacles. Upon reaching the selected tree, the guide places their partner's hands on the tree to allow them to explore it. Visually impaired partners can touch, hug, or use any other tactic they wish while blindfolded or with their eyes closed. After the exploration, the guides lead

their partners back to the starting point via a winding route to make it more challenging. Upon returning, the visually impaired partners regain their sight and attempt to find their special tree. When the tree is found (or time runs out), the roles are reversed.

Figure 32. My Tree Game

Incorporating nature-based physical activities into physical education classes can be a source of social, ecological, emotional, and physical well-being for students.

In the 1980s, physical education literature incorporated outdoor education into physical activity by defining its terminology and discussing its emotional benefits. Although outdoor education curricula have gained attention in recent years, they are not implemented as publications in physical education. One study indicated that less than 1% of female participants had experienced outdoor education in physical education programs. Furthermore, nearly half of all Americans participated in outdoor recreation last year. This number is

increasing every day. It has been noted that starting outdoor recreation and physical activities at an early age has a lasting effect. As participation in outdoor activities continues to grow, it is the right time to incorporate outdoor education into the physical education curriculum.

7.2. Benefits of Nature-Based Physical Activity in Childhood

Nature is a dynamic and ever-changing classroom that offers unlimited opportunities for discovery, exploration, and learning. The roles nature plays in early childhood education are outlined below. Participating in nature-based green exercise activities provides many advantages for children. It allows children to explore and understand their surroundings. It can help them learn about nature and the world and develop self-confidence. When examining the physical benefits of nature-based physical activities, they promote motor skills, cooperation, sharing, better quality sleep, and increased exposure to sunlight.

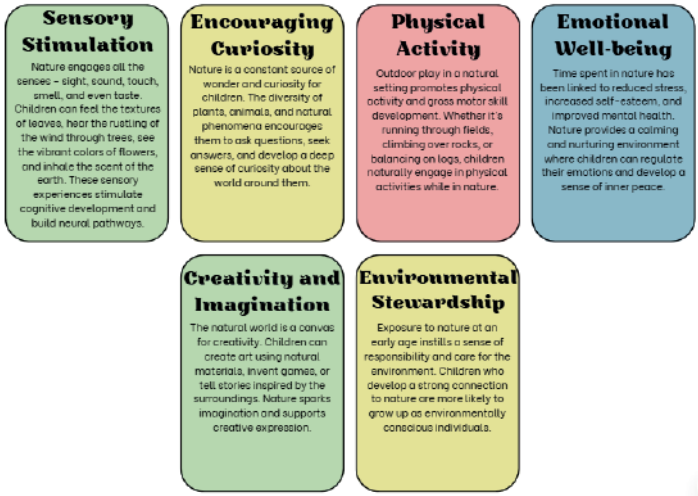

Figure 33. Benefits of Nature in Early Childhood

Playing in nature helps children develop gross motor skills such as balance, coordination, and strength. Physical activity is important for everyone, but it is even more important for growing children. Playing or exercising in nature can improve children's overall health by helping them stay active and fit, supporting their development and growth. Sensory perception of nature's sights, smells, and sounds can stimulate their brains and enhance their creativity. Playing outdoors helps children fall asleep faster and sleep better. One study found that children who spent more time outside during the day slept 34 minutes longer than those who spent less time outside. Running, climbing, and jumping help develop muscle strength, coordination, and balance. These physical activities also help increase bone density and reduce body fat. Moreover, playing outdoors is a great way for children to get 60 minutes of moderate to vigorous physical activity per day. Studies show that time spent in nature can improve attention span, reduce stress, and increase creativity.

The effects of physical activities in nature on children's psychological well-being have been increasingly discussed in recent years. These effects are not limited to one-sided outcomes such as happiness or reduced stress. The freedom of movement offered by outdoor environments allows children to interact directly with their surroundings, while also contributing to testing their limits and gaining body awareness. For some children, this process progresses more quickly. It has been observed that self-confidence and independence gradually strengthen in children who regularly experience open spaces; however, it cannot be said that this development occurs at the same level in every individual. The nature of the relationship established with nature, family support, and the educational environment can significantly shape this process. Therefore, when evaluating the psychological benefits of physical activity

in nature, it is thought that one should avoid assuming a uniform effect.

7.3. Children who play outside are more likely to protect nature in adulthood

In an industrialized world, every individual has both positive and negative effects on nature. The extent of people's negative impact on the environment can be reduced. Therefore, nature conservation practices are highly beneficial for both humans and the environment. Moreover, allowing our children to play outside can be considered one of the best ways to protect nature. A study found that children who play outside have a constant love for nature, do not litter, and see protecting nature as their top priority. The study found that all of the girls included in the study loved nature, and 87% of the boys also loved nature.

7.4. Adaptable Green Exercise and Physical Activity for Pregnant Women

It has been shown that exposure to green spaces is associated with health benefits in certain population groups, such as pregnant women. Pregnancy is a stage of life when there is a greater focus on health, and this focus can lead to improved health. Moderate-intensity physical activity during pregnancy is associated with improved mood and self-image, increased sleep, more appropriate weight gain, improved muscle tone, strength, and endurance, increased energy levels during delivery, and faster recovery after delivery. Currently, published data investigating the relationship between exposure to green space and physical activity levels in pregnant women is limited. In the general population, the beneficial effects of exposure to green space appear to be more pronounced for people living in socioeconomically poorer areas. Of particular relevance to reducing health inequalities among population

subgroups is the fact that exposure to green space may be a potentially more important determinant of pregnancy health for people living in poorer socioeconomic conditions. In a socioeconomically diverse birth cohort recorded in Barcelona, Spain, proximity to large green spaces and increased greenness of the environment were not associated with increased birth weight for the entire cohort, but this relationship emerged when considering babies born to women in the least educated group. A more recent study examining the relationship between green space and depression showed that exposure to green space during pregnancy and proximity to greenery in the residential environment were associated with a decrease in the incidence of depression in the entire cohort of pregnant women.

Pregnancy involves unique factors that both hinder and facilitate participation in physical activity. We outline the fundamental factors that generally apply to pregnant women. For overweight and obese women, these are often more pronounced, and they face additional challenges such as stronger self-consciousness or feelings of stigma, lack of guidance tailored to their needs, and misconceptions about the safety or benefits of exercise during pregnancy. Pregnancy presents a window of opportunity for behavioral change. It is considered a time when women may be more motivated to adopt healthier habits for the well-being of both themselves and their babies. Women who engage in physical activity throughout pregnancy are likely to carry these habits into the postpartum period and lay the foundation for a more active lifestyle that will support postpartum weight management and improve long-term health outcomes.

As indicated in the infographic below, exercise during pregnancy can provide significant benefits for both you and your baby, including maintaining a healthy weight, reducing the risk of gestational diabetes, and preventing back pain.

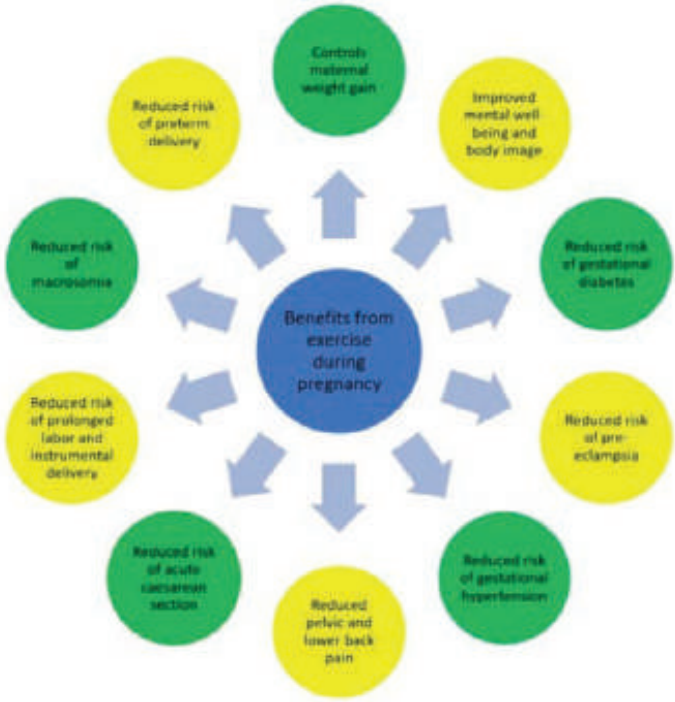

Figure 34. Benefits of exercise during pregnancy for the mother and fetus

The type of exercise generally recommended during pregnancy is a combination of moderate-intensity aerobic and strength training. If you are new to physical activity, this could be walking or light resistance exercises. If you are an elite athlete, you can continue with the same intensity of physical activity at the beginning. Figure 33 outlines the benefits of exercise during pregnancy:

- Weight control is maintained
- Mental well-being and body image improve
- Reduces the risk of diabetes

- Reduces the risk of preeclampsia
- Reduces the risk of gestational hypertension
- Back pain is reduced
- Reduces the risk of cesarean section
- Prevents delayed delivery
- Reduces the risk of macrosomia (large baby)
- Reduces the risk of preterm birth.

Figure 35. Physical activity recommendations for pregnant women

According to Figure 34, if you are active, you should continue cardio exercise at less than 90% of VO_2max for 20-30 minutes, 3-5 days a week. You should continue at least 150 minutes of moderate physical activity per week throughout your pregnancy while doing housework. If you are not

active, physical activity should be started gradually. Strength training should be performed 2-3 days a week, consisting of 7-8 different exercises, 8-12 repetitions, and 3 sets. Pelvic floor exercises should be performed (8-12 repetitions, 3 sets, every day).

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