

Joint Health, Balanced Everyday Activity

Benefits of Functional Training

Ízületi egészség, mindennapi mozgásharmónia A funkcionális edzés előnyei

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Abstract: In our rapidly changing world, we are leading increasingly sedentary lives, a trend that becomes even more pronounced with advancing age. A lack of physical activity can result in functional impairments, underactive muscles, and coordination issues. Therefore, the primary goal must be prevention, which involves maintaining physical fitness. Integrating regular physical activity into daily routines is essential not only for preserving health but also for enabling the safe and injury-free execution of everyday tasks. The fitness industry offers many trends and trends for developing motor (conditioning, coordination) skills and restoring and strengthening joint functions. Functional training provides a comprehensive solution by integrating natural movement patterns that prioritize the balance between joint mobility and stability.

In our study, we use examples from everyday life to highlight the benefits of functional training in promoting healthy joint function and improving daily movement patterns.

Keywords: fitness, joint function, anatomical plans, functional training

Absztrakt: Gyorsan változó világunkban egyre inaktívabb életet élünk, különösen igaz ez a kor előrehaladtával. A mozgásszegény életmód funkcióvesztést, alulműködő izmokat, a koordináció zavarait okozhatja. Ezért a cél a megelőzés, azaz a fittségi állapotunk szinten tartása kell, hogy legyen. A fizikai aktivitás rendszeres beillesztése a napi rutinba nemcsak az egészség megőrzése, hanem a mindennapi tevékenységek sérülésmentes végzése szempontjából is kiemelten fontos. A fitness számos irányzatot, trendet kínál a motoros (kondicionális, koordinációs) képességfejlesztésre, az ízületi funkciók helyreállítására, megszilárdítására. Ezek mindegyikére együttes megoldást nyújt a funkcionális edzés, ami olyan természetes mozgásmintákat integrál, amelyek az ízületi mobilitás és stabilitás egyensúlyára építenek. Munkánkban a mindennapi életből vett példák segítségével világítunk rá az egészséges ízületi működésre és a mindennapi mozgásminták javítását célzó funkcionális edzés előnyeire.

Kulcsszavak: fitness, ízületi funkció, anatómiai síkok, funkcionális edzés

Introduction

Inactive lifestyle is a serious problem worldwide. In Hungary, a significant portion of the adult population, particularly those of working age, engage primarily in sedentary activities (Hungarian Central Statistical Office, 2019). Musculoskeletal complaints, often resulting from excessive physical exertion, poor posture, and work-related stress, are prevalent (Bajsz et al., 2014).

The rise of modern technology has contributed to sedentary lifestyles by limiting opportunities for physical activity and outdoor recreation (Bull et al., 2020). In the past, our lifestyle was based on active movement, which helped us adapt to the challenges of our environment. Today, however, we tend to adapt our environment to our own lower need for exercise. Daily sedentary behavior has led to a widespread decline in gluteal muscle function, a condition often referred to as 'gluteal amnesia'. This muscle weakness can contribute to limitations and strain in the surrounding hip muscles. Due to the changing chal-

lenges of our environment, maintaining physical fitness is essential. Regular exercise also plays a key role in preventing diseases and contributes significantly to slowing down mental and physical decline (Paillard, 2015).

It is recommended to use training programs during which we encounter challenges that can be adapted to our everyday life. The development of strength, speed, and stamina is only part of the areas to be improved. The sense of balance continuously deteriorates with age (Kovács, 2016), even though it is an indispensable skill for many activities. For instance, maintaining balance is crucial for everyday tasks like carrying groceries (farmer's carry) or preventing falls. Spatial awareness is equally important, particularly when navigating through traffic or unfamiliar environments.

Joint Function

The coordinated execution of our movements depends not only on maintaining and developing our abilities, but also on the condition of

our joints. However, the interconnected joints of the body perform a different function, being part of a kinetic chain. Dr. Arthur Steindler described the body in 1955 as a system of segments connected by joints, in which the movement of individual joints also affects parts of the body farther away from it.

Steindler observed that when a limb resists an external force (closed kinetic chain), its muscle and joint function differs from when it moves freely (open kinetic chain) (Steindler, 1955).

Forces acting on any part of the body are transmitted through the interconnected system of joints. This affects the transmission of force and energy throughout the body. If you move your little toe, that movement affects the muscles and joints closest and farthest to that muscle chain. However, to achieve efficient energy transfer between the body and body parts, we need to know whether a particular joint is intended for mobility or stability.

Mobility is a combination of muscle elasticity, range of motion of joints, and freedom of movement of the body (Benkovics et al., 2019; Széll, n.d.). A joint is mobile if it can move painlessly along the entire range of motion intended for it (Almásy, 2021). The movement itself is called mobilization, where the range of motion is passed several times, at varying speeds, with different loads. Stability is a concept related to the nervous system and it means perfectly functioning neuromuscular control, during which muscles can maintain a stable position of the joint or move it in a controlled manner (Almásy, 2021). Stability therefore means controlling movements and maintaining correct posture (Benkovics et al., 2019; Széll, n.d.). Joints provide a balance between movement and stability, enabling bones to move while maintaining the body's integrity. Muscles close to the joint being moved are called stabilizer muscles, allowing this joint to perform only the movements and in the range of motion that is optimal for the joint. Active stabilizers, such as muscles, and passive stabilizers, like ligaments and joint capsules, play a role in maintaining stability. An imbalance between mobility and stability can lead to improper movement and injuries. According to Boyle's observation, lower back pain, knee and shoulder injuries are often due to muscle strength deficiencies, as our muscles are not able to provide adequate stability during critical movements (Boyle, 2020).

Each joint requires a balance of stability and mobility; however, the relative importance of these two factors varies during complex movements (Almásy, 2021). Gray Cook's joint-by-joint model shows which function each joint contributes to movement. According to the theory, the ankle should be mobile, the knee should be stable, the hip should be mobile, the lumbar spine should be stable, the back should be mobile, the shoulder blade should be stable, and the shoulder should be mobile (Boyle, 2020). Adjacent joints therefore have the opposite function. If dysfunction occurs in one joint, the adjacent joint(s) compensate (Figure 1). That is the reason why the pain does not occur where the original problem appears, but in the compensating joint.

There is dorsiflexion (up to 20-30 degrees) and plantar flexion (up to 30-50 degrees) in the ankle joint (Balogh, 1999; Kapandji, 2024). The range of motion of dorsiflexion plays a significant role in the absorption of body weight,

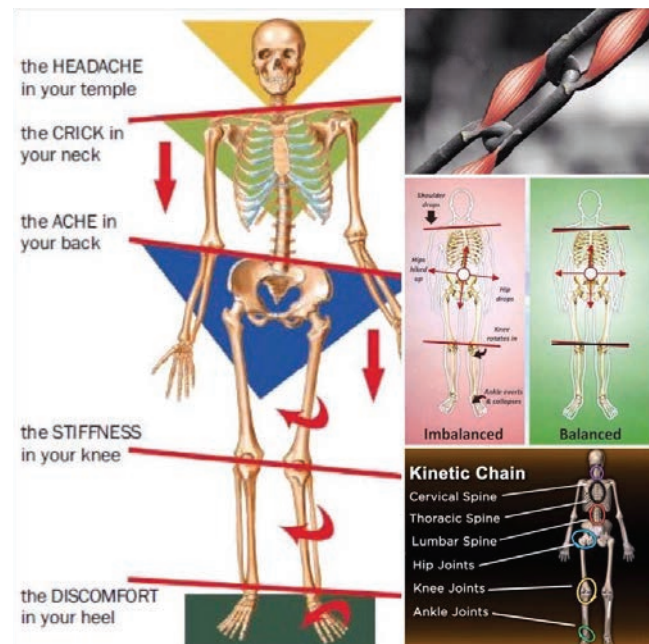


Figure 1. The interacting joint functions (source: https://www.facebook.com/photo.php?fbid=1429854570477848&id=496029673860347&set=a.496080860521895&locale=sr_RS)

especially when we arrive at the ground with eccentric or braking force (Dubin et al., 2011).

If the mobility and flexibility of the ankle decreases, for example, due to wearing high heels, there can be an increased risk of knee injuries.

The knee ligaments are primarily responsible for stabilizing the knee joint, while the secondary function is performed by the muscles around the knee. The anterior cruciate ligament is considered the main stabilizer of the knee, which contributes about 85% to this task (Abulhasan & Grey, 2017). The knee joint performs flexion up to 140 degrees and extension up to 5 degrees, lateral rotation up to 30 degrees and medial rotation up to 10 degrees (Prókai, 2018; Balogh, 1999).

The hip is a joint intended for mobilization. During movement, power is transmitted through the hips between the lower and upper body and towards the limbs. Therefore, the hip joint is the primary movement center of the body, yet it is used in a limited range of motion. The limited mobility of the hip joint can cause lower back pain and knee pain. The hip joint allows for a range of movements, including abduction (moving the leg away from the body) up to 30 degrees and adduction (moving the leg towards the body) up to 25 degrees. Additionally, the hip can flex (bend) up to 140 degrees and extend (straighten) up to 15 degrees. Finally, the hip can externally rotate (rotate outward) up to 90 degrees and internally rotate (rotate inward) up to 70 degrees.

The above is evidence that effective movement is therefore based on the stability and mobility of the joints.

Understanding Joint Movement in Anatomical Planes

Our daily activities involve three-dimensional movements. Therefore, understanding the planes of motion (sagittal, frontal, and transverse) in which our joints move (Figure 2) is crucial for performing exercises correctly.

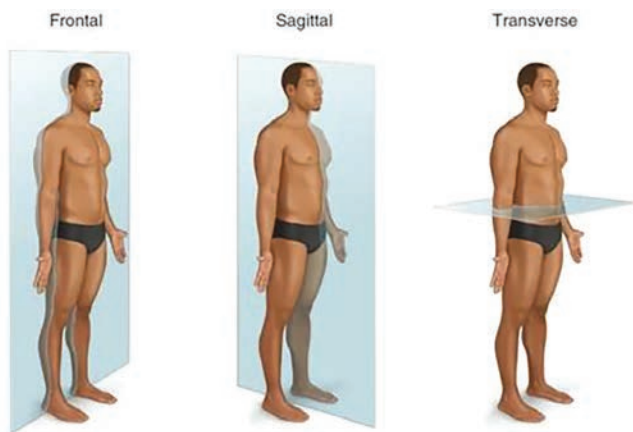


Figure 2. Anatomical planes (source: https://blog.nasm.org/exercise-programming/sagittal-frontal-traverse-planes-explained-with-exercises?utm_source=blog&utm_medium=referral&utm_campaign=organic&utm_content=ReasonsToBecomeCES)

Most of our everyday activities take place in the sagittal plane. For a mother to bend down to pick up her toddler, a lot of muscle groups need to work together. This movement is an everyday version of the dead lift (lifting the object on the ground) (Figure 3). Doing regular and intensive housework is also a series of actions done in several planes in addition to burning calories. Vacuuming is a series of pushing and pulling movements in the sagittal plane. During mopping, both the sagittal and frontal planes are utilized as the mop is moved back and forth, and side to side. When hanging laundry or placing items on a shelf above head level, the movement predominantly occurs within the sagittal plane, resembling a simplified overhead press. Proper walking is an all-day active plank posture, since by stretching the abdominal muscles and gluteal muscles, the stabilization of the torso is created by moving the arms and legs forward and backward in the sagittal plane (ante- and retroflexion).



Figure 3. The Dead Lift exercise in everyday and fitness terms (source: own creation)

Movement in the frontal plane appears in fewer everyday actions, but there are sports such as handball where the defensive arm- and foot work is especially significant, the arm work of breast swimming, or the cartwheel frequently practiced by children also occurs in this plane. In the transverse plane, we stir the soup with the wooden spoon, where the shoulder joint plays the main role, or when we turn our head from side to side while crossing the road. If we applaud at an official event, this movement is also in the transverse plane, which is realized by the horizontal adduction (approximation) of the arms. The use of the transverse plane

in sports is much more pronounced than in everyday life. Joints designed for stability, such as the knees and lower back, are often injured when forced to move in this plane, as their primary function is to maintain position against forces from various directions. In contrast, most daily movements involve rapid changes between different planes of motion, often occurring in fractions of a second.

Functional Training

Practicing movement patterns in different planes of movement is therefore the foundation for maintaining overall fitness and performing daily activities injury-free.

Functional training is an excellent option for this. Functional training is a training method in which the individual muscle groups are not worked in isolation but integrated into different movement patterns. We do not think about training tasks by focusing on individual body parts, because that is not how we live our everyday lives.

The background of the training method is focused on individual goals, movement-based execution, as opposed to isolated exercises focused on one muscle group. The training method is based on the current skills and performance level of the individual, which is determined by pre-training mobility and stability tests, and movement pattern analyses (Tóth et al., 2020). If any test result suggests that the risk of injury is high, it is worth thinking in isolated exercises, but the long-term goal is multidimensional exercise with many muscle groups. The essence of the system is a deep knowledge of anatomy, so although we do not focus on individual muscles, we still need to be aware of the collective muscle movements that create the larger movements. Knowing the correct starting positions, the correct mechanics of the movements and how to correct any errors with precise instructions, is essential for transferring these skills to everyday activities.

Functional training builds on six fundamental human movements: squatting, lunging, hip hinging, pushing, pulling, and carrying. A well-structured training program strengthens these fundamental movements and promotes balanced muscle development, improved coordination, and enhanced stability through a variety of exercises. The training method is enhanced by a comprehensive warm-up, which prepares the body for physical activity by increasing blood flow, improving flexibility, and reducing the risk of injury. Contrary to previous beliefs, the fascial system (all tissues that connect or border structures) (Pegán, 2021), the skeletal system, the musculoskeletal system, and the nervous system are all warmed up by this training method.

The Pillar preparation consists of mobilization exercises for the ankles, knees, and hips, followed by core stabilization exercises. The Movement preparation ensures an injury-free, complex, high-intensity and sport-specific execution of the exercise. This stage aims to activate the full range of motion of the body, increase blood circulation, and improve neuromuscular connections. The exercises are designed to restore muscle imbalances, protect the joints, and practice harmonious, complex movements that mimic everyday activities. This ensures long-term quality of life regardless of gender, age, or fitness level. During the functional exercises, we perform multi-joint movements at the same time, so the tasks are always complex. The focus is not on developing excessive strength in one movement pattern, but on achieving a balance between pushing and pulling force, and between

en knee-dominant hip extension (four-headed muscle and gluteal muscle) and hip-dominant hip extension (hamstring muscle and gluteal muscle) (Boyle, 2020).

Functional training will not be valuable with overcomplicating the exercises, but rather with striving for proper execution and proper breathing. The force should be generated from the hips and transmitted through the tight torso. Exercises can be facilitated (regression) and made difficult (progression) according to 3 aspects, tailored to the individual's abilities. These are strength, coordination, and combination.

Force is the amount of resistance that must be overcome. This can be varied during exercises by using lighter or heavier weights. To vary the coordination of an exercise, the support surface can be changed from stable to unstable. For example, a backward lunge can be made more challenging by aligning the feet or placing a Dynair ball under the front foot.

The complexity of an exercise is determined by combining various factors. For example, an exercise is considered simpler if it is performed in one plane of motion and involves only one or two movement phases. However, exercises become more complex when performed in multiple planes of motion, while moving, or when involving a greater number of movement phases. (Figure 4)



Figure 4. Exercise in several planes (source: own creation)

The central element of functional training is to increase and maintain the strength of the core muscles. The word core is used as a collective name for the muscles that surround the abdominal cavity for the stability of the spine and pelvis (that is, static operation during limb movements), thus core muscles are also responsible for correct posture (Bajsz et al., 2012). These muscles are the deep layer of the erector spinae, the transversospinalis muscle group, the abdominal muscles, especially the transversus abdominis and the

gluteal muscles around the pelvis (gluteus maximus, gluteus medius, gluteus minimus). The core muscles are responsible for antirotation (resistance to rotation), antiextension (resistance to extension), and antilateral flexion (resistance to side bending).

Functional training includes functional circuit training, functional step or bosu classes, but also CrossFit, kettlebell, Boot Camp, Spartan Girja, or HIIT training (Biróné et al., 2022).

Summary

In our fast-paced world, physical activity is becoming less and less important, even though we are facing more and more challenges. The most common problem that occurs during an inactive lifestyle is gluteal amnesia, or muscle weakness around the joints, which can cause long-term pain and thereby lead to a deterioration in quality of life.

The fitness industry offers excellent alternatives to the emerging phenomenon that affects every country in the world. Individualized forms of physical activity, exercise programs aimed at muscle functionality at any age and in any health status (except for people suffering from febrile diseases and hemorrhagic diseases) significantly improve the quality of life and prolong life expectancy (Tóth, 2021). Overall, it can be concluded that using complex movements in fitness trends is closely related to our everyday life, since despite the decrease in function resulting from lifestyle, it is possible to restore the balance of joint mobility and stability, to relearn previously lost natural movements, and to restore the full functioning of the body designed for movement. Harmonious, active, and injury-free living is not a matter of age or fitness level, but a conscious decision to choose the joy of movement and active quality of life to bring out the best in us and easily adapt to the challenges that surround us in our daily lives.

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