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Resetting: The Solution to Repetitive Stress

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Introduction

Repetitive stress remains one of the most consequential health risks facing today's workforce, from industrial workers to musicians. Performing the repetitive movements demanded by certain job tasks affects not only musculoskeletal function, but also the circulatory, lymphatic, and nervous systems. The key to preventing repetitive stress injuries starts with the concept of reciprocal inhibition: when a muscle is contracted, the muscles on the other side of the joint relax automatically. Resetting, or strengthening the muscle groups opposite the ones being repetitively used, is an effective way to protect the body from repetitive stress.

Executive Summary

Musculoskeletal disorders and repetitive stress injuries (RSIs) are one of the leading causes of occupational injury in U.S. businesses, along with hundreds of thousands of days away from work per year [1]. In the past several decades, there has been a significant increase—not only in the U.S., but worldwide—of reported RSIs in the neck, shoulders, arms, and hands, a phenomenon which dates back to the growing use of computers, CNC machinery, and related technology in the home and workplace that require the user to engage in repetitive motions [9].

RSIs are characterized by overuse of the tendons and muscles through repetitive motion. This is mainly due to the repetitive movements that are demanded of people in order to perform certain physical tasks, which are often accompanied by poor posture; for example, sitting at a computer or using mass production machines not only involves the repetitive movements of the hand and arm required to type and navigate, but also remaining in a fixed (and most likely a non-neutral) posture while doing so. Repetitive stress subjects the body to a variety of adverse effects, some of which include the shortening or tightness of muscles, the inflammation of tendons, the impingement of nerves, and the inhibition in the circulation of the blood and lymphatic fluids.

Additionally, RSIs have the potential to negatively impact quality-of-life; from carpal tunnel syndrome to back pain and rotator cuff injuries, repetitive stress poses a very real obstacle to performing physically-intensive job tasks and even the ability to complete daily activities if left unchecked. When a worker's ability to perform these tasks is diminished as a result of an RSI, it means more downtime, both inside and out of the workplace. In order to combat the effects of repetitive stress and to help prevent RSIs, repetitively used muscles must be "reset".

The term *resetting* will be used throughout this paper to refer to the process of strengthening the muscle groups opposite to the ones that are repetitively used, bringing balance and symmetry back to the body. Resetting repetitively used muscles helps to lengthen tight muscles, decreasing the likelihood that tendons will become inflamed or that nerves will be impeded from communicating efficiently with the brain. Resetting also allows the blood and lymphatic fluid to flow more freely and to be pumped out of the muscles with greater efficiency [11, 12].

Repetitive stress can cause dysfunction and damage to the muscles, tendons, nerves, blood, and lymphatic vessels, all of which play an important part in keeping the body functioning properly and maintaining homeostasis. For this reason, it is imperative to reset the body at the end of any period of physical activity.

A warehouse employee who performs repetitive movements throughout his shift

What Repetitive Stress Does to the Body

Repetitive stress has been proven to adversely affect the health and function of various bodily systems in several ways, by creating:

- Tight muscles
- Poor posture
- Inflamed tendons
- Limited range of motion in joints
- Impaired dexterity
- Nerve impingement
- Inhibition of blood and lymphatic circulation
- Increased mental fatigue

Tight muscles

As muscles are used repetitively, they often become tight or hyper-toned [3]. Tight muscles have an adverse effect on the bones, nerves, vessels, and connective tissue that surround them, impacting overall strength and endurance, inhibiting circulation, and making it more difficult to achieve correct posture. As muscles are used repetitively, they often become tight or hyper-toned [3].

Poor posture

Most repetitively stressful tasks involve manipulating the environment in front of the body, such as lifting, carrying, pushing, or pulling. When the anterior, or front muscles are used repetitively, they can become tight while the opposite muscles can become weak. Over time, this causes the body to assume poor posture, become hunched, and to develop protracted (forward-slumped) shoulders. These characteristics of poor posture often contribute to a host of other problems, most notably lower back pain and rotator cuff injuries [4].

Inflamed tendons

As muscles engage in repetitive movements, tendons—bands of connective tissue which attach muscles to bones—undergo shearing forces that can eventually lead to inflammation, a condition known as tendonitis [5]. When tendons are inflamed, they enlarge and cause a significant amount of pain, as well as dysfunction within surrounding structures. Tendonitis can also occur when small or weak muscles are engaged repetitively, as is the case with lateral epicondylitis and carpal tunnel syndrome, the latter of which has been linked to inflammation of the flexor tendon that inhibits the median nerve.

Limited range of motion (ROM) in joints

A tight muscle will limit ROM in the joints, whether in the back, shoulders, arms, wrists, or fingers. When joints are restricted from moving freely throughout their full range, or when they are improperly aligned as a result of surrounding hyper-toned muscles, it often results in pain and dysfunction.

Impaired dexterity

Inhibited nerve activity and limited ROM in the fingers can impair dexterity, making it significantly more difficult to manipulate small objects. When fine motor skills are impaired, everyday activities that involve hand-eye coordination, such as clicking a computer mouse, typing on a keyboard, cooking, or manipulating materials through a machine, become painful or even impossible. Limited dexterity not only impacts one's ability to perform daily functions, it can also prevent one from completing their job activities.

Nerve impingement

When nerves travel through a tight muscle, near inflamed tendons, or around a bent joint, they can become squeezed or impinged. This contributes to pain, tingling, and numbness that may be felt at, above, or below an impinged nerve. This nerve impingement can also impair dexterity (see above).

Inhibition of blood circulation

Blood flow can also become impaired by the muscle tightening caused by repetitive stress, which inhibits the efficiency of blood delivery to all parts of the body. Consequently, tissues normally supplied by the blood are forced to function at a deficit [6]. Over time, inhibited blood circulation results in a loss of muscle strength and endurance, difficulty performing daily tasks, colder extremities, and an increased susceptibility to injuries.

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Diminished cognitive ability

Several studies have shown that performing repetitive motions for long periods of time causes diminished cognitive ability, which includes a lack of concentration, decreased vigilance, and increased fatigue [8]. Repetitive physical activity may also contribute to mood disorders such as anxiety, depression, and somatic diseases.

The Solution

Employee's perform a lower back resetting movement using the Stand-N-Flex™ by BIOKINETIX

Reset muscles to prevent repetitive stress injuries

Muscles are arranged in opposing groups that reside on the opposite sides of a joint. These muscles work in tandem with each other. The term "reciprocal inhibition" describes the process: when one muscle concentrically contracts, the opposite muscle group relaxes. This allows for the movements of a joint. Let's take a more in-depth look.

Muscles connect to joints via tendons. As the muscle concentrically contracts and puts tension on a tendon, that tendon in turn pulls on the bone where it attaches, moving the joint. What allows this movement is that the muscle group on the opposite side of this joint relaxes. This opposite muscle knows to relax because a signal is sent from the concentrically contracting muscle to the spinal cord and back to the opposite muscle with a message to relax. When the opposite muscle relaxes, and the joint starts to move, the relaxed muscle and its tendon start to lengthen out.

The signal for a muscle to relax will be enhanced if resistance is increased. That is to say, when a muscle concentrically contracts against a resistance, the opposite muscle group will relax even more. As an example, when the bicep contracts to bend the elbow, the triceps relax. If at the same time the bicep picks up an object, which provides resistance, the triceps will relax even more [13]. This is an important point to note, because it explains why resetting needs to be done with resistance against the concentrically contracting muscle. To battle the negative effects of using muscles repetitively, these muscles need to be reset. When the repetitively used, or tight, muscles are reset, they start to lengthen out. It is the lengthening out of these tight muscles that helps to negate the ill effects of repetitive use.

For example, people who use handheld devices all day use the same muscles over and over again in repetitive movements, such as typing on a keyboard or using both thumbs to input text. The flexor muscles located on the underside of the forearm—a group of muscles used to produce these movements—experience stress and pain because of overuse. The extensor muscle group—on the topside of the forearm opposite the flexors—are responsible for producing the opposite movements of clicking a mouse or typing on a keyboard. Such movements would include moving the hands up away from the keyboard or opening up the hand and spreading the fingers apart. In order to reset the repetitively used flexors on the underside of the forearm, the extensors on the topside of the forearm need to be strengthened through concentric contractions. As the extensors are strengthened through concentric contractions, the repetitively used flexor muscles start to lengthen.

Resetting techniques for the lower spine can help alleviate soreness and discomfort in the lower back brought on from bending over repeatedly throughout the day.

What happens to the body as it resets?

Resetting allows the body to alleviate damage from repetitive movements in the following ways:

- Lengthens out repetitively used muscles, reducing tightness
- Combats poor posture
- Reduces limited ROM
- Reduces limited dexterity
- Aids inflamed tendons
- Reduces nerve impingement
- Enhances blood flow
- Enhances lymphatic fluid circulation

Lengthening tight muscles prevents repetitive stress

Resetting, or lengthening out repetitively used tight muscles, has the direct opposite effect of conditions that occur with repetitive stress. Resetting repetitively used muscles allows involved joints to move through their full range of movement. This process will help to correct posture, to prevent disks or other structures adjacent to joints from becoming injured, and to improve dexterity. Resetting will also help prevent tendons from becoming inflamed, nerves from being impinged, and blood and lymphatic vessels from becoming inhibited.

Combats poor posture, ROM and dexterity

The repetitive or prolonged stress of sitting at a desk all day has a tremendous effect on posture. Sitting with poor posture, as in the case of sitting with shoulders “hunched” or rounded, keeps muscles in the front of the body in a shortened position, which makes these muscles tight.

Resetting not only lengthens out these tight muscles, but it also strengthens the opposite muscles, to help prevent poor posture. Concentrically contracting and strengthening the muscles located in the upper back resets and lengthens out the muscles in the front of the body that contribute to poor posture. As these muscles lengthen out, they cease pulling on the shoulders and making them rounded.

Furthermore, as the muscles in the upper back are strengthened, they have greater ability to “pull” the shoulders back, further enhancing correct posture.

Resetting also helps joints to move through their full range of movement; this helps prevent bones from becoming misaligned. A misaligned pelvis can detrimentally affect the areas that surround it, including the disks in the spinal column. When muscles that connect to or near the pelvis are reset, they start to pull less on the pelvis and the structures surrounding the pelvis. This prevents the pelvis from becoming misaligned and eases the stress placed on the surrounding structures, such as the disks.
Resetting also helps to maintain finger dexterity. Dexterity can be enhanced through resetting, because lengthening out the tight muscles that connect to the fingers will allow them to move more freely and with greater precision. This is particularly important for musicians, as their ability to perform is dependent on maintaining superior manual dexterity while using their instrument; overuse injuries are common within the profession due to the demand for repetitive movements, which are often combined with excessive force, poor posture, and stress [10].

Aids inflamed tendons

Resetting muscles that are repetitively used and keeping them in a lengthened position takes stress off the tendons that connect to the repetitively used muscles. As this stress is reduced, the tendons are less likely to become inflamed or irritated, thus reducing the risk of tendonitis. Resetting also helps the opposite muscles and tendons that are repetitively used to move through the sheaths that cover the tendon, which also reduces the risk of tendonitis.

Reduces nerve impingement

Resetting repetitively used muscles reduces the risk that nerves will become impinged by tight muscles and inflamed tendons. As muscles are lengthened and the tendons remain supple, nerves travel through, around, and nearby these muscles and tendons without becoming impinged. When nerves are not impinged they can transmit signals to and from the brain with no interference.

Enhances blood flow

Therefore, as muscles are reset, their ability to relax and contract is enhanced. When a muscle freely and fully contracts and relaxes, it acts as a pump. A great example of this is the heart, as it pumps the blood around the body. The same idea is true with muscles in our arms and legs. As these muscles are contracted, they pump the blood out of them. This enhances the return of blood to the heart. Veins, which carry blood from the tissues to the heart, rely on the muscles to move the blood back to the heart. The more the muscles can contract and relax, the better they can push blood back to the heart through the veins.

Enhances Lymphatic Fluid circulation

Finally, resetting enhances circulation of the lymphatic system fluid. As stated above, when muscles lengthen out and become less tight, their ability to contract and relax is enhanced. Because the lymphatic system is a passive circulatory system (it has no heart), it relies on the muscles to move the lymphatic fluid through its system.

When muscles are reset and their ability to contract and relax is enhanced, the movement of lymphatic fluid is improved. This helps move the waste products out of the muscles, reducing the chance of toxicity. This muscle action pumps the lymphatic fluid out of the muscles and associated tissues and prevents it from coagulating and forming collagenous masses, which can hinder muscle function. Without collagenous masses, the muscles become healthy and function efficiently.

Conclusion

In part, the increase of reported RSIs can be considered a side effect of the Digital Revolution that brought computers and technological innovation to workplaces around the world. As people have become more specialized and precise in their skill sets, the demand for repetitive movements has grown in nearly every sector.

For many years, ergonomic products have been considered the answer to helping prevent RSIs by adjusting the work environment to fit the body's needs. Despite a wider availability and variety of ergonomic products on the market today, RSIs continue to impact the workforce in tremendous levels.

Resetting properly helps reduce the risk of suffering from a RSI by lengthening the muscles, tendons, fascia, ligaments, and joints that are repetitively used throughout the day of someone performing repetitive movements. By strengthening the muscle groups opposite the ones that are repetitively used, resetting brings balance and symmetry back to the body, increases resilience, and better equips individuals to handle repetitive stress without injury.

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