

Sprains & Strains: The Silver Bullet!

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Introduction

For over 16 years, Tailored Injury Prevention Solutions (TIPS) has successfully worked with companies to decrease soft-tissue injuries in the workplace. Through our work with thousands of employees and endless varieties of physical challenge, injury causal factors and varied circumstances, we have identified what we term “Controllable Contributors” and their underlying origins.

Whether dealing with over-exertion, repetitive injury, or other identifiable causes, there are common core contributors to those pesky sprain and strain type injuries that are likely missing in your solution attempts. Most people have at least a couple of these contributors and are not even aware of them. Oftentimes we see people who are trying to do everything right, but because their body is not moving quite the way it should, they continue to remain at risk for sprains and strains as well as other soft-tissue injuries. In fact, it’s rare to find a person that truly moves as well as they should—even when they’re trying. The good news is that there is a set of very common, easily identifiable and correctable problems that, when remedied, create a very clear link to better human performance and less risk.

This paper will address common core contributors to sprains and strains in the workplace, corrections to reduce soft-tissue injuries, and how to successfully apply these corrections.

Controllable Contributors

When we think about root cause contributors to soft-tissue injuries, often the terms that come to mind first are slips, trips and falls, sustained positions, over-exertion, repetition and sudden force change. While all of these certainly are root cause contributors, there are underlying physical variables, that we call Controllable Contributors, that you probably do not realize are in place. These Controllable Contributors increase the likelihood that one of the commonly identified root causes for injury will occur. If an individual has one or more of the Controllable Contributors, the likelihood of an individual suffering from an over-exertion, repetitive motion, slip, trip or fall, sustained position or sudden force change injury increases. The Controllable Contributors can also lead to the increased severity of the aforementioned injuries. When we consider the fact that it is a rare individual that does not have some of the Controllable Contributors and that most people have many, then adding physical load to the equation, it makes it easy to understand why strains and sprains continue to plague us.

Below is a list of some of the underlying Controllable Contributors. Often times, individuals do not recognize that they have these issues until poor function or pain reaches an identifiable threshold and causes one or more contributors to surface. Without proper intervention, this can start a cascade effect that can lead to increased frequency and severity of soft-tissue injuries.

Controllable Contributors

- Tight Muscles
- Weak Muscles
- Poor Kinesthetic Awareness
- Lack of Stability
- Lack of Flexibility
- Lack of Effective Force Generation
- Poor Proprioception / Balance
- Nerve Pressure
- Inflammation
- Poor Circulation
- Mental Awareness
- Wearing of Ligaments/ Cartilage/Tendons

So where do these Controllable Contributors come from? The answer also is multifaceted and again leads us to a better understanding of causation and the difficulty in effectively addressing sprain and strain injuries. This brings us directly to the Behavioral Drivers that both contribute to and are caused by the Controllable Contributors.

1. **Patterning.** Our unconscious learned behaviors start very early in life and continue to develop as we begin our careers, families and other activities. The way that we walk, sit, stand and move is largely influenced by those around us. As we develop, we pick up all visible habits-good and bad. Since most people have one or more faulty movement patterns or posture components, the positioning and movement patterns we pick up are not always to our advantage. As we begin our jobs, we watch and learn to move and interact from those around us as well. Correct or incorrect, we pattern our movements based on how we are taught a task.
2. **Compensation.** Having daily aches and pains is commonplace for many, especially as we age. Because most people don't have the luxury of complete and total rest with pain or injury, our bodies make compensations to get the task at hand done. Think of someone that has sprained an ankle. Even something as simple as walking usually requires some modification to reduce pain of the injured joint. This compensation can lead to over activity of some muscle groups and under activation of others. Uneven stresses placed on muscle groups can lead to increased joint stress. Since the human body is designed to act as a chain, one link that is not functioning correctly most certainly will affect another.
3. **The Path of Least Resistance.** It's human nature to get things done the easy way- even if it isn't the correct way. An easy example to illustrate this is our tendency to bend at the waist to pick up an object instead of using our leg muscles to properly squat to the ground to retrieve the object. No matter how light or heavy the object in question is, the body is not designed to lift loads with the small back extensors. We do it anyways because it's easier, quicker, and again we pattern our behavior from those around us.
4. **Positioning.** Whether we are sitting, standing, sleeping, walking or working, our bodies hold certain postures that can help or hinder the functionality of our muscles, joints and other structures. Most individuals do not recognize the positional issues they have with each movement. How they lift, twist, push, pull, etc. is affected by their positioning patterns. For

instance, if an individual sits and stands with rounded posture virtually all the time, then the chances that they will lift with a straight back are very slim.

Physical Components of Injury

Although we often think of soft-tissue injuries only affecting the ligaments and muscles of the body, there are several other physical components that are involved with these injuries. All of the physical structures listed below can be affected by and contribute to soft-tissue injuries.

- Nerves
- Ligaments (Sprain)
- Muscles & Tendons (Strain)
- Joints
- Cartilage
- Circulation (Inflammation)

Good nerve function is critical to the function of the entire body. We often do not realize that we have nerve issues until we have pain or loss of function. Poor neuromuscular communication can significantly contribute to functional ability and injury potential even when we do not have any pain.

Ligamentous injury is usually associated with an acute injury mechanism but is often the result of a muscular imbalance stemming from poor positional habits and work practice.

Muscles and tendons can be damaged with excess force, quick heavy lifting, sudden movements or a sustained load. Muscles and tendons that are weak, tight, inflamed or otherwise compromised, sustain “injury” more easily under less severe circumstances.

Each joint in the body is controlled by our muscles, tendons and ligaments. Poor function of any of these structures can lead to acute joint injury or gradual uneven stress placed on the joint leading to chronic conditions. This wear and tear at the joint level often negatively impacts the cartilaginous structures that function to cushion each joint.

The circulation to each joint is also a crucial element to consider. With muscular imbalances and joint stress, our circulation to the joints can be compromised, leading to increased inflammation and pain. This begins the “Pain-Inflammation Cycle” which must be broken to promote healing. See Exhibit 1 for more information on the "Pain-Inflammation Cycle."

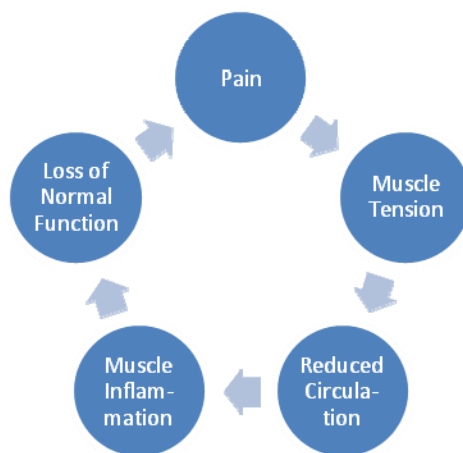


Exhibit 1. The Pain-Inflammation Cycle.

Considering all of the tissues involved or potentially involved with injury, we must look at what we can control and where we can make an impact to break the pain-inflammation cycle and promote healing and injury prevention. Several of the aforementioned bodily tissues are virtually impossible to manually manipulate. We cannot improve a nerves function simply by making a conscious choice to do so or to get the knee to track more effectively just by deciding that we want it to. In virtually every case, however, we have direct control of our muscular system and how that system influences the nerves, ligaments, circulation, etc. We can make muscles stronger and more flexible and use them to correct joint alignment and movement, improve circulation and reduce pressure on nerves. Recognizing and understanding how to use our musculoskeletal system to effect change is a huge piece to the puzzle in pain and injury prevention, as well as pain and injury modification. The fundamental basis for muscle and tendon utilization is proper body positioning.

Importance of Positioning

Our body position can negatively or positively affect each structure, tissue, joint and injury in the human body. It is to our great advantage to utilize best practices in positioning to positively influence the skeletal, muscular, nervous and circulatory systems. With proper positioning, we experience increased muscular recruitment for optimum strength and flexibility. This enhanced muscle function serves as the foundation for successive functional improvements leading to decreased joint stress, decreased pressure on nerves and intervertebral discs, and improved circulation. With these positive changes, we begin to see decreased functional compensations, improved stability and improved balance. With proper positioning, we will start to see improved body mechanics as well as improvements in the other Behavioral Drivers and Controllable Contributors.

Of course without such changes, we are at risk for a negative cascade of events that can lead to problems or pain at any or all body systems and increased severity of injury and increased risk of other injury complications. These changes need to be addressed at every level of activity- from heavy work to sedentary postures. Because the changes need to be included with all activity and inactivity, initiating a habit change will increase the likelihood that the change is made. We will discuss habit change later in this document.

Common Positioning Abnormalities

Postural abnormalities can occur at any and all joint levels. Similarly, each joint level or injured area can negatively or positively affect the other. In this section, we will discuss the common postural abnormalities and the effects each can have on the body.

1. Excessive foot and knee turn out. Foot and knee turn out is usually a result of overactive external rotators at the hip and lower leg. These muscles are usually overactive to compensate for weak structures in the abdominal area and medial structures of the lower extremities. Foot and knee turn out can cause decreased function of the core stabilizing unit and impaired balance due to narrow stance width while standing and walking.
2. Hyperextension of the knee joints. Knee hyperextension usually relates to the imbalance at the lumbo-pelvic-hip-complex and/or the quadriceps and hamstrings. Hyperextended knees can lead to increased knee stress, increased low back stress, decreased gluteus maximus

activation and decreased spinal shock absorption. Hyperextended knees lead to standing and moving with a posterior center of mass, which can negatively affect the spine, hips, knees, shoulders and neck. Balance may also be negatively affected.

3. Compressed and rounded posture. Rounded posture is probably the most easily identifiable posture abnormality. With rounded posture, the three spinal curves are minimized or even eliminated, leading to increased stress along the spine and increased tension in the spinal musculature. Each vertebral segment can be affected, as well as the neck, shoulders, hips and low back. With rounded posture, individuals typically also experience some compression of the spinal segments that can lead to increased pressure on the intervertebral discs and nerves. This can lead to pain, paresthesia, and loss of motor function of any innervated musculature.
4. Shoulder protraction. Shoulder protraction, or the shoulders “slumped forward” usually accompanies a compressed and rounded posture position. With shoulder protraction, the pectoral muscles are hyperactive and the midback muscles, namely the rhomboid and paraspinal muscles, are underactive. This muscular imbalance negatively impacts the scapulothoracic motion of the glenohumeral joint, as well as the elbow and wrist musculature and joints. Shoulder protraction can increase the severity of rounded posture and the muscular imbalances that are involved with rounded posture.
5. Cervical protraction. With compressed and rounded posture and shoulder protraction, most people will undoubtedly have some cervical protraction, or forward head positioning. This forward head posture places great strain on the cervical musculature as well as increases the severity of both rounded posture and shoulder protraction. Cervical protraction can lead to complications at the temporomandibular joint and can also lead to the likelihood of stress- and tension-related headaches.

With each postural abnormality, each segment can affect the other, and vice versa. Because of this, most people have to correct posture and positioning at multiple joint levels to achieve long-term success. See Exhibit 2 for the correct posture and body position.



Exhibit 2. The Correct Posture and Body Position.

Position Corrections

Corrections for posture abnormalities need to be addressed at all levels of activity- from sitting, standing, walking, kneeling, and working--the basics of position correction remain constant. From the lateral view, imagine a plumb line from the ear to the lateral malleolus, (the bony

prominence on the outside of the ankle). The ear, shoulder, hip, knee and ankle should ideally all fall in the same line.

Common Postural Corrections

- Position feet forward with minimal turnout (15° or less)
- Position weight on feet between metatarsal heads and calcaneus
- Align knees with ear, shoulder and lateral malleolus
- Unlock knees
- Anteriorly and posteriorly rotate pelvis to achieve pelvic neutral
- Sit or stand tall
- Retract shoulders by activating rhomboids and deactivating trapezius
- Engage transverse abdominus and multifidus musculature
- Retract head so ear aligns with shoulder

Modifications to body positioning should be limited to comfort and move towards progressively improved position as tolerated by the body and other demands. These corrections help to realign the skeletal structures and position the muscles for optimal strength and flexibility, allowing us to use the musculature to positively impact the Controllable Contributors and Behavioral Drivers.

Adding Movement

Starting movement with proper positioning is crucial to the success and effectiveness of joint stress reduction. If movement begins without these practices in place, it is extremely difficult, if not impossible to fully engage the stabilizing musculature. It is most effective to practice the positioning changes on their own and with very simple and light daily activities, before utilizing it with work or strenuous activity.

Because posture and positioning changes are habits, it will take some time for these changes to feel normal, let alone become permanent. As positioning changes are being made, it is important to physically feel the muscle recruitment with the postural adjustments. Muscle activation should be felt in the muscles, of course, and the joints should not be negatively affected. It is possible to feel decreased joint stress with these corrections, but there should never be a feeling of increased joint stress or pain.

Once the activation of the various muscle groups is felt and this practice is becoming more natural, begin to apply basic movements. As before, with the application of movements, there should be a feeling of increased muscular recruitment and no increase of joint pain.

Muscular fatigue is common while beginning this practice. The muscle groups involved in postural stabilization are designed to have high levels of muscular endurance- meaning muscles can be continuously activated for long periods of time without rest. Because most people have postural abnormalities that are accompanied by muscular imbalance, the muscular endurance of the stabilizing muscle groups is usually poor. These endurance gains will come with time and practice, as will the flexibility improvements needed that further correct the imbalance.

Barriers to Change

Any change, especially habit change, is a long and difficult process. Most people have been walking since about one year of age, so our habits with regard to posture and movement have been ingrained in us for virtually our entire lives. Also, because most of these habits are so unconscious, the change can be that much more difficult.

Another barrier to change is the lack of motivation to be proactive. Pain and dysfunction are tangible reasons for change. If an individual has postural abnormalities but is currently pain free, it is hard to rationalize the need for change. Unfortunately, these problems usually do tend to present themselves eventually.

From a physiological standpoint, it is far easier and much more desirable to make these changes prior to the onset of problems. Once an individual is in pain, our focus must move from 'prevention' to 'rehabilitation.' While compliance usually increases with the incidence of pain, developing secondary injuries and conditions at this point may occur. This complicates the healing process and can make any habit change even harder to perform.

Additionally, it is important to recognize that any change takes repetition and reinforcement to be successful. With physical change, we also have to allow our bodies to gain an understanding of the change benefit. This means that we must allow time for muscles that are more functionally engaged because of position changes, to gain strength without overloading them. We must also retrain our body through the varied stages of improvement. For many people, a singular training, no matter how good it is, is not enough to effect a true and full change in movement patterns.

The final barrier to change examines past efforts to enact change that may have been unsuccessful. When dealing with soft-tissue injuries and pain prevention, it is important to reflect on what hasn't worked in the past and why your workforce has not connected with previous efforts. While it is important to enact rules and regulations to protect your employees, being told to make a change simply because it is the rule can be a tough sell. For your workforce to understand the potential benefits and see the need for change, it is essential that they can see and feel an improvement within themselves. This 'buy-in' is essential for compliance with habit change and behavior modification which can lead to a reduction in soft-tissue injuries.

Application

Because these principles apply to all areas of living, it is important to apply these changes with all activity and inactivity. For safety reasons, it is important to begin making changes when attention can be devoted to your positioning, not when you need to be conscious of your surroundings and work environment. This will also allow for practice with basic body positions such as sitting and standing.

After these habits are set and muscles begin to get stronger to provide stabilizing strength and endurance, applying these positional adjustments to our work environment is appropriate. Working on these positions both in and out of the work environment will help build strength and endurance that will provide support during repetitive movements and awkward positioning. By utilizing this muscular support, we can reduce stress to the joints and provide safer, more effective positional habits.

Habit Change

Because these postural and positioning changes are so difficult to make, it is important to make the corrections frequently throughout the day. We need to make our new and improved positioning a habit and we can use our current habits to help us do this. In order to make these changes permanent, repetition is critical. Associating habit change with something that is already part of your daily life will help make the transition to habit an easier one. If you work on this habit change ten to fifteen times a day, positioning yourself correctly each time, your muscles will become stronger and more flexible and your joints will align properly and ultimately, your body will be able to function better and safer.

Sometimes making all needed postural adjustments at once can overwhelm your system and cause pain. Making two or three changes at a time will help ease your body into the process of habit change and make the transition of change easier to make. It is essential that all changes made are pain free. Changes should always be felt in muscular tissue and a relief of stress in the joints should occur.

Postural adjustment is not something that can be done every minute of every day. Work on your correct position several times a day for a few minutes at a time. These small increments of muscular activity are enough to increase strength and endurance of the stabilizing muscular groups that can alleviate joint stress and synergistic dominant muscular fatigue. Whether seated, standing or moving, the principles stay the same- make a few changes and start small with easy tasks.

Conclusion

The “Silver Bullet” essentially points to proper body positioning which can lead to improved muscle function. If muscle function improves, our bodies have improved strength, endurance and flexibility. Proper muscle function also leads to improved movement and biomechanics which alleviate stress to our joints, nerves and intervertebral discs. Because the tissues in the body are stronger and more resilient, our bodies have an increased ability for internal tissue repair which will lead to reduced soft-tissue injuries. By utilizing the TIPS Silver Bullet approach, you can positively impact the Controllable Contributors and Behavioral Drivers that make up the true foundational root causes of the Sprain/Strain dilemma.