How To Do Joint Mobility Drills

by Todd Hargrove
Introduction

Dynamic joint mobility drills are becoming very popular, and are starting to replace static stretching as a way to warm up, train healthy movement patterns, and (p)rehab injuries. If you are interested in fitness and performance, you have probably heard of their benefits for increasing movement skill and decreasing pain.

Unfortunately, there are many misconceptions about how mobility drills should be done, and this can make them less effective, or even detrimental.

In this report I’m going to explain what they are, exactly how and why they provide benefit, and most importantly, how to do them and how not to do them.

The rules of thumb described below can be applied to any mobility drills, dynamic warmups, muscle activations, or movement prep work that is currently part of your training routine. In fact, you can apply most of this advice to the movements you do in a Pilates or yoga class, or even the weight room.

Dynamic joint mobility drills defined

First a definition:

*Mobility drills can be defined as deliberate movements through a defined pathway, done repetitively, usually without resistance.*

Examples include wall slides or arm circles for the shoulders, clam shells or leg circles for the hips, and cat/cows or rotations for the spine.
One good way to understand mobility work is to contrast it with static stretching. In static stretching, you take a certain joint to its end range of motion and then stay there for a while. In a mobility drill, you are always moving as opposed to staying still. Further, you typically move from the neutral or middle ranges of motion out to the end ranges and then back. The point is not so much how far you go, but how smoothly and easily you get there.

For these reasons, joint mobility work promises to have far more carryover to real world activities than static stretching. Most of life and sport takes place during *movement* through the middle ranges of motion, not during rest at the end ranges. Thus, healthy athletic movement at most joints has more to do with *quality* of motion than *quantity* of motion. So the trend toward mobility drills is a positive development.

**How do joint mobility drills work?**

The mainstream idea is that joint mobility drills work by making changes to the local muscular and connective tissues involved in the movement. The vision seems to be that joints and connective tissues get “gummed up” or stuck, and that repetitive movement can get those joints freed, oiled, smoothed out and aligned. There may be a small grain of truth here, but as discussed in more detail below, these are probably not plausible mechanisms for benefit.

Mobility work has only a limited ability to cause significant adaptation in the *structure* of joints. Instead, it works by changing the way the nervous system controls the movement and perception of the joint.
In other words, mobility work is more about function not structure, the brain not the body, the software not the hardware, the driver not the car. OK, enough with the metaphorical distinctions. Here’s a detailed explanation of what I mean.

**Mobility drills won't change structure (much)**

There is little reason to believe that joint mobility drills have any notable effects on the local tissues that are being mobilized. We can see this by comparing it to various other forms of exercise that do have significant effects.

*Unlike weight training or endurance training,* mobility work does not create enough tension or energetic stress to cause adaptations in the size or metabolic capacities of muscle cells. Mobility drills won't make you big or fit.

*Unlike stretching,* mobility drills do not involve enough time at the end ranges of motion to permanently add more muscle or connective tissue length. (In fact, most stretching routines **probably won't** do that either.) Mobility work doesn't change your shape.

*Unlike sports or other habitual physical activities,* mobility work will probably not create enough high repetition mechanical stress to the tendons, ligaments and joint capsules to cause any significant [connective tissue remodeling](#) (unless you did thousands of repetitions in the presence of significant forces.) Mobility work doesn't change your structure or improve “tissue quality.”

So what does mobility work do? Joint mobility drills **will** provide circulation and warmth to the local tissues and synovial fluids, which is necessary for health.
However, we would expect similar benefits from almost any repetitive non-harmful motion in the same area. Which is pretty easy to come by.

So why would the specific form of a mobility exercise matter? Why not just move all your joints through all their ranges of motion in any old way? The answer is that mobility exercises work by sending information to the nervous system, and the results depend on the quality of the information, and the way that information is processed. Following is a discussion of how the sensory information created by mobility drills can change movement and perception for the better. Or worse.

**Building brain maps**

Coordination is governed by the nervous system. Some key networks in the brain that sense and coordinate the muscles are called the body maps. The body maps are discrete parts of the brain that are organized in such a way as to represent the different body parts, just as lines on a map represent roads. Each part of the body has a separate area of the brain dedicated to moving and sensing that body part.

Body parts that have greater sensory motor demands have bigger maps. Not surprisingly, the map for the hand is significantly larger than the map for the elbow. Thus, larger and more detailed maps means better coordination. The information necessary to maintain and build the maps is provided by proprioceptive signals from the body. Proprioception occurs when movement or touch stimulates mechanoreceptors, which are located all over the body and primarily in joints.
You can sense the effects of mechanoreception on your maps instantly by doing a simple experiment. Try to imagine or sense the exact position of your middle toes. Now rub just the left middle toe for a few seconds and then compare your ability to sense the left middle toe and the right. You will note that it is much easier to form a clear mental picture of the left toe. The simple reason is that touching the toe activated its mechanoreceptors, which sent a signal to the brain, which excited the neurons in the map for that area. Of course, the additional clarity in the map is only temporary, and after a minute your toes will feel the same.

In order to make long term changes in the maps, you need to place demands on them consistently over a long period of time. When a certain movement is used repeatedly in a coordinated and mindful fashion, there are actual physical and observable changes in the part of the brain that controls that movement. For example, the finger maps in a braille reader’s brain are observably larger than the counterpart of the average person.

While movement will clarify maps, lack of movement will tend to blur them. In a famous experiment, researchers found that sewing a monkey’s fingers together for a few weeks caused it’s brain to map the fingers as one unit, not as two separate parts capable of individual movements. We would expect similar map blurring to occur when any joint movement is neglected for a certain period of time. This loss of control over previously accessible movements is the neural version of the “use it or lose it” principle, and is sometimes called sensory motor amnesia (“SMA”).
Most of the benefit from joint mobility drills probably comes from their ability to cure sensory motor amnesia. For example, a common area for SMA is the thoracic spine. Most people probably have at least one vertebrae in their upper back that hasn’t moved very much in a certain direction with respect to its neighbor in years. A good analogy might be a language that you could once speak fluently but haven’t spoken for years. The knowledge is in there somewhere, but a good portion of it is inaccessible without some brushing up.

A well designed thoracic mobility drill will force you to move the trunk in ways that you habitually avoid. This requires the brain to brush up on its thoracic movement skills and reactivate some rusty movement programs.

If the brain remembers how to move a currently static vertebra, a whole new set of movement options is returned. The result might be an immediate qualitative change in the movement of the entire spine. *The decisive change is not to the physical tissues of the vertebral joint, but to the way that the brain maps the vertebrae for sensation and movement.*

Some common other areas for SMA are the feet, hip joints and upper thorax, which is why most mobility drills focus on these areas.

**Blurred maps and pain**

Accurate maps also have important consequences for how we feel. Phantom limb pain is a dramatic example. Many people with an amputated limb experience pain in the missing body part. This is because even though the arm is gone, the virtual arm in the brain lives on, and can be stimulated by cross talk from nearby
neural activity. When this occurs, the brain creates a sensation of the missing arm that is incredibly realistic and often excruciatingly painful.

Some pain researchers believe that less severe instances of mapping errors may be involved in certain chronic pain conditions. Numerous studies have shown that sensory motor illusions caused by mirrors or other tricks can cause pain. For example, if you immerse your index and ring fingers in warm water and the middle finger in cold water, this will often cause your middle finger to feel painfully hot. Other studies have shown that pain from these illusions can be alleviated with proprioceptive input that corrects distortions in the maps. For example, an amazing treatment for phantom limb pain involves placing the remaining limb in a mirror box in such a way that it fools the brain into thinking the missing limb is alive and well! Based on these and other studies, many pain researchers believe that clarifying the motor sensory maps is a promising treatment for many forms of chronic pain.

**Movement creates sensory gating**

Mobility drills can also reduce pain by sensory gating. Sensory gating means that the processing and perception of sense information is reduced by the presence of competing sense information. If your nervous system is busy trying to process signals resulting from movement or touching (proprioception), it has less ability process signals caused by tissue damage (nociception). Imagine trying to hear what someone is saying in crowded bar with lots of other voices. Pain is the same way. It can be drowned out by other interesting conversations.
Most people will instinctively take advantage of sensory gating by rubbing a painful area. The rubbing sends sensory signals to the brain which compete with the damage signals. Have you ever experienced temporary pain relief after a massage, exercise, or yoga? Sensory gating is probably a major reason why. And joint mobility drills are an ideal way to activate it, especially if they create novel and interesting sensory input.

**Conclusion: how to mobility drills**

Based on the foregoing, there is good reason to believe that the nervous system should be the primary target for joint mobility work. With this in mind, here is a quick list of rules that will help you hit this target.

**Avoid pain and threat**

If you create pain while doing joint mobility drills, the brain will attend to the pain and ignore the potentially interesting proprioceptive information that can help build better movement maps. Further, the presence of pain during a novel movement will discourage the brain from adopting it as a new pattern, which is one of the primary goals of mobile work.

Therefore, make sure the movement does not cause discomfort or create other signs of threat such as breath holding, grimacing, postural collapse, or excess tension.
Pay attention to what you are doing

The brain receives massive amounts of sensory information each second and must be selective in deciding what information to process. As such, it will ignore any inputs it deems irrelevant, uninteresting or redundant. If you pay careful attention to what you are doing during mobility drills, this will act like a spotlight or microphone on the proprioceptive information caused by movement. If you want your brain to really notice the interesting sensory data you are sending it by mobilizing your joints, pay attention to what you are doing and how it feels. Don’t just go through the motions!

Use novel movements

The brain is more likely to pay attention to a stimulus that is novel. Most joint mobility drills incorporate novelty already and that is why they work. However, endlessly repeating the same drill will have diminishing returns. So you might want to change things up from time to time to keep the brain interested.

Start slow

The benefits of moving slowly and gently to improve coordination have been recognized by martial artists, elite athletes and musicians for a long time. The scientific explanation for why slow and easy works requires a post of its own, but here is a start. Slow and easy movement works because it: is inherently non threatening; is less likely to cause pain; allows you to find movement angles that would be missed at higher speeds; improves the proprioceptive signal to noise ratio; allows greater opportunity to focus on the subtle differences in joint
movements; and, under the Weber-Fechner rule, less force equals greater ability to discriminate in the amount of force used.

**Be curious, exploratory and playful**

Motor learning is facilitated by a playful attitude. All animals engage in the most play during the times of their lives when the educational demands are the highest. This means that play is the best solution to difficult education problems that evolution has found. With this in mind, use mobility work as a way to experiment with subtle variations of how to move and figure out which ones work best. Think of joint mobility drills as way to explore how your joints work, and find out what feels good, and what does not.

In summary, next time you do some joint mobility drills, move slowly and carefully, completely avoiding any discomfort. Reduce speed and range of motion as necessary. Use the minimum amount of force and effort to get the job done. Pay careful attention to exactly what you are doing and play with subtle variations to assess which are most efficient and comfortable. Try a few repetitions at the slowest speed you can possibly move. Then see how you are moving. I think you will see some improvements. Good luck!
To Learn More

To learn more about the science of movement and pain, and to try twenty-five movement lessons that will teach you to move better and feel better, check out my new book:

**A Guide to Better Movement**  
The Science and Practice of Moving With More Skill and Less Pain

If you have any questions, please feel free to contact me at my blog, [Better Movement](http://www.bettermovement.org).
About the Author Todd Hargrove

Todd Hargrove is a bodyworker and writer living in Seattle, Washington. An athlete all his life, he has been a competitive tennis player and squash player, and not so competitive soccer player.

In his former career as an attorney, he suffered from chronic pain that he eliminated through movement work. Inspired by his own success and interest in chronic pain and movement, he quit the law to become a Rolfer and Feldenkrais Practitioner. In 2008, Todd started a popular blog at bettermovement.org to correct common misconceptions regarding pain, and promote greater awareness of recent developments in science emphasizing the role of the brain in pain.

www.bettermovement.org