THE SPORTS INJURY HANDBOOK

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Disclaimer

The information contained in this book is intended to provide the reader with an insight into the diagnostic and rehabilitation process used in a healthcare setting. The information provided is general in nature and is not intended to replace proper medical care or assessment.

For treatment of any injury or condition, and use of any treatment including, but not limited to, pharmaceuticals, physical exercise and exercise modification, we recommended that you seek advice from your doctor or healthcare professional. Never disregard advice received from, or delay seeking the opinion of, your doctor or healthcare provider based on the information contained within this book.

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2. PRINCIPLES OF DIAGNOSIS

With any given region of the body, the list of potential diagnoses are seemingly endless. Clinical assessment by a health professional relies on a number of principles to understand the nature of the condition and limit the potential diagnoses to a short list.

Here are some of the more common principles.

a. Inflammatory patterns

Inflammatory reactions are notable by their response to movement. They tend to “warm up” and become less symptomatic with activity. But the stiffness and symptoms will increase with rest and after being stationary for a prolonged period of time. They often feel most painful in the early hours of the morning and on waking.

The severity of the reaction can be gauged by how long it takes to “warm up”.

A positive response to anti-inflammatory medication, being reduced pain and stiffness, can confirm the inflammatory reaction. However, this is not always an indication that they should be used to treat the condition.

b. Response to loading

Determining the symptomatic response to loading is vital to help formulate a rehab plan.
Does the pain ease or feel like it warms up with activity?
Does it get painful with prolonged activity?
Is it only painful after exercise, or gets worse after exercise, and how long do the increased symptoms last?

As a general guide for injuries that are mainly inflammatory, symptoms will reduce as they warm up with exercise but become quite painful after cooling down. They often respond well to anti-inflammatory medication and ice, however, the cause will need to be rectified and the injured tissue will need to be rehabilitated via controlled loading.

Bone stress injuries often get more painful with loading and remain painful for a prolonged period afterwards. Bone stress reactions, the precursor to stress fractures, are often more painful for up to 24hrs post exercise. Stress fractures are usually painful for longer periods, lasting up to 3 days after exercise. It's worth noting that although bone stress injuries seem to respond very well to anti-inflammatory medication, with a significant reduction in pain, recent evidence suggests that the medication can inhibit the bone's ability to regenerate and can make the overall condition worse.

Mechanical patterns, which occur with muscle tissue and ligament injuries, are painful when loaded and worsen with prolonged loading. They improve once loading ceases and feel better with rest. This tends to indicate an absence of an inflammatory process and helps narrow down the potential diagnosis to a shorter list.

c. Acute vs insidious

Acute injuries are defined as injuries due to a sudden overload, often caused by a single incident such as a collision. Insidious (gradual) onset injuries refer to injuries that are the result of a sustained period of abnormal loading. They develop over a prolonged period of time, although they may suddenly become symptomatic and present like an acute injury.

Differentiating between acute and insidious onset injuries is important when looking to identify the cause of the injury.

d. Additional injury sequence

The brain is highly adaptable and is able to reduce load on fatigued or painful areas by increasing load on other structures to compensate. This is an effective short term strategy but can often lead to secondary injuries at other sites.

When looking for the cause of an injury, it's important to consider a deficit in other areas as a cause of overload.

The deficit may be weakness or joint stiffness and isn't necessarily symptomatic. As a guide, look at the areas with the greatest impact on the way you move - for running, reduced ankle dorsiflexion, big toe extension, hip rotation and extension are all common biomechanical disruptors. Leg weakness is also a factor.

The simplest leg strength test that isn't affected by joint range and pain is a maximum calf circumference measurement. Measure the calf while it's relaxed in a lying down position. A difference of 1cm or greater is an indication of weakness.

e. Identifying potential causes

Injuries are the result of abnormal loading patterns. This might be a sustained period of excessive load, a single moment of overload or alteration in the alignment of the load being placed through any structure.

Here are some guidelines to figuring out potential causes of your injury. Remember that there's not necessarily a single cause of your injury and it may be a combination of factors that have contributed.

i. Unilateral vs bilateral

As a general rule, one-sided injuries have one-sided causes. These include joint stiffness on one side, asymmetrical leg strength or a painful area on one side creating a compensatory overload.

Injuries that occur on both sides with similar severity are often the results of overall loading issues such as a rapid increase in training load or intensity or bilateral issues such as hamstring tightness on both sides or a general lack of strength.

ii. Effect time for loading to cause injury

Symptoms can initially appear at seemingly random times. You might survive an intensive period of training only to feel like you've strained your hamstrings while doing up a shoelace 2 days later. This is due to the latency or delay of tissue irritation to the pathology becoming symptomatic.

Most acute onset injuries will present as the overload occurs. On the other hand, insidious onset injuries are typically delayed from when the tissue is exposed to overload, with the symptom intensity peaking 24 to 48 hours later.

iii. Effect of rest

Resting for a day by avoiding athletic training and reducing everyday tasks will typically minimise symptoms by reducing tissue irritation, however, this isn't a sign of injury recovery. After only a few days of continued rest, joints stiffen up and lose mobility, muscles begin to lose strength and tendons become less elastic.

We know that injured tissue requires loading to return to normal function. Anything more than a very short period of rest should be viewed as unproductive in the rehabilitation of the injury, unless it is medically ordered for conditions like bone stress fractures.

iv. Lack of recovery

Training is designed to load tissue in order to stimulate a response and improve load tolerance. So the effect of inadequate rest in a training program can be more detrimental than a reduced level of training.

In the case of an athlete training five days a week, it might be tempting to add a 6th day of training. But the extra training day isn't just a 20% increase in training time, it's a 50% decrease in recovery time. This lack of recovery can lead to gradual tissue breakdown and injury.

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3. TESTING SYMPTOM BEHAVIOUR WITH VARIABLES

Discovering how the injury responds to changes in loading and other variables is a critical part of devising a successful rehab plan. Here is a simple system to help establish which variables will have the greatest effect on the injured area.

a. Establish the common features

Think of the three most aggravating activities that irritate your symptoms. Start a list of what these activities have in common. It might be a large amount of ankle flexibility, calf activity or impact loading. It doesn't have to be a comprehensive list, just think of the most obvious components.

These will be referred to as '*Common features*', a list of potential factors that explain why certain activities cause more pain than others. They're also aspects of movement that we can alter to decrease the symptom response and loading on injured tissue.

b. Select simplest symptomatic movement

Select the simplest movement that always generates symptoms. This will be known as our '*Reference test*'.

Choose a movement that has the least number of moving parts, one that can be performed consistently. For example, a single leg squat works well, whereas a single leg hop is harder to keep consistent. Avoid too much complexity as this introduces a greater number of forces and variables. Try to standardise other aspects of the movement such as squat depth by using a fixed reference point.

c. Alter one aspect of loading

After performing several repetitions of the *reference test* to establish the base level of symptoms, change just one variable from your list of *common features* and repeat several repetitions with the altered variable.

Note the variable and symptom change by scoring your level of pain out of 10 (with 10 being equivalent to the worst pain). Any change in symptoms needs to be a decrease of at least 2/10 to be a genuine improvement, for example reducing your pain from 7/10 to 5/10.

d. Retest original movement

Retest the *reference test* without variations in between each test to confirm the level of pain remains consistent. Some conditions, such as inflammatory pathologies, will improve with each repetition as the injury “warms up”. Without repeating the *reference test*, it would appear that each subsequent variable change is further reducing the pain.

If the pain continues to reduce with each test regardless of changes to the test conditions, the condition is likely to be inflammatory and testing variables are unlikely to achieve any clear outcomes.

e. Identify 1-2 key variables

After repeating the testing for different *common features*, you should have one or two variables that clearly had the greatest impact on your symptoms. That's not to say that there may only be one or two variables that improved your symptoms. We just choose your most effective two variables to form the basis of your rehab plan.

Devising the rehab plan is discussed in the next chapter.

4. PLANNING REHAB BASED ON TESTING

The best rehab plans focus on improving function while reducing symptoms. It's a simple methodology that works for almost every condition. By comparison, previous methodology focused on fixing a specific diagnosis; this failed to take into account the variety of causes, deficits and symptomatic presentations seen for the same condition. With this outdated approach, potential success or failure relies on both the diagnosis being accurate, with no other concurrent pathologies, as well as assuming that the underlying deficit fits with the most common cause of that diagnosis.

So we use functional testing and altering variables to test symptom response to devise the optimal rehab program, not just for the injury, but for the underlying causes.

a. Identify key variables

After conducting the testing phase as explained in chapter 3, we've selected two variables that are most effective in reducing the symptoms. These two variables will be used as the basis for different exercise modifications in order to improve tissue tolerance and capacity without further exacerbating the symptoms.

b. Using variables in an exercise approach

We need to figure out a way of including the selected variables in a strength program for the injury, and it's not as difficult as it sounds. Initially we need to work out what we're trying to achieve with each exercise.

i. Range

Forceful movement for joints, exercise for muscle shortness

If the primary variable that reduces symptoms relates to optimising range of motion, a decision must be made on whether the restricted range is due to joint or muscle factors. The simplest way to determine which structure restricts movement is to perform a test of range of motion. If the main resistance to movement is felt in the compressed side of the joint, this indicates a joint-based restriction. If the restriction is felt in the middle of the stretched muscle, the muscle tendon unit is the most restrictive factor in that movement.

As an example, if you were testing hip flexion by bringing your knee to your chest, restriction in the front of the hip suggests a joint-based restriction. Conversely, restriction in the back of the hip due to stretching gluteal muscles is suggestive of a muscle-based restriction to movement.

To improve a joint-based restriction to range of motion, exercises need to target repetitive and forceful movements. Examples of this are a repetitive lunge with the knee moving over toes to force ankle dorsiflexion.

If the restriction is muscle-based, muscles only temporarily respond to stretching before recoiling to their starting length. The reason that ballet and other flexibility-based sports typically include stretching in their training is to improve stretch tolerance and reduce protective muscle activity in stretched positions.

The best way to change muscle length on a more permanent basis is to perform resistance training exercises in the lengthened position. This forces an adaptation in the muscle, which alters its length to the ideal position for that exercise. You can read further on these adaptations in Chapter 5.

ii. Stiffness

Repetitive gentle movement

For a feeling of stiffness without a clear loss of range, gentle repetitive movement patterns are more effective at gradually loosening the joint. This won't have a long term effect, however, the movement will improve joint range and reduce stiffness until the next period of extended rest when the joint stiffens again. The most simple example of this is walking.

iii. Strength

Stable functional movement

The most effective method of building strength is simple stable movement with resistance or loading; nothing complicated, nothing complex.

You don't need to isolate any muscles, as rehearsing a movement pattern can be just as important as building muscle strength.

You don't need to add in extra variations - distractions from the main goal of the exercise only reduces the focus on that goal, diminishing the benefits for your chosen goal.

You don't need to make it more challenging by making it unstable. Strength is compromised by stability - if you're too busy fighting for balance, you can't apply as much force to the target muscle. So although standing on an unstable surface, like a Bosu ball, might make the exercise seem harder, it's actually reducing your strength gains.

Choose strength exercises that mimic your goal activity. If you're building up your cycling strength, position your leg like you're on a bike; if you're aiming to return to running, move your leg through the same depth as your running stride.

iv. Stability

Unstable movement on edge of ability

When working on stability, a common mistake is to find the most challenging exercise possible. However, if the balance task is too hard, you can't rehearse the required muscle patterns for control as you're too busy falling over.

Think of it as if you're acquiring a complex skill, such as learning to drive a car. You don't start by driving at 200km/h and try to survive. You start slowly, build basic skills then move on to more challenging situations that are just beyond your current ability.

The same applies to balance and stability. You need to challenge yourself with tasks that are just beyond your current ability so your brain and body can adapt in increments. As you master one level, you can progress to the next small step up.

As a guide, you should be able to perform a few repetitions with good technique and no compensatory “cheats” before starting to lose control. You'll steadily improve and increase the period of time that you can maintain stability.

If you need to engage compensatory muscle patterns to hold the position, you'll be able to keep your balance but every session is just reinforcing the wrong muscle pattern and creating overload elsewhere.