

Flexibility in Performance: Foundational Concepts and Practical Issues

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Athletic therapists typically include flexibility training when treating physically active individuals, with the interrelated goals of improving performance capabilities and preventing injury. In a recent article, Andersen¹ reported that much of the available research evidence does not support the effectiveness of preexercise static stretching in injury prevention. In addition, a recent textbook

Key Points

Flexibility is one of several factors influencing performance capabilities, whereas stretching is a tool for the development of flexibility.

Flexibility needs should be assessed in the context of movement demands.

Flexibility development must be seen as a long-term process.

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states that stretching might actually impair performance by reducing musculotendinous stiffness and increasing autogenic inhibition.² In contrast, Kraemer and Gomez³ identify flexibility as one of the components of a solid fitness base, particularly for high-level conditioning activities.

If we believe that flexibility is a key component of physical fit-

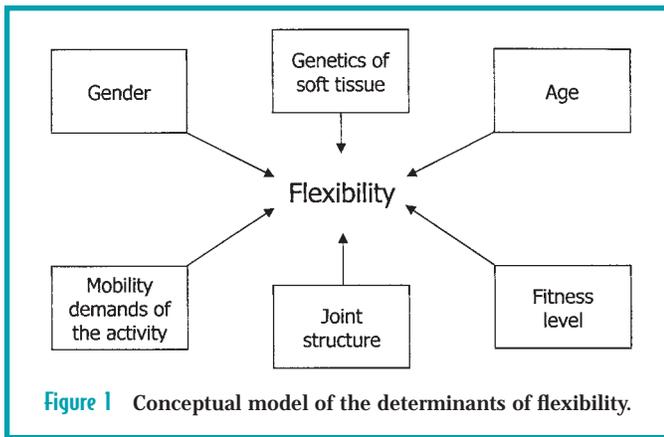
ness, the development and maintenance of flexibility is quite important to our clients, and we must be clear about what we are attempting to achieve when we employ different stretching techniques. We should consider the timing of stretching (i.e., immediately before or after activity or several hours afterward) and the purpose of stretching (i.e., preparing for sport participation or increasing flexibility). The limitations of stretching cited by Andersen¹ might not apply to a client who is seeking a long-term change in flexibility.

With these points in mind, the purpose of this article is to provide the reader with foundational concepts associated with flexibility and stretching and to provide some insight into clinical issues associated with flexibility and stretching.

Foundational Concepts

Flexibility can be defined as the ability to move a joint through the range of motion required for a given activity. Therefore, flexibility is not an absolute quality of a given joint. Rather, it is a variable attribute that depends on the nature of the activity and other factors (see Figure 1). Thus, stretching to “improve” the flexibility of a given joint movement might not be necessary if the range of motion that is available for that movement is adequate for the movement.

For example, screening a group of uninjured football players using the passive straight-leg-raise test might demonstrate that several linemen have relatively poor hamstring flexibility. None of these linemen report any low back or lower extremity problems, and they are returning starters. Based on these findings, should we intervene to improve their hamstring flexibility? Previously, like many of you, I would have said yes—based on the belief that we need to improve their flexibility to prevent injury and improve their performance as linemen. Today, I am less sure that we need to intervene to improve flexibility. Rather, it seems that we should simply maintain the flexibility that they already have.



Support for this approach can be found in a review by Gleim and McHugh,⁴ who stated that increased flexibility is important to athletes who rely on the extremes of range of motion for joint movement, such as gymnasts. Limited flexibility might actually benefit football linemen in performing their sport-specific skills, because they are rarely required to use extremes of range of motion. Muscle that is less flexible (i.e., stiffer) provides a better mechanism for effective transmission of force. A practical example of this concept might enhance our understanding. Suppose we are using a rope to pull on an object. In our initial attempt, we allow some slack in the rope (i.e., more flexibility). We have to “take up the slack” before we can apply a meaningful force to the object. In our next attempt, we do not allow any slack in the rope and, in fact, put some slight tension on it (i.e., more stiffness) before we pull on the object, which allows our force application to be more effective when we pull on the object. In the same way, athletes who increase flexibility (i.e., decrease muscle–tendon stiffness) can alter muscle–tendon properties that influence force production at a given joint angle.³ This alteration could result in decreased performance capabilities or increased injury risk.⁵ An athlete might view decreased stiffness as a positive adaptation, because a less stiff muscle might impose less resistive force against joint movement

Prevention and Performance Issues

An important factor for clinicians to consider is the extent to which the level of flexibility affects injury risk and performance. Unfortunately, there is little evidence available to guide this assessment.^{1,4,6} Most studies have investigated whether or not a short-term (≤12 weeks) stretching intervention, often aimed at

increasing flexibility, can prevent injury. These studies have demonstrated little or no effect of injury-risk reduction.¹ Many of the studies on performance enhancement have involved a stretching intervention that was hypothesized to increase flexibility and improve performance. Shrier⁵ reviewed the research evidence and concluded that acute stretching provided no benefit to performance. Among studies on regular long-term stretching, there was some support for improved isometric force production, contraction velocity, and 50-yd dash time. Although the specific mechanisms underlying these improvements are not known, Shrier⁵ stated that the improvements in performance could have been caused by stretch-induced muscular hypertrophy. Unfortunately, no information about changes in range of motion was presented to determine whether range-of-motion improvements were related to improvements in performance.

Thus, our understanding of the relationship of flexibility to injury risk and performance remains incomplete, and we need to look for new evidence that will clarify the relationship. For example, Devan et al.⁷ recently reported the results of a prospective investigation of overuse knee injuries in female athletes, which involved measuring iliotibial band (ITB) flexibility using the Ober test. They found that ITB tightness was not an important factor with respect to injury susceptibility, nor was a positive Ober test found in athletes who were subsequently diagnosed with ITB friction syndrome. These findings suggest that the athletes had adequate ITB flexibility, which is contrary to the widely held belief that ITB tightness is linked to ITB friction syndrome. Clearly, more prospective studies are needed to improve our understanding of injury risk and the techniques used to measure flexibility.

Clinical-Practice Issues

Most clinicians believe that some level of flexibility at each joint is necessary to maximize an individual’s performance capabilities. As a performance factor, flexibility does not cause movement but, rather, permits it.⁸ Therefore, athletes should possess a level of flexibility that is appropriate for their chosen activities. Just as we recognize the need for metabolic energy reserve to meet some unexpected physiological demand, it makes sense for athletes to develop some level of flexibility reserve to meet unexpected joint-movement demands.