# FLEXIBILITY REDEFINED

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As many as those who write about flexibility are the attempts that have been put forward to define it. Many of these seem to satisfy most disciplinarians. Those established in the field seem comfortable in either providing new definitions or in putting a unique spin on those which by precedent have been accepted. Notwithstanding, there is much difficulty in defining this term, for although its applications are clear enough, its essence is elusive.

Many claim that flexibility is "a fundamental component of physical fitness and required in all physical activities to varying degrees", which it is. But this is no definition. Strength, energy, and so on are also fundamental components of fitness required to varying degrees in all physical activities. Beyond this, some merely supply a list of preceding definitions, like the following. "Flexibility has been variously defined as mobilization, freedom to move, or technically, the range of motion (ROM) available in a joint or group of joints" (Alter, 1988). What is laudable here is the recognized discrepancy among various definitions. What is not is that there is no suggestion as to which, if any, of these is best or whether there is yet a better. If one is to write meaningfully about flexibility one must commit to an explicit conception of it.

Consider. "Flexibility [is] the range or extent of motion possible in a given joint or joints" (Holt, 1974). What is wrong with this definition is that flexibility is seen not as *corresponding* to some particular measurement, but as the measurement. That is, by this definition flexibility is divorced from that to which it purports to be a predicate, tissue, joint, joint group, or organism. Range of motion is not the same as, but rather is demonstrative of, flexibility.

It is suggested that flexibility is "the range of motion of a joint or a series of joints that are influenced by muscles, tendons, ligaments, bones, and bony structures" (Anderson & Burke, 1991). Of this, the first part is typical, the second in some sense unique. But 'influenced' is far too vague, and to use 'joint' in this way, as influential rather than constitutive, is either subtly redundant or patently false.

Some acknowledge the nature of flexibility as complex, involving not only the joint itself but also relevant surrounding tissues. Flexibility as "the total achievable excursion (within limits of pain) of a body part through its potential range of motion" (Saal, 1987) is both pedantic and erroneous. 'Excursion' is too vague a term. Other words such as 'part' are too broad. Can a toenail be said to be flexible in the same sense as the knee? Does 'within the limits of pain' mean that which is 'comfortable' or rather that which is 'not too painful'? It should be mentioned, however, that the introduction of 'pain' or 'pain limit' is not only valid but necessary, for flexibility must be a property whereby no, or minimal, damage is done to related structures.

Several articles are presented in such a way as to define flexibility, accidentally or advertently, as 'mobility' (Corbin, 1984; Hardy, 1985). Though 'mobility' has quite vague associations with which most of us are familiar, so has 'flexibility'. If it is unclear what 'mobility' means, the definition is uninformative, and if it, as it must, mean 'flexibility', we are in a quagmire of circularity, equally uninformative.

Many who write on the subject often define flexibility simply as "range of motion". Range of motion (ROM) sounds like the shibboleth that it truly is, for as much as it pleases the ear to hear or the eye to read, it is used in most if not all, and many if not most instances in the literature. Very often it is the case that the phrase is used half a dozen times in the average paragraph. The problem with these definitions is that no differentia are appended to the obvious genus 'range of motion'. Range of motion with respect to the body could easily include that part of range which is beyond certain thresholds such as pain, injury, and even permanent damage. This is not a desideratum. Flexibility is restorative. After full movement, the relevant structures, though certain adaptations therein may have occurred, are in a condition comparable to that when the trial began. Some do, of course, realize that 'flexibility' is not synonymous with, but is obviously related to, 'range of motion'. One such (Surburg, 1986) limns the errors of others without, however, offering much suggestion for improvement.

In one article, flexibility "as a component of physical fitness, is the ability of an individual to move the body and its parts through as wide a range as possible without strain to the articulations and muscles attachments" (Uppal & Singh, 1984). This attempt is better than most, as flexibility is described admittedly in its disciplinary context. It also includes the notion of range of motion as it pertains to individual physical performance while establishing as a relevant criterion the idea that flexibility pertains to normalcy, that is, range within injury thresholds. Even so, there are problems with it, such as the failure to mention joint or joint group specificity, and the exclusion of flexibility as exhibited by passive stretching, a not insignificant aspect not only of flexibility but also of the many activities that require it.

Flexibility as "the range of motion (ROM) available in a joint which allows movement to occur with as minimal a resistance from the body tissue as possible" (Wollbaum, 1986) is better articulated than most, including the concepts of joint specificity, the resistance of relevant issues, and range of motion. And yet this definition does not allow the ascription of flexibility to joint groups, tissues, or organisms. Spinal flexibility, after all, is not a misnomer. As well, the notion of as minimal tissue resistance as possible is vague, and perhaps contradictory. Surely flexibility is, rather, a matter of range below a certain *threshold* of resistance from body tissue.

Another definition cites flexibility as that which is "usually defined as the range of motion around a joint or series of joints (as in the case of the spine)" (van Gyn, 1984), which obviates the multiple joint problem of the above definition but fails to refer to the elasticity of surrounding tissue on which such range depends. This is not altogether bad as it stands, but the writer goes on to differentiate between static flexibility and dynamic flexibility without indication of what it is that these two have in common.

There are two definitions which come closer to being adequate, one of which holds flexibility to be "the ability of a joint to move through its normal range of motion" (Feingold, 1986), the other as "range of motion at a single joint or series of joints and reflects the ability of the muscle-tendon units to elongate within the physical restrictions of the joint" (Hubley-Kozey, 1991). The first unfortunately excludes joint groups and leaves vague the notion, helpful as it might be, of normalcy. the second, like the first, identifies flexibility with range of motion reflective of relevant tissue properties. Others hint at similar insight but get it the wrong way around (Bryant, 1984; Corbin & Noble, 1980; Harris, 1969; Sigerseth, 1971). Flexibility is not the occurrent *range* of motion exhibitive of the property of tissues allowing it. It is rather the dispositional *property* of tissues

exhibited occurrently by range of motion.

In light of the foregoing the authors present, below, a new definition of flexibility that will, hopefully, provide a model which coheres and helps illuminate the importance of flexibility in exercise, sport, and rehabilitation. We do this with an eye, first, to conceptual understanding and an eye, second, to the practical implications for stretching technique and regimen that such understanding indicates.

## Definition of Flexibility

Flexibility is the intrinsic property of body tissues which determines the range of motion achievable without injury at a joint or group of joints.

a. It has been demonstrated that this property is amenable to change; lifestyle, exercise, injury, and aging, etc. can either increase or decrease this property. It is recognized that, for each motion, an excessive excursion may lead to dysfunction. This should be viewed as a parameter with limitations.

b. Tissues include muscle, tendon, fascia, ligaments, bone, and various nervous system components: muscle spindles, Golgi tendon organs, and central mechanisms. A tissue hierarchy exists at each joint and joint group for each person.

c. Each joint by design allows specific movements to take place. Limits to each ROM may include soft tissue contact, bone to bone contact, ligamentous tension and soft tissue tension.

d. There is an implied restorative capacity. When range restriction is due to tension in soft tissue, the structures will, by means of intrinsic elasticity, return to a normal testing state even though an increase in over-all length has been achieved through a stretching regimen. Where ROM is limited by ligament tension, capsular tissue, or bony contact attempts to augment ROM is questionable and may lead to injury.

## How Flexibility is Demonstrated

1. Actively - a slow concentric contraction of the antagonists can stretch the agonist muscle(s) to their limit.
2. Passively - external forces, ie., gravity, or machine, or partner can stretch the agonist muscle(s) to their limit.
3. Dynamically - rapid forceful concentric contractions of the antagonists can stretch the agonist muscle(s) to their limit; which for a brief period of time may surpass the extent of movement elicited by active attempts.

## How Flexibility is Measured

Virtually all measures of flexibility are planar and use simple goniometry in spite of the fact that a majority of fitness and sport movements are performed around 2 or 3 axes

simultaneously. This is a major source of error in research and severely limits our understanding of this phenomenon. Multiaxial measures under active, passive and dynamic conditions are desirable.

## Summary

Flexibility exercises have traditionally been a popular component in general fitness and sport specific workouts, as well as a meaningful rehabilitation tool. However, from a theoretical perspective, the term has been ill-defined and poorly understood. The authors have presented a new and hopefully improved model, attempting to get at the underlying concept of flexibility and to enhance our understanding of this irnportant component of exercise.

Such is flexibility as we see it.

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