

LITERATURE REVIEW.

ANKLE TAPING : Implications and
Future Directions
for Research and
Development.

HSHM 210 MOVEMENT STUDIES

BASKETBALL MAJOR ASSIGNMENT

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RATIONALE: Examination of the literature concerning the practice of ankle taping encompasses studies over nearly three decades. To review this literature as such, would merely be to reiterate the reviews of the most recent articles which begin with a comprehensive review of the literature. Because of this, and observations that in the greater portion of these studies, researchers report on functional problems regarding decreased function, material breakdown and limitations in joint mobility, but fail to draw implications from their findings, which may lead to the development of a more efficient and effective system, ^{Capriance} this review will concentrate on examining the findings of these studies, and then draw from them the pros and cons of the various systems in an attempt to infer future directions in development of a better system of prophylactic (external) support.

OK

DISCUSSION: The theory behind external support is that tape or cloth restrict the ankle from turning outwards (eversion) by limiting the ankle range of movement in this direction, with normal ligamentous strength being replaced by the strength of the material. This support of ligaments need be present only when the physiologic or normal ranges of motion have been exceeded (Garrick and Requa, 1973). They state, "the achievement of this goal, however, is virtually impossible." The Author agrees with this statement when considering current methods, but in a broader sense it must be seen to be tainted with ignorance.

on terry's sample the date is necessary

Statistical proof that ranges of motion of the ankle joint in plantar-dorsi flexion and inversion-eversion is restricted, is given by Morris (1983), who shows that taping causes significant reductions in R.O.M. both before, during, and after exercise. It is not argued that by limiting range of motion, the ankle may be supported, and even after exercise, support is maintained via this method. What is of concern here, is that an initial reduction in range of 25% in plantar-dorsi flexion and a 35% reduction in inversion-eversion, is too great a restriction on motion, simply to allow for significant support following exercise. (ROM in plantar-dorsi flexion and inversion-eversion still being limited by 17% & 30% respectively following 20 minutes exercise). This process of support through restriction of range and function needs to be carefully examined. Good

What kind of taping?

Numerous studies have been conducted to establish the extent to which exercise reduces the support of the ankle by prophylactic tape^{1, 2, 9, 10}

Garich 1962

Good

Collectively, they report that the effective support is reduced by as much as 50% after 10 minutes of exercise which included running, jumping, agility runs and simulated inversions. It is the reports of material behavior; tearing, slipping and deformation that is of interest here.

check this!

Most currently used techniques use anchor strips, stirrups and heel locks which are made of non-elastic cotton tape. Methods vary in what they use to close and support the rigid structural supports established with non-elastic tape. Most close with a basket-weave of either elastic or non-elastic tape.

Good

get better description!
is harder

The rigid structure of heel locks, stirrups and anchor strips is what functionally restricts movement and therefore supports the ankle. And it is precisely this structure which is affected by exercise.

Garich et al.¹² in two separate studies^{1, 2} in 1962, observed that during and after exercise the lateral sides of the stirrups were most affected. Either the whole structure was displaced downwards, (ie anchors and stirrups were separated) the stirrups tore as a result of forced inversion, or the tape loosened below each malleoli as a result of creep, or sweat accumulation. How then could this support structure be improved?

on to use et al. here if used in full the joint zone

The tearing or lateral displacement occurs as a result of tensile stress concentrations when the ankle joint is moved in directions in which the tape limits its motion. Since

tape initially restricts range by up to 35% in inversion-eversion (Morris 1983), it is not surprising that ROM in normal locomotive exercises places stress on this support structure to cause accommodation for normal range. These stress concentrations, in sudden inversion need to be displaced so as not to cause material deformation. It is logical that if the material of support were elastic, then stresses could be absorbed, range accommodated, slipping and tearing minimised, and the rate at which stress is applied increased substantially (Impulse = $F \times \text{time}$) (confirmed by (46))

Good

These principles are reflected in Juwend's 1972 study relating to the effect of ankle taping on verticle jumping ability. Both elastic and non-elastic tape wraps were found to significantly impair jumping ability, though the elastic tape permitted significantly greater heights than linen tape. They suggest this is due to the increased ROM of the ankle in plantar-dorsal flexion.

Good

Separation at the anchor points on the lateral and medial sides from the stirrups is not only from stress concentrations at these points, but from ineffective windings at these junctions. Since tensile stress has already been addressed, it remains to discuss the anchor sites. If the anchor and the stirrups could be joined by a fastening arrangement such as velcro[®], better holding in sheer would create better holding at these points.

Curved and circular structures provide displacement of stresses in directions other than that of loading. This principle has implications to both the shape of the attachment site, and the structure of the anchor strip material.

Accumulation of sweat has been observed as a prime reason for slippage of stirrups, water induced creep, and it's effect on adhesive properties of the tape. Rarrick et al ¹² (1962), measured the comparative support of a closed basketweave with stirrups and heel lock applied directly over the skin, over a stockingette, and a cloth wrap over a cotton sock. Under exercise of five minutes they found that tape on skin had greatest support both before and after exercise, whilst the cloth wrap over a sock provided little support in either condition. Interesting here is that the tape over the stockingette, whilst not as supportive as the tape on the skin, was the only one in which the mean support was not reduced significantly after exercise.

Implications to be drawn from this relate to sweat accumulation and movement of skin under the wrap, not being detrimental to tape adhesion and stress accumulation. ? Since sweat is allowed to disperse into the stockingette, it won't affect adhesion, yet would probably still lead to sweat assisted creep, hence loosening. Movement under the tape, (of the skin) now means that stresses are concentrated at the anchor sites. This would not be altogether desirable unless first addressing the effectiveness of the anchor stirrup junction, as previously discussed. Hence, in the Rarrick ^{et al} studies, ¹² (1962) overall support was less since the increased stress concentration at the anchor sites simply lead to separation of the stirrups from the anchors.

15 Feb 50

not really needed

Ferguson⁽⁵⁾ (1973) makes discussion of the case against ankle taping. Major points of interest here are; the locking of the subtalar joint (ankle safety valve) by rigid taping; and the time effort and money consumed by this practice.

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Locking the subtalar joint occurs when rigid tape is applied to the ankle during the practice of prophylactic taping, when range of motion in inversion-eversion is restricted. (the natural motion of the subtalar joint). ^{SOP, P. 100}

Locking the subtalar joint leads to a transfer of stress up the leg to the knee when a player suddenly changes direction. This emphasises the importance of allowing subtalar ROM in inversion-eversion with support which will absorb rather than transfer stress. This indicates that an elastic material with similar properties in tension to ligaments, but with a greater total energy to failure, could be used to absorb the sudden induced force of inversion, whilst helping to prevent stress transfer up the leg, and simultaneously increasing the time of loading.

The second consideration here is that taping each athlete before practice and competition requires large amounts of time, effort and most importantly tape. A conservative estimate would put the cost of taping at around \$4 Australian per ankle, which ultimately becomes waste. If the amount of waste could be reduced to a minimum with substantially reusable parts, and the time and effort involved in application, not only would it save time and money, but make prophylactic support available to the general populace, since cost and effort now make taping a practice limited to the professional.

very interesting

very true

Not only would reduced cost and effort assist the amateur, money saved by professional organisations, could be better spent upgrading facilities and equipment, whilst the time savings could be better used for rehabilitation and strengthening of important musculature.

Good

An EMG analysis of the effect of ankle taping on the actions of the peroneus group of muscles by Spraggings, Pelton and Brandell (1981) reports that the actions of these muscles as ankle evertors (sprain prevention) is enhanced, and tonus increased as a result of tape pressure over these muscle bellies. They suggest that the effectiveness of taping may be its action on ankle evertor stimulation. This pressure may be unavoidable in any method of prophylactic support, and due to the reported effects, may be a desirable as an aid to injury prevention. Similar results were observed by Cluck et al. (1976), who attributed the benefit of taping to stimulus of the peroneus *l* muscle.

now down

One further limitation to current taping techniques becomes evident when we examine the advised methods of early and ongoing treatment of ankle sprains. Ryan (1973, 1986) recommends early treatment of ankle sprains by immobilization, RICE, followed by range of motion exercises in directions which don't cause pain in the injured region.

and immobil.

doesn't
does not

If the ankle is immobilized with tape, it is not going to allow range of motion exercises to be performed adequately. Further

to this, if ice is applied during range of motion exercises, and as it should be in the acute phase of treatment, water seepage will tend to loosen the wrap, reduce compression, and need to be replaced quite often. Also, if immobilization is required for some time, i.e. up to ten days in severe sprains (Grade 2), ^{net} the whole wrap would need to be replaced each time the patient wishes to bathe the area. It has also been observed that allergic reactions occur to constant covering by tape, so this needs to be considered.

may cause acute allergy problems.

Implications from this are similar to others already outlined for preventative taping. These are; range should only be limited at the point where damage to ligaments will occur; the wrap should be substantially reusable and easy to apply; sweat and water should be allowed to disperse so as not to loosen the wrap. Further to these, the wrap should be easily removable (and reusable) to allow bathing and icing; not be in constant contact with the skin (as in tape on skin application) to avoid allergic reactions.

#Plastering

CONCLUSIONS:

The implications to be drawn from this review indicate that some serious changes need to be made to the current systems of prophylactic taping to better support the ankle joint against injury, reduce cost, waste, effort and wasted time. It is also important that these changes are implemented and a system developed that will make effective ankle support available to every sports person without prejudice of cost, effort and availability.

The Author is currently working on this problem and intends to develop future studies to test these methods currently in development. For this reason it is asked that this paper, and its contents, remain confidential, and that points raised here remain within this confidence. Publication or leakage of this paper's contents may lead to problems of disclosure relating to patent applications pending.

I trust you will be able to respect these wishes, and thank you for this respect in advance.

Craig J. Hubbard.

6/6/90.

no problem - same advice Craig -
if you wish to publish - and it was, believe it
or not, you will need to reference fully - and
consistently & correctly - I'm not trying to be critical
but Journals are very strict. Anyway
Great work - very well researched

NEETH DISTRICT
George Gidd

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