

Reviewer's report

Title: Understanding the nature and mechanism of foot pain

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Reviewer: Adam Garrow

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In this paper the authors review the literature on foot pain and its mechanisms. A review of this kind is long overdue and the review will be of great interest to health care professionals and researchers interested in foot pain.

In reviewing the manuscript, I have found it difficult to differentiate between major, minor and discretionary revisions. The authors may wish to make changes to the manuscript in the light of my comments and I would be content that they can be trusted to make appropriate changes to the document.

Prevalence of Foot Pain

Towards the end of this section the authors introduce the concept of disabling foot pain. I am not sure how any of the readers will be familiar either with this definition or how disabling foot pain differs from chronic pain. It might be helpful, therefore, to provide an explanation of the criteria for disabling foot pain (i.e. past pain, current pain and reporting at least one disability item on the Manchester Foot Pain and Disability Index - MFPDI). It will then be clearer that disabling foot pain is an attempt at measuring the impact of foot pain in terms of disability. On this subject, I do not think it is quite correct to describe instruments listed in the Quantifying Foot Pain section as instruments "specifically used for pain". To varying degrees, the FFI, FHSQ and MFPDI contain different components relating to disability, activity restriction, personal appearance and footwear.

Predictors of Foot Pain

I have tended to avoid using the term 'predictor' when discussing the Cheshire Foot Pain and Disability Survey as this was a cross-sectional study and so can only highlight associations. The term 'predictor' suggests causation and cross-sectional studies are unsuitable for drawing conclusions about causation in either direction.

I do think, however, that this section is very important, as the Cheshire Foot Pain and Disability Survey, suggested a link between disabling foot pain (as defined) and other musculoskeletal problems. This concurred with the findings of Leville et al (1998) and was also supported in subsequent studies. For example, Peat et al, found a step-wise reduction in physical function with each additional joint pain site and that site-specific pain severity increased as the total number of lower extremity joint pain increased. They concluded that treatments targeted at a single joint may only be marginally beneficial in reducing disability in individuals

with multiple joint involvement unless the treatment also produced benefits in other sites. These results may, in part, explain why the RCT evidence why the RCT evidence on effectiveness of in-shoe devices is lacking.

The authors are correct in mentioning that the association between disabling foot pain and RA was not significant, however, on average, people with RA had over a three-fold increase in odds of having disabling foot pain, so although not statistically significant, the results, nevertheless, could be considered to be clinically important, particularly since DFP was also associated with other indicators of poor general health. The authors mentioned that the Menz et al study reported associations between Pes Planus as well as limited ankle joint range of motion. These findings are perhaps not so dissimilar to the Cheshire study as the text suggests. The Cheshire study reported a three-fold increase in odds of people with Pes Planus having disabling foot pain (although the odds ratio did span unity) and a strong (and significant) association between foot joint tenderness, which includes a component of ankle pain.

After the section, the authors introduce a new section on the Classification of Foot Pain and then describe neurological differences between the clinical presentations of foot pain. I think it is important to mention that these aspects are not mutually exclusive. Someone with inflamed arthritis in the first metatarsal phalangeal joint, may also find themselves walking with a stone in their shoe or accidentally stepping on a drawing pin. I also wondered what mechanisms are involved in the case of someone who has long term pain and discomfort from an involuted nail or a neurovascular corn.

Chronic Foot Pain

The authors are correct in mentioning that there are inconsistencies in terminology, however, although imperfect, the IASP definition quoted, "...pain persisting past the normal time of healing..." does work reasonably well. I am not sure that I completely agree that "chronic foot pain does not share the sharp spatial localisation typical of acute foot pain".

I tend to favour the following definition of Chronicity

Chronic: This important term in medicine comes from the Greek *chronos*, time and means lasting a long time.

"A chronic condition is one lasting 3 months or more, by the definition of the U.S. National Center for Health Statistics. In ancient Greece, the "father of medicine" Hippocrates distinguished diseases that were acute (abrupt, sharp and brief) from those that were chronic. This is still a very useful distinction. Subacute has been coined to designate the mid-ground between acute and chronic."

Certainly there are a large number of things that may be associated with chronic conditions but some of these may not be present in all cases and others may be difficult to measure.

Taking the example of a stress fracture of a second metatarsal where there is

localised acute pain. After splinting and a period of rest, the pain should resolve uneventfully. Initially, the injury is likely to have a major impact on the person's ability to walk and so the pain could be said to cause disability, but would only meet the criteria for disabling foot pain if the person experienced pain in the past month lasting one day or longer, pain on the day of the assessment and marked at least one item positively on the Manchester Foot Pain & Disability Index.

If we assume that normal healing of a break of this kind in a 35 year old male in otherwise good general health, would occur in 2 months, the pain may be considered chronic if it persisted (arbitrarily) for 3 months or longer. The "stimulus" for this would have been the initial trauma which has since been "removed". In this scenario, the IASP definition for chronic pain works reasonably well. Similarly, if the pain persists for three months or longer but was intermittent and self-limiting, the pain may be chronic but not severe enough to have an important impact on the person's personal or psychological well-being. If it did, the term disabling foot pain would be appropriate. And, if the pain affected the person's quality of life or was associated with anxiety or depression, this could be assessed with an appropriate measure.

This model also works reasonably well for other conditions such as plantar fasciitis/calcanal spur and Morton's toe where the pain is also localised. In addition, how would a clinician be able to determine that "adaptive changes at various levels of the nervous system" had occurred?

Foot Pain as a sensory, emotional and psychosocial experience

I think that this section is particularly important. Something that is perhaps missing from this review of the literature is the role of footwear in foot pain. This is a much neglected area perhaps because it is extremely difficult to research, not least, because people nowadays may wear a variety of different pairs of shoes each week, and sometimes even two or three different pairs per day. Assessing the suitability of footwear, to say the least, is problematic. Anyone who has suffered a blister on their little toe will easily attribute this to the wearing of a particular pair of shoes. But it is not simply the wearing of the shoes that causes the blister; duration, type of activity and resilience of the tissues all have a role to play. In the context of this section, the benefits to an individual's appearance and self-esteem while attending an important social or business function, may exceed the short-term pain and discomfort caused by a tight-fitting pair of shoes. In contrast, the psychological effect of wearing 'therapeutic' footwear, in spite of any known or perceived health benefits, in many cases, may be large enough to limit or prevent the wearing of such footwear. Because of this, I would whole-heartedly agree that "further research is required to understand the many facets of foot pain suffering and to identify or develop interventions effective at modifying the 'foot pain experience'"

Finally, the authors may be interested in the British Society of Rheumatology Guidelines for the Integrated Management of Musculoskeletal Pain Symptoms (IMMsPS) that have been posted for comment on the website of the Human Pain Research Group.

<http://www.hope-academic.org.uk/Academic/researchdevelopment/Themes/Neurosciences/Pain>

In the opening section of this document, the authors state

“The current evidence from functional imaging studies is that all types of pain are processed within a common human pain matrix in the brain and that acute pain and chronic arthritic pain are also processed within this same common matrix of brain structures (Jones 1999;Kulkarni et al. 2005). Only two or three of these structures (Primary somatosensory, insula cortices and the lateral thalamus) are concerned with where the pain comes from. The rest of the pain matrix is mainly concerned with the psychological context of the pain and planning motor responses to the pain.

It is therefore likely that there is much common physiology for the perception of all types of pain and that there may be substantial commonalities of effect between different types of therapeutic interventions. So far, there is no evidence to refute this and as the levels of evidence for different interventions for different musculoskeletal pain conditions is relatively poor or absent, we have developed the guidelines on the principle that if there is reasonable evidence for positive therapeutic effect in one condition, then as long as there is no evidence to the contrary, we have assumed it may have some benefit for another.”

Additional references which the authors may find useful.

Smith BH, Hopton JL, Chambers WA Chronic pain in primary care. *Fam Pract.* 1999; 16: 475-482

Peat G, Thomas E, Wilkie R, Croft P. Multiple joint pain and lower extremity disability in middle and old age. *Disabil Rehabil.* 2006 Dec 30;28(24):1543-9.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.