Damien Howell
Physical Therapy

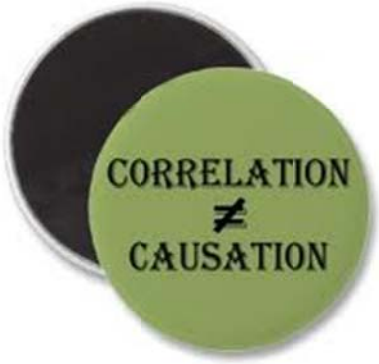
Faulty Causation Reasoning - Correlation Does Not Imply Causation

The Declaration of Independence states "We hold these truths to be self evident". Most will agree it is self evident that finding solutions to problems starts with identifying the cause. As a clinician I believe identifying the cause of a repetitive use injury is a potent way to address the problem. I spend a great deal of time looking for the potential cause of repetitive injury. One of the benefits of being a seasoned clinician is having had the opportunity to develop wisdom, which can be clever euphuism for having had the opportunity to learn from mistakes. Not having the intellect of genius, I strive to keep things simple stupid. Over the years I have developed a theoretical frame work which attempts to identify in a simple approach to identify the potential causes of repetitive use injuries.

The theory is repetitive use injuries are caused by one or more of three things, first repeating a motion too much, too fast, too soon; secondly having an anatomical structure which is funky, and thirdly doing it funky, that is moving in an uncoordinated manner.

As an example, I've observed runners who have shin splints often strike the ground with the heel first, and when the injured runner was asked to consciously modify their running form and to strike the ground with their whole foot instead of the heel first they either diminished or alleviated the symptoms. This is an example of "doing it funky".

Correlation does not imply causation is a phrase used in science and statistics to emphasize that correlation between two variables does not automatically imply that one causes the other. However correlation is necessary for causation and can indicate possible causes or areas for further investigation. There is a lot more to proving causation than a simple correlation or relationship between two things. This is why we've got to be very careful reading news stories, blogs or even peer reviewed medical journals that purport to show that A causes B.



The older I got I had the opportunity to evaluated a lot more runners suffering with shin splints, and observed there were some runners who were not heel strikers but struck the ground with the whole foot, but still suffered with shin pain. There were individuals who struck the ground with their heel first and when they changed their foot strike to a whole foot strike, it did not diminish their shin pain. Foot strike may be correlated with shin pain, but this does not automatically imply that heel strike causes shin pain.

Additional examples related to running injuries where A is related to B, but does not necessarily mean A causes B are as follows: Some individuals with heel pain have short/tight calf muscles. However recent research has shown some individuals with heel pain have long lax weak calf muscles. Runners who collapse at the end of a marathon have been assumed to be dehydrated, and it was suggested to prevent collapse drink a lot of fluid. However recent research has shown some runners who collapse at the end of a marathon are hyper-hydrated commonly called water poisoning that results from drinking too much water. Runners who pronate excessively or at the wrong time experience injuries; however some injured runners under pronate or excessively supinate.

In our attempt to keep things simple stupid and believing that a funky anatomical structure of having short/tight calf muscles leading to injury, we can ignore other important factors, like the calf muscle may be weak, the intrinsic muscles of the foot may be weak, or the manner in which we run may be funky.

It is important to have an open mind in order to avoid mono-causal myopia. Over emphasizing one cause, rather than exploring the many parts engaged in the process or examining the numerous possible risk factors for a behavior, is

likely to produce solutions with consequences worse than the original problems themselves.

Treatments can be effective and symptoms can get better without the effect of treatment. Injuries can get better because of "Tincture of time" or the natural history of the disease or injury. Injuries can get better because of placebo effect. The bias or beliefs of the clinician who is measuring the patient's signs and symptoms can influence or explain why the treatment has been assessed as being effective.

The riddle "who is buried in Grant's tomb" has been used as an allegory in which the question provides the answer. What causes running injuries? The answer is in the question, running causes running injuries. However human movement is complex therefore it is likely that the cause of repetitive use injuries is complex and multi-faceted. A richer understanding of what causes running injuries is there to be explored given an open mind. Recognize that treatments that work, in whatever form they might come, even if we do not know why the work, and yes, even if we cannot prove that the treatment is causing the cure. Some treatments may work because of "tincture of time" or the natural history of the disease or injury.

Bottom line:

- It is important to look for the cause
- Correlation does not imply causation
- It is important to have an open mind to consider alternatives
- Treatment should be based on individualized evidence and careful thought processing