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Opinion

The epistemic basis of distance running injury research: A historical perspective

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1. Introduction

For both recreational and competitive purposes, distance running is an ideal activity for increasing endurance capacity and improving cardiovascular health. Running is an accessible and relatively simple form of exercise that is performed by able bodied individuals in a variety of locations worldwide. Accordingly, the popularity of running in developed countries has increased dramatically in recent times, demonstrated by the growth in fun runs, marathons, and fundraising events. Unfortunately, musculoskeletal injuries are a common side effect of participation, particularly for novice exercisers who are at greatest risk.[1] In order to reduce the incidence of distance running injury, the identification of risk factors and injury mechanisms is a necessary step for effectuating preventative interventions.[2] Aetiological research, however, requires a multidisciplinary approach encompassing epidemiological data, biomechanical analyses, clinical research, and behavioral studies.[2]

Recent calls for more experimental and observational research to better understand the aetiology of distance running injury are certainly justified.[3] In particular, scientific study designs located higher on the evidence hierarchy, such as the randomised controlled trial and prospective cohort, are capable of reducing methodological biases to establish cause–effect relationships reliably. Irrespective of the need for more analytical research, the scientific literature is replete with aetiologically-focused distance running injury investigations.

With consideration for what is now a significant body of research, the purpose of this opinion piece is to present the epistemological basis underpinning distance running injury epidemiological research. Exploring the historical context of the literature from an epistemic perspective presents the opportunity to reflect on past developments and current practice. From here, opportunities are identified, and complementary and alternative conceptual and methodological directions for future research are recommended.

2. Revisiting the conceptual "research scaffold"

Even before finding a topic and formulating research questions and hypotheses, a given researcher has a predilection for a particular methodological approach.[4] An individual's conception of reality and their epistemic beliefs conspire to form a position that maintains there are better ways in which to derive *a posteriori* knowledge. This broader ontological assumption about the nature of reality and what can be "known" about the natural world results in the following "research scaffold":[5]

(1) Epistemology (i.e., knowledge acquisition);
(2) Theoretical perspective (i.e., assumptions about reality);
(3) Methodology (e.g., a case–control study design *vs*. phenomenological inquiry);
(4) Method (e.g., survey approach *vs*. focus group interviewing);
(5) Analysis (e.g., a general linear model *vs*. thematic analysis).

Given that the academic research scaffold is native to all forms of inquiry found across different scientific disciplines, its usefulness can also be evaluated in the context of running injury prevention research. Primarily, a particular epistemic perspective that forms the foundation of any given research will vary between individuals or groups depending on geography, culture and/or context. Moreover, standards of evidence are likely to reflect the beholder's personal criteria for validity. In other words, the design of running injury prevention research has mostly been influenced by the contextual and historical backdrop within which researchers have operated.

3. The objectivist tradition in distance running injury research

Since the inception of running injury prevention research in the 1970s (e.g., Ref. 6), a theoretical perspective of positivism

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informed by an objectivist epistemology has produced a biomedical understanding of injury pathogenesis and pathophysiology. This has resulted in an overwhelmingly high number of quantitative research designs and methods.[3,7,8] It would seem that assumptions about injury causality, be it largely through tradition and repetition, have encouraged the promulgation of an empiricist paradigm in its purest form. This has shaped the aetiology of distance running injury into a nomothetic and deterministic phenomenon. Indeed, the preoccupation with identifying and isolating risk factors has precluded the possibility of exploring additional approaches, and has resulted in a particular ideal that suggests aetiological processes will eventually be realised when enough high quality scientific research is conducted.

Under an empiricist paradigm, the testing of a theory involves a certain degree of control, to regulate and quantify phenomena in order to accept or refute hypotheses with validated and reliable instrumentation.[9] In taking this approach, the end result is often reductionist, explaining the relationship between a discrete set of variables selected and analysed by the researcher.[9] Routinely wanting to ascertain the objective reality of phenomena via traditional epidemiological approaches produces an expert-led, paradigm-driven process. It just so happens that the aetiology of distance running injury is only ever explained with this traditional approach. For example, the primary means of identifying risk factors has been through the use of techniques such as discriminant function analysis, *t* tests, χ^2, and various types of analyses of variance. The use of more sophisticated techniques, such as multivariable logistic regression analyses first employed around the late 1980s (e.g., Ref. 10), and used more recently (e.g., Ref. 11), has involved testing each exposure separately before including the "significant variables" in a final adjusted model using stepwise procedures.[12] Notwithstanding their few limitations, appropriate statistical analyses do result in valid and logical conclusions, and their use should be further encouraged in future running injury research. However, there is also a need to consider complementary alternative approaches.

4. Considering an alternative conceptual framework

There is justification in encouraging distance running injury researchers to understand the human experience and condition in its natural state through organic means of inquiry. Each injured runner experiences a unique chain of prior causal events, involving many different intra- and interpersonal determinants. In contrast to an objectivist epistemology, interpretations of causality could still be viewed as personally or socially constructed and, by extension, the absolute physical reality behind injury could be considered profoundly "idiographic".[13]

When dealing with complex social issues, inclusive of human nature and behavior, objectivist methodologies, if used exclusively, are incapable of producing definitive answers. This is not to say that a biomedical paradigm has greatly hindered progress by any means. For one, distance running injury prevention research has still progressed with limited risk factor identification. Nevertheless, where there are historical implications, geographical and cultural differences, and even social inequalities, habitually collapsing the broader ecological risk factor landscape down to the individual component-cause level might preclude any consideration for additional reasons that otherwise explain the incidence of distance running injury.

At the other end of the continuum lies the epistemology of constructivism. This particular epistemic orientation encourages the use of methodologies that have the capacity to consider the specific context of runners' lives, their relationships and careers, sociocultural beliefs and historical accounts.[9] It is for this reason that the corresponding theoretical perspective of interpretivism is well suited for research with a social and behavioral emphasis. Interpretivism values subjectivity, the complexity and diversity of personal views, and that conclusions of causality operate under context and within the individual's social tapestry.[5] Indeed, in the wider field of injury research, it has been acknowledged that qualitative methodologies[14] and behavioral and social science theories and models[15] are exceptionally rare despite their potential value. Likewise, very few behavioral and social science theories and models have also featured in sports injury research,[16] prompting some to acknowledge the paucity of literature exploring behavioral risk factors from the perspectives of athletes and coaches.[17] Recent calls for a "broader research focus" in the context of the sports injury epidemiological literature[18] suggest that it is now time to explore alternative conceptual approaches and associated complementary methodologies.

5. Leading by example: a single case in point

In the distance running injury literature, only 1 study has explored the beliefs of recreational runners in relation to injury risk.[19] Using a semi-structured interviewing technique, this study drew upon participants' personal experiences in order to identify their perceptions of running injury causality. Reflecting upon their findings, the authors concluded that injury prevention educational interventions are required to address the many misperceptions about injury causality that were reported.[19] Effectively, this study found incongruence between scientific theory and the real-world beliefs of runners. Successfully closing the gap between the conclusions derived via highly controlled scientific inquiry and the beliefs of the running community requires direct collaboration with end-users (i.e., runners) and key members (e.g., academic researchers, sports coaches, healthcare providers) of the system. Future research should strive to determine the underlying intrinsic and extrinsic motivators dictating distance runners' decisions to engage with certain behaviors known to pose risk. Before doing so, however, a good place to start would be with the sources of injury prevention beliefs and attitudes among runners, and understanding the reasons for why particular sources are held to a higher standard.[19] This would require the acceptance and further use of qualitative methodologies to supplement the traditional epidemiological risk factor approach. Such a realisation begins with the introduction of a fresh and impartial philosophical position.