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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 aetiological-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 methodologies¹⁴ and behavioral and social science theories and models¹⁵ 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 literature¹⁸ 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.

6. A pragmatic solution

Where the epistemologies of objectivism and constructivism attempt to explain reality with 2 theoretical perspectives that situate on different ends of a broader ontological continuum, it is pragmatism that focuses on the “what” and “how”, and does not need to associate with an epistemology or paradigm.⁹ Discussing pragmatism in considerable detail regarding its historical origins and its practical application, Johnson and Onwuegbuzie²⁰ argued for this pragmatic, or “pluralist” position, referring to it as balanced and outcome-oriented. Pragmatism has been described as the “philosophical partner for the mixed methods approach”, and has been described as having 4 key facets:²¹

- (1) It challenges the philosophical dualism that emerged at the time of “the paradigm wars”, attempting to find common ground and promote compatibility between theoretical perspectives;
- (2) When quantitative or qualitative inquiry alone is not enough, it provides a third alternative in which to best address research aims;
- (3) It is considered a new orthodoxy, a method of conducting research that is not to be viewed as permissible, but actually desirable if the situation permits;
- (4) It is not merely a convenient approach that is adopted to provide diversity based on the researcher’s strengths, weaknesses, or indecisions, but to overcome bias, build on existing research, increase data accuracy, and provide a more complete picture of phenomena.

7. The future for distance running injury research

Despite the aforementioned suggestion for more qualitative inquiry, a pragmatic orientation is not necessarily limited to reconciling the differences between quantitative and qualitative inquiry *per se*, especially within the confines of a single investigation.²² Rather, a pragmatic solution also integrates additional complementary and alternative conceptual approaches and methodologies that have been intentionally selected to better expose aetiologic variables and elucidate injury mechanisms. The following points list some recommendations for future distance running injury research directions:

- (1) It would be beneficial to begin to conduct research *with* runners, rather than continuing to conduct research *for* runners based on the assumption that distance runners are entirely capable of reflective and critical thought regarding their personal situations;
- (2) Active engagement with distance runners when searching for answers is a form of emancipatory research that does not exclusively work from a “top-down” perspective, but will empower all parties;
- (3) Data obtained from end-users and community clinicians will highlight where injury prevention educational interventions need to be aimed, and how best to deliver such initiatives;
- (4) Operationalising alternative approaches including causal visuals that incorporate the multifactorial nature of dis-

tance running injury is another option that would expose an enhanced conceptualisation of its aetiology. Examples here might include the use of Directed Acyclic Graphs,²³ or a “systems thinking” perspective involving a range of quantitative²⁴ and/or qualitative methods and analyses.²⁵

We encourage the international community of running injury prevention researchers to begin the process of thinking about how to strengthen and supplement the traditional epidemiological approach to enhance knowledge about what factors combine to contribute to injury risk. More qualitative inquiry will help to displace the degree of inertia that has accumulated and partly thwarted knowledge progression; but alone, it is not the answer. A pragmatic approach towards research design also requires that researchers re-evaluate their own epistemological and theoretical predilections that inform the optimal way in which to acquire knowledge and disseminate evidence. This might translate into the use of unique and/or emerging methodologies, such as causal modelling and those found in the field of systems science.

8. Conclusion

In the past 45 years, only 1 published study¹⁹ has engaged distance runners in their community setting and sought their own perspectives on risk factors for injury. This approach originates with an intellectual tendency to view distance runners as participatory, rather than as objects of inquiry. Qualitative approaches will introduce new methods and themes to running injury research, thus recalibrating the focus of traditional forms of epidemiologic inquiry that have saturated the literature. Interpretive approaches can lead to discovery, helping to explain variation in outcomes through the refinement of reductionist models. This will further complement quantitative methodologies that should continue, where feasible, to develop in the form of randomised controlled trials and longitudinal designs. For distance running injury research to progress optimally, researchers are encouraged to adopt pragmatism in their “thinking” and designing stages. A pragmatic solution, however, does not solely mean a combination of quantitative and qualitative approaches. Rather, this philosophical orientation embraces innovative and novel ways to explore the multifactorial nature of distance running injury. Alternative approaches and methodologies including causal modelling and visual representations of injury aetiology, will aid in conceptualising its complex origins. This will require borrowing, adapting, and refining methods and analyses from other research disciplines, including the system science. Through embracing change and accepting these new directions, the science of running injury control and prevention will assuredly climb to new heights, enabling people around the globe to gain even more of the many health benefits associated with this form of exercise.

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Authors' contributions

AH led the development of the manuscript and initiated the idea. CFF contributed further ideas and had editorial input into the manuscript. Both authors read and approved the final manuscript and agree with the order that authors are presented.

Competing interests

Neither of the authors declare competing financial interests.

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