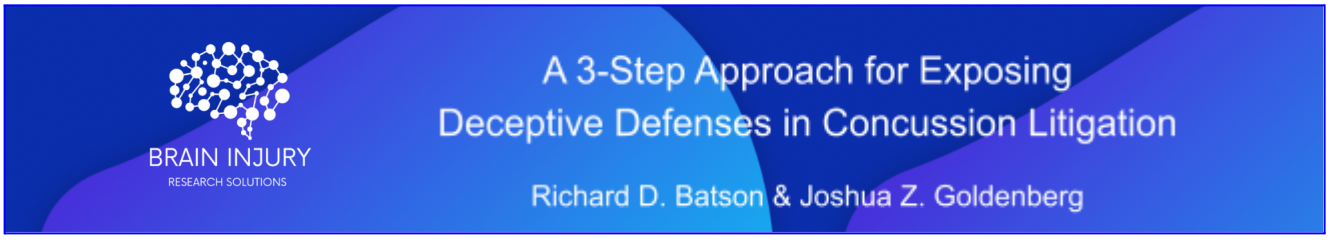

INTRODUCTION

In the setting of personal injury litigation, strong incentives exist to either call a diagnosis into question, or if agreed upon, to question its relationship to a personal injury event. We refer to this practice collectively as "Diagnosis and Causation Negation". In the context of mild traumatic brain injury (mTBI, concussion), defense experts frequently attempt to negate concussion claims by (1) calling into question the concussion diagnosis, (2) positing that even if a concussion occurred, most people recover, and therefore, (3) the subsequent outcomes in question (e.g. cognitive impairment, mood disturbance, visual dysfunction) must be caused by something else (e.g. somatoform disorder, "it's all in your head", secondary gain) and not directly related to the injury in question. Indeed, the 'most recover and therefore unrelated' argument is a common tactic utilized in personal injury litigation involving claims of persistent post-concussion symptoms and sequelae. We refer to this common tactic as the *"3-Step Negation of Concussion Claims"*.

This tactic is not only deceptive, but is also legally flawed and logically erroneous. In this paper we identify and describe the legal and logical errors inherent in this tactic while demonstrating that a systematic approach for determining causation can not only reveal these errors but also establish and defend causation through a structured and easily reproducible method. We present an example of the *3-Step Negation of Concussion Claims* from traumatic brain injury litigation in order to ground the discussion in a real-world scenario.

DISCUSSION

With the exception of forensic psychiatry, few if any medical specialties encourage formal forensic training in order to provide expert testimony. As a result, many expert witnesses fail to grasp and apply a structured approach to determining causation, and may therefore, knowingly or unknowingly, make errors in causation analysis.

In order to better understand these errors and to approach causation analysis in a systematic manner, we review a widely accepted model of causation, the *3-Step Causation Methodology.* This methodology was initially published in 2008, has been refined in peer reviewed publications over the last 14 years, has been widely used in personal injury litigation, and reinforced through case law (e.g. Freeman *et al.* 2008; Freeman *et al.* 2009; Koehler & Freeman, 2014, Meilia *et al.,* 2020, Meilia *et al.* 2021, Etherton v. Owners Insurance Co. 2016). When understood and diligently applied in personal injury claims involving mild traumatic brain injury, the *3-Step Causation Methodology* provides a powerful and necessary antidote to the *3-Step Negation of Concussion Claims.*

There is currently, as well as historically, an ongoing debate in the medical literature regarding the prevalence of persistent post-concussion symptoms and sequelae. It is beyond the scope of this paper to address this diverse body of literature detailing prevalence rates of persistent post-concussion symptoms and sequelae. In context of the *3-Step Negation of Concussion Claims,* it is common for defense experts to select medical literature which suggests that most recover from concussion. The attempt to curate a body of medical literature to support a particular position (i.e. cherry- picking[1]) is common in forensic practice. More importantly, however, the application of medical literature to a legal question may not violate central tenets of causation analysis. One such tenet is that medical literature broadly speaks to prognosis in the general population but is not specific to an individual and cannot be used exclusively to confer a prognosis in the absence of case-specific clinical information.

Furthermore, citing medical literature that suggests that most recover from concussion, is not synonymous with saying that 100% of individuals fully

[1] Choosing medical literature which supports a specific position or argument while ignoring literature that contradicts or disputes a chosen position or argument.

recover. Despite the fact that not all recover, it is common for experts to apply population data in absolute terms as illustrated below (names changed for anonymity):

"Based on the review of the medical records, data from first responders, and the ER data, the findings did not show any evidence that Mr. Doe experienced a traumatic brain injury (TBI). The emergency medical providers at St. John's Hospital did not diagnose Mr. Doe with traumatic brain injury/ concussion around the time of the incident".

"If one assumed that Mr. Doe actually experienced a TBI, based on his report of brief loss of consciousness and the available medical records, it would be most reasonably characterized as uncomplicated mild (umTBI)/concussion".

"Based on the existing research, individuals who experience an umTBI recover from neuropsychological deficits within 3 to 6 months post-injury".

In the above example the defense expert follows the *3-Step Negation of Concussion Claims* as previously outlined and characterized by (1) questioning the concussion diagnosis[2] (Diagnosis Negation), (2) positing that even if a concussion occurred, most people recover in 3-6 months ('Most Recover'), thereby setting him up to later argue that, (3) the subsequent outcomes in question must be caused by something other than the litigated injury (Causation Negation). We assume for purposes of this discussion that the expert meant *most* individuals recover and was not actually claiming that 100% of individuals recover in 3-6 months, a statement which is clearly unsupported by the medical literature.

By positing that the alleged low prevalence of a condition or impairment negates the condition or impairment which has been observed or diagnosed in the claimant's case, the expert errs by conflating general and specific causation. Conflation of general and specific causation can prejudice the trier of fact against the claimant by misapplying population data (general causation) to questions of specific causation.

Prior Odds Fallacy

The expert also makes a logical error in this case, referred to as the 'Prior Odds Fallacy.' Even if we assume that the odds of a specific claimant not recovering by six months is very low, it would only be appropriate to apply these odds to the claimant <u>at the time of the concussion</u> for

[2] In this case the patient was diagnosed with concussion within days of the injury (acute phase) by a qualified medical provider despite not being diagnosed with a concussion on the day of injury in the emergency department. A failure to diagnose concussion in the emergency department is common and has been reported by researchers to occur at a rate of 56% (Powell et al. 2008).

the purpose of providing a prognosis. It is therefore erroneous to apply these prior odds to a claimant who is experiencing persistent post-concussion symptoms in the chronic phase following a brain injury.

This logical error can be demonstrated through the following analogy we refer to as the "Green Marble Denial". To illustrate this logical fallacy, a bowl is filled with 100 marbles, 99 of which are blue, and 1 of which is green. A blindfolded participant is asked to randomly select a marble and she selects the green one. Her prior odds of selecting the green marble were therefore 1 in 100. She is now holding the green marble in hand, nevertheless a bystander attempts to convince the other observers that the marble cannot possibly be green because there was only a 1 in 100 chance of her picking the green marble .

Similarly, the defense expert has referenced prior odds of an outcome (i.e. persistent post-concussion symptoms and sequelae), to suggest that the outcome has not occurred despite empirical evidence to the contrary.

To avoid this error, a more appropriate way to explore causation is through the application of a structured approach to causation analysis. A number of structured approaches have been published in peer-reviewed medical literature beginning with the Hill Criteria in 1965 (Hill 1965). Other published causation approaches include Stephens *et al*. (1987), Miller et al. (2000), McLean *et al.* (2005), Freeman *et al.* (2008), Freeman *et al*. (2009), Koehler & Freeman (2014), Meilia *et al.* (2020) and Meilia *et al.* (2021). The latter five publications represent an introduction to, and refinement of, the *3-Step Causation Methodology,* a methodology whose genesis lies in the Hill Criteria, with influences from Miller and McLean (Hill,1965; Miller *et al.*, 2000; McLean *et al*., 2005).

Causation

Causation refers to the relationship between an exposure (event, injury, etc.) and an outcome (disease, condition, persistent sequelae of an event or injury). In order to determine causation three elements must be established according to the *3-Step Causation Methodology.* These factors and their relationship to general and specific causation include the following:

1. Plausibility (Biological, Epidemiological) [General Causation]

2. Temporality (Temporal Association) [Specific Causation]

3. Lack of a More Probable Alternative Explanation [Specific Causation]

In this methodology, population data is used to establish plausibility (general causation) not specific causation, which is established via temporality and lack of a more probable alternative explanation.

In discussing this methodology, forensic epidemiologist, Michael Freeman, notes:

"The first step addresses whether it is biologically plausible for the injury to have caused the condition (a.k.a. general causation). A finding of plausibility is unrelated to the frequency of the injury (prevalence), because even if the injury occurs in 1 in 100 or fewer cases of exposure to the event, it is still plausibly caused by the event. Plausibility is a relatively low hurdle to clear in causal analysis and is largely satisfied by the lack of evidence of implausibility of the relationship" (Freeman & Zeegers, 2016).

CONCLUSION

In conclusion, in the setting of personal injury litigation involving alleged mild traumatic brain injury, defense experts often apply the *3-Step Negation of Concussion Claims*. While commonplace, this argument makes two errors. The first is a legal error in which general causation is conflated with specific causation. The second is a logical error, also known as the *Prior Odds Fallacy*, in which the outcome is said to be unlikely or improbable because the prior odds of the outcome are low.

The misuse of statistical/ epidemiologic concepts in legal cases was brought to general public attention over 20 years ago in the 1999 R v. Sally Clark (Watkins 2000), highlighting key issues regarding the correct application of medical statistics by expert witnesses (Bacon 2003). Despite insights gleaned from this case, very little has changed over the last two decades.

Fortunately, over the past decade there have been significant strides made in the field of forensic epidemiology, including the development and standardization of evidence-based causation methodologies. The routine and judicious application of these methodologies in personal injury litigation shows promise for enhancing fair and just outcomes for claimants and families burdened by the long-term sequelae of traumatic brain injury.

In order to make best use of these developments, we are of the opinion that expert witnesses should be

required to demonstrate basic competency in causation analysis. Such education and basic competency requirements will help to prevent the tangible adverse effects on the lives of injured claimants arising from expert lack of competency in causation analysis.

To promptly bring about such meaningful and necessary change, under ER702, attorneys should make diligent efforts to ensure that experts apply a systematic approach to causation analysis. In cases in which experts fail to apply such an approach, attorneys should bring appropriate motions to exclude the expert's testimony because the testimony is more likely to confuse the trier of fact than to be helpful.

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