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Prevention versus Risk Reduction or Mitigation: Why create unnecessary battles?

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ABSTRACT

Recently, some in the sports medicine community have argued that injury "prevention" is an inappropriate term when efforts fall short and not all injuries are prevented. Some reviewers are now insisting authors replace the term prevention with risk reduction or risk mitigation. We illustrate that because prevention is a causal concept, banning its use would also require banning the word "cause". Using definitions that are consistent with the broader medical community is necessary for communicating scientific information.

EDITORIAL

Several authors in sports medicine (eg. ¹⁻⁵) argue that the term "prevention," as in "injury prevention" be abandoned or even prohibited because they believe it implies all events are stopped by the stated intervention. Since injuries occur even with the best injury prevention programs, these authors believe prevention is a misnomer. For example, one author wrote "[injury prevention] implies stopping a specific event from occurring and that's not likely what these [injury prevention] programs do", ³ and another wrote "prevention means no occurrence of injuries."⁵ Some have even suggested legal liability is increased if a parent is told their child is following an injury prevention program and yet the child becomes injured.¹ These authors suggest replacing prevention with risk reduction, mitigation, or risk management.^{3,5} Some reviewers now insist authors avoid the term prevention (personal experiences managing submitted articles and ²).

The interpretation of prevention used by the authors trying to stop its use is not consistent with the interpretation used by the rest of the scientific community (epidemiologists, clinicians, public health workers, etc). Further, it suggests prohibiting a word that is commonly used by the health community in communications with the general public (e.g., <https://www.cancer.nsw.gov.au/prevention-and-screening/preventing-cancer>; <https://www.heart.org/en/health-topics/heart-attack/life-after-a-heart-attack/lifestyle-changes-for-heart-attack-prevention>; <https://www.osha.gov/sites/default/files/OSHAwhite-paper-january2012sm.pdf>). We believe the sport research community should use definitions that are consistent with the broader medical community unless there are extremely strong reasons not to do so. This article explains the definition and use of "prevention" in epidemiology and medicine. As shown below, if interventions cannot "prevent" injury, then interventions (e.g., exercise) cannot prevent anything (e.g. cardiovascular disease and death).

Prevention is synonymous with risk reduction and/or risk mitigation

The authors wanting the word prevention to be abandoned argue that we should use the terms risk reduction and/or risk mitigation. However, definitions of prevention include the concepts of risk reduction and risk mitigation. We will use vaccines to prevent polio as a familiar pedagogical example that mimics many medical interventions. The same principles apply to the more complex injury context.

Consider a randomized trial for an oral live vaccine to prevent polio. The vaccine is less than 100% effective⁶ and the live vaccine also causes some cases of polio. In epidemiology, we categorize each participant in the study population into one of four theoretical groups before the study begins depending on their “potential outcomes”, i.e. whether they would get polio if they either received or did not receive the vaccine.⁷

1. No effect (Doomed): Participants with a compromised immune system who do not generate an effective immune response may contract polio with or without vaccine
2. No effect (Immune): Participants with an immune system that fights off the virus on its own will not contract polio with or without vaccine
3. Helpful effect (Preventive): Participants with an appropriate immune response will not contract polio with vaccine, but may contract polio without vaccine
4. Harmful effect (Causal): Participants with an immune system that is unable to fight off the small amount of live virus used will contract polio with vaccine, but may not contract polio without vaccine

We can see that “preventive” and “causal” both refer to the vaccine having an effect, i.e. causing a change in outcome. In epidemiology, we generally use the term preventive when the intervention results in removal of harm, and the term cause when the intervention results in harm or benefit. In other words, prevention and causation are similar; the only difference is how we code the treatment and outcome. “The intervention prevents death” is equivalent to “The intervention causes increased survival”. If we cannot use the word “prevention”, then we cannot use the word “causal”. Further, delaying the outcome (i.e., *preventing* the condition within a specified time interval) is *also* considered prevention. If some participants die at age 80 instead of age 50, most people would agree that mortality was prevented for 30 years.

The context of injury prevention programs is similar. In a randomized trial examining exercise as an injury prevention program, some participants would be categorized as Doomed (injured with or without the intervention), some Immune (not injured with or without the intervention), some Preventive (no injury with the intervention but injury without the

intervention), some Causal (injury with the exercise intervention but no injury without the exercise intervention). Although a little more complicated than the vaccine example, the guiding principles remain the same. The potential outcomes approach agrees with those who say we cannot prevent injury in every person. However, the same principle applies to risk as we do not reduce the risk in every person.

In clinical medicine and epidemiology, we cannot know if the vaccine was helpful or harmful (preventive/causal) for any individual participant (known as sharp causal effect) because each participant either receives the vaccine or not. Therefore, we generally use causal and preventive in the context of describing the *average causal effect* in the population. We consider that an intervention has a causal/preventive effect if it changes the outcome in at least *some* of the population. More generally, other accepted definitions of prevention (Table 1) are all consistent with the interpretation of preventing or delaying disease in at least some of the population.

Table 1. Some medical and epidemiological definitions of “prevention”

Source	Definitions
The Dictionary of Epidemiology ⁸	“[A]ctions that prevent disease occurrence. Actions aimed at eradicating, eliminating, or minimizing the impact of disease and disability, or if none of these is feasible, <i>retarding the progress of disease and disability.</i> ”
The National Cancer Institute ^a	“[A]ction taken to <i>decrease the chance</i> of getting a disease or condition.”
World Health Organization ⁹	“[A]pproaches and activities aimed at <i>reducing the likelihood</i> that a disease or disorder will affect an individual, interrupting or <i>slowing the progress</i> of the disorder or reducing disability”.
World Health Organization ⁹	“Primary prevention reduces the likelihood of the development of a disease or disorder. Secondary prevention interrupts, prevents or minimizes the progress of a disease or disorder at an early stage. Tertiary prevention focuses on halting the progression of damage already done.”

Emphases added by the authors to highlight key terms;

a, <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/prevention>;

The claim that using prevention instead of risk reduction puts someone at increased risk of legal liability suggests a misunderstanding of accepted definitions. Again, both are based on population averages. We agree that health care professionals must use their words within context when communicating with patients. We discourage using phrases that are likely to be interpreted as the treatment being 100% effective for a specific individual, such as: “My treatment will prevent you from getting cancer”. However, this is very different from the use of the term prevention in the sport medicine literature, which is based on population averages.

Finally, this issue reflects the much broader challenge of how to communicate uncertainty to patients in general, and is not restricted to a preference for the term risk reduction versus prevention.

Some argue risk mitigation is the optimal term. Risk mitigation in epidemiology⁸ and other fields^{9, 10} includes “Actions taken to avoid or minimize negative environmental, medical, or social impacts”.⁸ This is essentially a combination of primary prevention (“...reduce the incidence of disease by personal and communal efforts...”) and tertiary prevention (... softening the impact of long-term disease and disability by eliminating or reducing impairment, disability, and handicap; minimizing suffering; and maximizing potential years or useful life....”).⁸ This confirms that risk mitigation is synonymous with a combination of other more specific definitions of prevention.

Although risk reduction offers no conceptual benefit over the use of the term prevention, some may still argue that risk reduction is more precise. However, it is not. Both “reduce” and “prevent” are imprecise without further specification. Assume each person in a study can only be injured once. If someone says there was a 10% reduction in risk, we will not know if they are referring to a risk ratio (relative risk), relative risk reduction (1-relative risk) or absolute risk reduction (risk difference). Similarly, one can prevent a certain percentage of injuries (relative risk or relative risk reduction) or a certain number of injuries per player (absolute risk reduction). “Prevention” also needs to be qualified because primary, secondary and tertiary prevention all have different meanings.⁸ Further, prevention and “risk reduction” are not only whether an injury occurs, but as above, also refer to delaying the occurrence or progression of a disease. Risk reduction is not any more or less precise than prevention; both require qualifiers for proper interpretation.

In conclusion, using definitions that are consistent with the broader medical community is helpful for communicating scientific information. Prevention is a causal concept and the arguments against its use would also mean that we cannot say anything is a cause of injury. Risk reduction and risk mitigation are synonymous with different forms of prevention. We see no reason to abandon the use of the term prevention which is both conceptually correct and commonly used in knowledge translation to the general public.

Contributions

Contributed to conception and design: IS, FMI, SDS

Drafted and/or revised the article: IS, FMI, SDS

Approved the submitted version for publication IS, FMI, SDS

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