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The rising role of advanced heart rate monitoring technology in athletic cardiac safety

To the Editor

This letter to the editor of the *Medical Research Journal* highlights the growing importance of heart rate monitors (HRMs) in detecting cardiac arrhythmias in athletes. It reviews research on the clinical reliability of HRMs and the challenge of distinguishing true arrhythmias from artifacts. We emphasize technological advancements in HRMs and note their usefulness in identifying arrhythmias that may be undetectable in clinical settings. We call for HRMs that are accurate, user-friendly, and suitable for endurance sports, emphasizing their critical role in ensuring athletes' cardiac safety during training and competition.

In the realm of athletic training, the utilization of digital heart rate monitors (HRMs) is prevalent across a spectrum of sports disciplines, appealing to both amateur and professional athletes [1]. Such devices are not only valuable for training optimization, but also for monitoring physical activity among individuals pursuing healthy lifestyles and patients adhering to prescribed exercise regimens [2–4]. In this letter to the editors of *Medical Research Journal*, we wish to point out the insights of this trend in research.

We have carried out a series of studies over the years, directed at understanding how sports HRMs can assist in detecting cardiac arrhythmias, especially in endurance athletes [5]. Initially, our research faced challenges due to the perception that HRMs, being non-medical devices, might not provide clinically reliable data. However, our findings, which were eventually published in the *Scandinavian Journal of Medicine*

& *Science in Sports*, have contributed to an ever-broadening acceptance of HRMs as useful tools in identifying both brady- and tachyarrhythmias [6].

One of the main challenges in this area was — and of course, remains — HRMs' tendency to confuse actual cardiac arrhythmias with similar readings caused by artifacts [1]. To address this, we have worked on methods to better interpret HRM data, considering clinical symptoms that accompany arrhythmic readings [1]. Despite these advancements, some top-level athletes remain reluctant to use HRMs during competitions, concerned about the potential for false alarms [7, 8] and uncertain whether the benefits outweigh the psychological and/or physical burdens involved. Our research has nevertheless shown that in certain cases — such as a marathon runner who was misdiagnosed due to the non-reproducibility of arrhythmia in clinical settings [9] — HRMs worn regularly during exercise and athletic competitions can at least sometimes be the only means of detecting such conditions.

The market offers a broad range of sports HRMs based on photoplethysmography (PPG) or electrocardiogram (ECG) technologies [1]. While PPG-based HRMs are good at tracking heart rate changes, they cannot identify the type of arrhythmias. ECG-based HRMs, on the other hand, have a similar limitation unless they include full ECG recording capabilities [10]. Recent developments like the Frontier X2, which allows for continuous ECG monitoring, represent significant advancements, though challenges remain in ensuring high-quality recordings during intense exercise [10].

In this letter, we wish to call attention to the evolving role of HRMs in ensuring the safety of athletes.

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As detailed in a recent expert panel discussion published in *Sports Medicine*, the ideal sports HRM should offer continuous ECG recording, be resistant to artifacts, user-friendly, and specifically designed for endurance sports [10]. These developments are anticipated to lead to HRMs that not only assist in training but also in monitoring athletes' cardiac health (mainly recording and recognizing exercise-provoked arrhythmias) more reliably. We wish to highlight the need for dependable data from these devices, as this is crucial for medical professionals and athletes alike in making informed decisions about "cardiac safety" during training and competition.

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