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Check off the bucket list: the rise in running after the covid pandemic and the physiological & public health benefits to training and running a marathon

Abstract

Objectives: The purpose of the present review study is to assess the existing literature regarding the physiological and public health adaptations made in the surge in marathon runners, as a result of the COVID-19 pandemic. Furthermore, it is well documented the growth in running, post pandemic has benefited many countries financially and socially. However, a deeper look into the physiology and from a public health perspective, has not been recently discussed. The present paper outlines three specific empirically based physiological factors to training and running a marathon that many may not clearly understand.

Search methods: A search was conducted on the wide-body of research that exists in and around the physiology mechanisms related to distance and endurance running. The data presented aligns the research in a clear manner, specifically describing the potential physiological response implementing a training program for running a marathon. Literature gathered involved trails of comparative analysis with control groups in various exercise settings.

Main results: In an attempt to clarify the physiological adaptations many new runners experience as a result of newly training for a marathon, the conclusion of this review outlines 3 empirically supported factors suggesting the continued growth of marathon running. Specifically, the present paper displays how training and running a marathon will have public health outcomes enhancing oxygen utilization, bettering body composition and improving resting heart rate.

Keywords: marathon, running, oxygen uptake, body composition, resting heart rate, cardiovascular

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Abbreviations: RMR, resting metabolic rate, EPOC, post exercise recovery period.

Introduction

As a result of the COVID-19 pandemic, nearly 25% of gyms across the United States reportedly closed prematurely. Moreover, those that remained open were required to abide by strict guidelines, driving business traffic downward.[1] Many Americans, deprived of social and physical activities, began venturing outside to run as a means of maintaining their health and a productive lifestyle. As a result of these semi-forced lifestyle changes, there was a boom in what was once considered a mere "bucket list" item—running a marathon.

The recent trends in marathon and running data across the world is exponentially growing. In a recent report by Statista, published in 2022, more than 50 million Americans (15% of the population) cite they participate in the form of running or jogging. Across the globe, running data has been growing at rapid rates. The exercise tracker Strava, reported in 2022 that runners who use their app for marathon tracking had doubled from the previous year. In the Netherlands, the rate had tripled. Similarly, many individuals with a runner-focused social media presence have gained thousands of new followers (Fast Company, 2023). According to an article titled How the Pandemic Hooked a New Generation of Runners, the COVID-19 pandemic played a significant role in this surge (Fast Company, 2023).

The marathon trends have also made a substantial financial impact. The economic power of this "marathon boom" has generated a significant financial shift. A recent study conducted by the University of Illinois Urbana-Champaign found that the Chicago Marathon contributed a record $386 million to Chicago's economy—a 25% increase from 2021 (Sports Destinations, 2023). While the COVID-19 pandemic has undoubtedly changed the world in multiple ways, one notable effect has been an increase in the number of people taking up running.

While many across the world understand the general benefits for running, such as weight loss and increased mental health. There are far deeper physiological effects that have a much greater magnitude on the public health of our globe. The following manuscript is poised to outline those physiological aspects to the boom of running as many seek to check it off their "Bucket List." However, from a public health perspective, many clinicians hope they don't stop running.

Material and methods

Increased oxygen utilization

There are a multitude of physiological benefits to training for and running a marathon. One key aspect is its impact on muscular function and the body's ability to utilize and transport oxygen (VO_2 max). An improved VO_2 max enhances oxygen utilization, reducing fatigue during endurance exercise. This is of heightened interest for individuals with cardiovascular disease, who typically have lower exercise capacity compared to healthy counterparts. By increasing VO_2 max and oxygen utilization, marathon training can enhance fatigue resistance. Additionally, oxygen transport may improve

through blood vessel dilation, stimulated by hormonal activity during exercise. These effects, combined with enhanced vascular wall function and a greater ability to deliver oxygen to skeletal muscles, have significant public health implications.[2]

Body composition

The influence of marathon training is hypothesized to positively affect body composition and reduce body fat, which directly affects the field of public health and well-being. Implications of this effect would potentially be twofold: 1) impact on resting metabolic rate (RMR) and 2) the physiological impact submaximal endurance training places on the body, tissues, and substrate utilization. Weight loss resulting in improved body composition, produced by an increase in endurance training with an unchanging energy intake, is of obvious importance. Also, lack of weight loss with improved body composition can result in favorable health changes. Equally important is weight loss associated with lean tissue retention and RMR. Oftentimes, weight and fat loss following chronic endurance training is a result of a negative energy balance.[3] However, subsequent mechanisms may positively impact RMR contributing to improved body composition. The most noticeable association between marathon training and RMR is the potential for skeletal muscle growth. Additionally, increases in RMR after marathon training during the post exercise recovery period (EPOC) may also be present. Furthermore, mechanisms such as increased protein turnover, sympathetic nervous system activity, and uncoupled respiration have been theorized (but not conclusively shown) to increase RMR.[3] Nevertheless, chronic endurance training appears to be a factor in increasing RMR and improving body composition, which have significant implications to the field of public health.[3]

Marathon training at low to moderate intensity levels (<50% of VO_2max) relies on fats as the predominant substrate. As intensity rises (>50% of VO2max), there is a progressive decrease in fat oxidation giving way to carbohydrate oxidation. As oxygen supplied by the heart and lungs to the contracting skeletal muscles are unable to meet the demand of the growing intensity, glucose is forced to become the primary fuel.[3] Regardless of the reciprocal decrease in fat oxidation for increases in glucose breakdown, the absolute quantity of fat oxidation may increase as the total amount of work at greater intensity exercise increases. Therefore, fat utilization may be maximized at high intensities. Thus the primary goal of improving body composition from a public health standpoint may be to encourage higher intensity endurance training. However, individuals with low or diverse aerobic fitness (i.e., low VO_2 max values) and poor body composition (high body fat values) may not be capable of high intensity endurance training thereby limiting the effect.[3]

Resting heart rate

Finally, potential outcomes related to resting heart rate (RHR) values may be valuable for general health. A lower RHR is a well-documented effect of chronic endurance training, with reductions of approximately 10 beats per minute observed after as little as 10 weeks of training.[4] However, the exact physiological mechanisms remain unclear. The most likely explanation for decreased RHR is an increase in plasma volume, which enhances venous return to the heart and increases stroke volume.[4]

More relevant to public health is the role of RHR as a predictive factor for cardiovascular disease and all-cause mortality. Clinical trials on heart rate-lowering drugs suggest that reducing RHR benefits patients with chronic heart failure, acute myocardial infarction, and angina.[5] Additionally, pathophysiological data indicate that a high RHR may directly contribute to adverse effects such as coronary atherosclerosis, myocardial ischemia, ventricular arrhythmias, and impaired left ventricular function. Furthermore, research suggests an increased risk of disease when RHR exceeds 60 beats per minute.[5]

Overall, the relationship between cardiovascular training and RHR is of particular significance to public health and wellness.

Conclusion

The rise in marathons and the overall growth of the sport as a result of the COVID-19 pandemic is a helpful driver for improved health across the globe. Not only are individuals participating in added chronic cardiovascular activities, the economy is boosted, mental health can be combated and people gained a sense of belonging and community (Kupacova et al.,2023). Furthermore, the field of Public Health may be impacted for the better by some deeper physiological adaptations as a result of the "Bucket List" boom. It was discussed how chronic marathon training provided a fuller magnitude of physiological aspects. Those include a greater capacity for the delivery of oxygen, lowering the stress on the cardiovascular system. Two, improved body composition impacting resting metabolic rate and substrate utilization. And finally, a drop in resting heart rate, improving overall health and cardiovascular function.

The rise in marathon participation and the overall growth of the sport, particularly following the COVID-19 pandemic, has contributed to improved global health outcomes. Beyond encouraging individuals to engage in sustained cardiovascular exercise, marathon running also stimulates economic growth, supports mental well-being, and fosters a sense of belonging and community (Kupacova et al., 2023). Additionally, the field of public health may benefit from deeper physiological adaptations driven by the recent "Bucket List" boom in marathon participation. Chronic marathon training has been associated with significant physiological benefits, including an enhanced capacity for oxygen delivery, reduced cardiovascular strain, improved body composition influencing resting metabolic rate and substrate utilization, and a lower resting heart rate—collectively promoting better overall health and cardiovascular function. However, while these physiological implications are favorable, limitations may be in need of consideration. Many reviewed studies referenced above, focus on short-term adaptations, leaving gaps in understanding the long-term cardiovascular benefits and or the potential risks of marathon running. Additionally, demographic variations in participation—such as differences in age, gender, socioeconomic status, and access to training resources—remain underexplored, potentially influencing the outcomes of the present literature. Further research is needed to assess the sustainability of these health benefits over time, identify potential adverse effects related to overtraining or injury risk, and explore strategies to investigate further the implication of marathon running and long term mental health.[6-8]

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Conflicts of interest

The authors declare no conflicts of interest

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