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Letter

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Letter: Heart Rate Responses at Rest, during Exercise and after Exercise Periods in Relation to Adiposity Levels among Young Nigerian Adults (J Obes Metab Syndr 2023;32:87–97)

Sang Yeoup Lee[1,2,3,*]

[1]Integrated Research Institute for Natural Ingredients and Functional Foods, [2]Department of Family Medicine and Biomedical Research Institute, Pusan National University Yangsan Hospital, Yangsan; [3]Department of Medical Education, Pusan National University School of Medicine, Yangsan, Korea

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*Corresponding author
Sang Yeoup Lee

https://orcid.org/0000-0002-3585-9910

Department of Family Medicine, Pusan National University Yangsan Hospital, 20 Geumo-ro, Mulgeum-eup, Yangsan 50612, Korea
Tel: +82-51-510-8024
Fax: +82-51-510-8125
E-mail: saylee@pnu.edu

The study by Rajalakshmi et al.[1] published in the *Nigerian Journal of Physiological Sciences* in 2013 provided a thorough investigation into the cardiovascular states of young Nigerian adults. In particular, it reported on the rate-pressure product (RPP) response relative to the presence or absence of overweight/obesity in 85 young adults. The participants were divided into normal, overweight, and obese groups. They undertook controlled treadmill exercise for 5 minutes at a moderate intensity level of four metabolic equivalent tasks, followed by a 5-minute rest period without a cool-down exercise. Heart rate (HR) and blood pressure measurements were recorded before, during, and 5 minutes after exercise. These values were utilized to calculate the RPP, an important indirect indicator of myocardial oxygen consumption. Impressively, precisely 10 years later, the subsequent research conducted by this team further advanced our understanding, providing beneficial information to clinicians caring for obese patients through a remarkably creative and sophisticated study design.[2]

However, several observations can be made about the study that clarify its context within the field. Firstly, the author's choice to title the study 'Relationship with adiposity levels' rather than 'Relationship with overweight/obesity' seems to present a point of contention. While body mass index (BMI) is correlated with body fat and continues to be utilized in large-scale studies, more direct measures of body fat, such as underwater weighing or dual-energy X-ray absorptiometry (DEX), are requisite for more accurate results. Additionally, interpreting the BMI requires caution, as it can introduce disparities. Even with an equivalent BMI, younger adults tend to have less body fat than older adults. Moreover, women generally have more body fat than men with an equivalent BMI. Muscular individuals or those who regularly engage in strength training may also present higher BMI due to increased muscle mass rather than body fat.

Secondly, the definition of impaired heart rate recovery (HRR) can vary, particularly concerning whether a cool-down period is included following exercise. In the study conducted by Cole et al.,[3] cited by the authors, peak workload was achieved through treadmill exercise, followed by a 2-minute cool-down period. During this time, exercise intensity was gradually reduced at a 2.4 km/hr speed with a 2.5% incline. Impaired HRR was defined as a 1-minute post-exercise HR reduction (HRR1) < 12 beats per minute (bpm). However, although the authors stated that study participants engaged in active, loadless pedaling while seated on a standard ergometer during a 5-minute recovery period post-reaching steady-state HR, more information must be provided regarding the bpm of active pedaling. This information critical, since, if the intensity is less than that during Cole et al.'s cool-down period,[3] the threshold for HRR1 should be higher; if the intensity is greater, then the HRR1 threshold should be lower. Watanabe et al.[4] defined a different threshold for HRR as normal, adopting a HRR1 ≥18 bpm based on a HRR1 without a cool-down period. The prevalence of impaired HRR in a specific population may be exaggerated or overlooked depending on the HRR1 threshold, highlighting a need to establish a standardized evaluation protocol for the entire research community. Furthermore, the cutoff point of 12 bpm for abnormal HRR1, indicating impaired HRR, was based on a cohort study that tracked patients visiting a single United States hospital over 6 years in the early 1990s. In particular, Cole et al.[3] reported an average participant age of 57 years, with a 63% male demographic, while the authors' study featured an average age in the early 20s, consisting of 38% men,[2] thus involving notably different target groups. This discrepancy raises questions about the universal applicability of a 12-bpm threshold as abnormal HRR1 for impaired HRR, suggesting the need for standardized age-dependent thresholds. Moreover, Jouven et al.[5] prospectively tracked approximately 6,000 working French men in their 40s for an average of 23 years, investigating sudden deaths from all causes, including myocardial infarction. The study found that when the HRR1 was less than 25 bpm upon ceasing exercise without a cool-down period, the relative risk of sudden death increased by 2.2 times. Hence, they proposed 25 bpm as a new cut-off point for HRR1. Considering that the criteria and classifications for obesity can differ between Asians and Westerners or among different races, it is imperative to determine whether HRR1 can be uniformly applied across all regions, races, age groups, and genders, or if such distinctions should be made.

Another important consideration is that subsequent research on this topic has been conducted more directly through various measurement methods. Although this study did not evaluate cardiorespiratory fitness (CRF), Sydó et al.[6] assessed CRF as functional aerobic capacity, calculated as actual exercise duration/predicted exercise time ×100. Possibly due to disparate measurement methods, studies have occasionally yielded apparently conflicting results. For example, Thomas et al.,[7] focusing on sedentary young adults with an average BMI of 25.3 kg/m^2 and an average age of 25.2 years, found no correlation between peak oxygen uptake, measured during maximal graded exercise testing, and HRR1. HRR1 was only associated with the fat-free mass measured by DEX. To determine whether these disparities stem from differences in research methods, it seems imperative for researchers to conduct cross-verifications using each other's methodologies. Such an undertaking would also help to define the optimal HRR1 threshold for future research.

The most compelling results from this study are as follows: A retrospective analysis using the Mayo Clinic database, involving 2,664 men and women aged 30 to 39, revealed that the prevalence of impaired HRR was 12.8%.[6] In contrast, this study reported a significantly higher prevalence of impaired HRR of 56.3%, which is 4.4 times higher. The authors labeled this as an 'interesting' finding. Does this imply that in this country's studied population, overweight/obese young adults are more frequently associated with poor CRF or greater cardiovascular risk than their counterparts of similar age and weight status in other countries? Furthermore, do overweight/obese adults in this country exhibit a higher prevalence of cardiovascular disease than those in other countries or ethnic groups? Lastly, in the initial section of the discussion section, the authors stated that the resting HR of the overweight/obese group was lower than that of the healthy-weight group. However, Table 1 of this study indicates the opposite.[2] There appears to be some confusion.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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