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Original Article

The impact of acute and chronic aerobic and resistance exercise on stem cell mobilization: A review of effects in healthy and diseased individuals across different age groups

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Abstract

Stem cells (SCs) play a crucial role in tissue repair, regeneration, and maintaining physiological homeostasis. Exercise mobilizes and enhances the function of SCs. This review examines the effects of acute and chronic aerobic and resistance exercise on the population of SCs in healthy and diseased individuals across different age groups. Both acute intense exercise and moderate regular training increase circulating precursor cells $CD34^+$ and, in particular, the subset of angiogenic progenitor cells (APCs) CD34+/KDR+. Conversely, chronic exercise training has conflicting effects on circulating $CD34^+$ cells and their function, which are likely influenced by exercise dosage, the health status of the participants, and the methodologies employed. While acute activity promotes transient mobilization, regular exercise often leads to an increased number of progenitors and more sustainable functionality. Short interventions lasting 10â€“21 days mobilize CD34+/KDRÂ +Â APCs in sedentary elderly individuals, indicating the inherent capacity of the body to rapidly activate tissue-reparative SCs during activity. However, further investigation is needed to determine the optimal exercise regimens for enhancing SC mobilization, elucidating the underlying mechanisms, and establishing functional benefits for health and disease prevention. Current evidence supports the integration of intense exercise with chronic training in exercise protocols aimed at activating the inherent regenerative potential through SC mobilization. The physical activity promotes endogenous repair processes, and research on exercise protocols that effectively mobilize SCs can provide innovative guidelines designed for lifelong tissue regeneration. An artificial neural network (ANN) was developed to estimate the effects of modifying elderly individuals and implementing chronic resistance exercise on stem cell mobilization and its impact on individuals and exercise. The network's predictions were validated using linear regression and found to be acceptable compared to experimental results.