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Opinion

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Defining Different Types of Interval Training: Do we need to use more specific terminology?

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Interval training began gaining popularity in modern society throughout the mid 1900's when track and field athletes started to incorporate them regularly into training programs. Soon after, Christensen, et al. published a study with a sample size of two concluding that "Research on intermittent work may open up a new field in work physiology"[1] and in 1968 *The Science of Swimming* written by James Counsilman strongly advocated the use of sprints in training to optimize performance.[2] This new found interest had peaked the curiosity of exercise physiologists and as a result a number of studies in the 1970's utilized higher intensity intervals as training protocols. The consensus was that training intensity was a powerful tool to induce significant positive adaptations.[3-6]

Traditionally high-intensity interval training has been generalized as repeated bouts of exercise 20 sec or longer in duration at an intensity above anaerobic threshold,[7] but more specific definitions have been used.[8-10] For example, high-intensity interval training (HIIT) can be considered an exercise at an intensity between our anaerobic threshold and maximal aerobic capacity (~80-100% of VO_2 max). However, sprint or supramaximal-intensity interval training (SIT) can be defined as an exercise >150% VO_2 max power. A comparison of HIIT and SIT reveals distinct differences between the exercises and using specific terminology for different types of interval training can increase clarity among researchers and the general public.

A review on *Pubmed.gov* of the 20 most recent articles to include HIIT in the title have utilized protocols of varying exercise intensities (~80-250% VO_2 max power) and duration (20-240 sec).[11] Compounding the lack of clarity, the loose definition of HIIT can be commonly found in popular magazines that share training tips from published research. The conundrum is that two different types of training are being defined as the same.

HIIT programs that have resulted in positive adaptations utilized protocols that included 8-12 intervals that were 1-4 min in duration, while beneficial SIT protocols have typically included 4-10 intervals lasting 20-30 sec in duration.[7] Acute responses to these protocols differ and each requires varying levels of aerobic and anaerobic contributions to energy production to complete the exercise. As a result, it is likely that unique levels of physiological stress result in some unique adaptations.

In general, similar chronic adaptations can be observed between HIIT and SIT programs lasting six weeks or greater. Both can improve aerobic, endurance and sprint capacity as well as markers of muscle metabolism and cardiovascular health in individuals of average fitness.[7,12] However, training protocols that only last 2-3 weeks in duration have yielded different results. Following two weeks of training both HIIT and SIT appear to improve endurance capacity and markers of metabolism, but only HIIT has been observed to improve aerobic capacity.[8] In addition, an investigation by Stepto, et al. observed trends that improvements in endurance and sprint capacity were greater with three weeks of HIIT (n=4) compared to SIT

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(n=4).[13]

Improvements in aerobic and endurance capacity following two weeks of HIIT suggest that it may be better suited for improving cardiorespiratory fitness over a short period of time. This would fit the theory of "training specificity" since HIIT requires a significantly greater aerobic contribution compared to SIT.[12,14] This same theory would suggest that SIT would be better at improving sprint ability compared to HIIT, but interestingly Stepto, et al. did not observe this trend. It is likely that their sample size was small and further research is warranted.[13]

In addition to different physiological responses following HIIT and SIT, the time commitment differs between the two programs. The average total exercise session (intervals and recovery between bouts) for HIIT last about 60 min and for SIT about 30 min. This can be a defining factor when deciding on the appropriate type of training. One could argue that SIT can be easier to complete because of the shorter training session, though the effort required to complete each interval may be greater.

An eloquent review of intense exercise training by Coyle concluded that "SIT performed all-out and repeatedly requires a high level of motivation, and it causes a feeling of severe fatigue lasting for at least 10-20 min. That is the 'price' for its effectiveness and remarkable time efficiency."[15] Through personal anecdotal experience completing both HIIT and SIT training protocols, I concluded that both are taxing and requires a great deal of perceived and actual effort, however the perceived exertion during HIIT was less than SIT. The trade-off is that the intervals are longer for HIIT (~1-4 min) compared to SIT (~20-30 sec).

When determining the optimal training program we must consider a number of factors including: the goals of the program; the time required to complete training sessions; the effort of completing the training; and the health and fitness of the participant in relation to their ability and willingness to complete the exercise. Because there are distinct differences between HIIT and SIT, one protocol may be more appropriate than the other.

For practitioners to avoid confusion between these two unique training programs, we should use specific terminology to distinguish each type of training. These two logical terms would be HIIT and SIT; HIIT include intervals above anaerobic threshold up to VO_2 max and last 1-4 min in duration and SIT include intervals above 150% VO_2 max power and last 20-30 sec in duration. By offering a clear distinction between these two unique training protocols, we can ensure that athletes receive the specific workout that best fits their needs.

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