

SWIMMING SCIENCE BULLETIN

Number 45e

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UNDERSTANDING A USRPT SET

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September 1, 2013

As with any new innovation in physical/mental training formats, considerable experimentation occurs. Such adventures have the potential to stray beyond the boundaries of producing race-relevant training effects. This short commentary covers an example of a USRPT item that was used by one of the original USRPT programmers in a highly-successful swimming environment.

One set used in training was:

20 x 50 m on 50 seconds holding race-pace 200 m crawl stroke

It was assumed that for the training group, the average pace for 50 m was 30 seconds leaving 20 seconds per repetition for recovery/rest. The following are some thoughts and recollections that come to mind when considering this as a training set.

The "set" appears to be five repetitions of a consistently broken 200 m-swim (i.e., broken at 50 m). The only new added feature is the stipulation of the pace to be held for each segment of the swim as opposed to going all-out and varying the interval completion times. Several questions need to be asked about the value of such swimming for improving race performances. Some are:

1. Does the set conform to the principles of training that produce performance improvements? Those principles are Specificity, Overload, and Recovery.
2. Does the set provide an opportunity for new experiences on any day to influence future performances?

While other considerations are possible, this discussion will focus on the principles associated with these questions and the potential for future improvements.

Specificity and Two Aspects of Overload

In the middle of the last century, considerable Scandinavian and European research focused on interval training of various forms including ultra-short training. Research that showed single exposures to race simulations or broken-race formats did not produce any substantial physical training effect. To gain benefits from training, one has to overload the athlete a number of times to produce sufficient exposures to a specific-performance stress to improve that specific performance. Producing non-specific overload has little to do with specific performance improvements. This latter feature was hypothesized as being one reason swimming coaches were so bad at predicting the standard of performance that a swimmer might produce in a competitive setting.

Across a number of sports (e.g., cycling, rowing, and track and field), practitioners honed in on the upper boundary of the volume of race-quality training being 300-500% of the intended race

distance. It was realized by many coaches and scientists at the time that performing race efforts over race distances at training was not an effective stimulus for performance improvements. Somewhere in the literature of pre-1960, there are a few studies that show no physiological improvements are gained from one or a few race-simulations at practice. Interval training was the format for achieving a significant volume of work at race-pace quality/intensity that would result in stimulation for specific physiological adaptation. In testing that concept, total volumes exceeding the race distance were needed (Rushall, 1960, 1967; Stegemann, 1981). Practitioners eventually adopted a 300-500% overload volume, a volume that is still relevant to this day. Unfortunately, many swimming coaches adopted the dogma that variety in training was preferable to repetitive overloads. A few repetitions (e.g., 4 x 75 on 1:15) are useless because the first few repetitions are normally inconsistent as the body adjusts to the exercise onset and stabilizes its response during the early repetitions (four?). Even when a swimmer becomes very good at achieving a race pace, the early repetitions are usually physiologically variable. Consequently, if only a small number of repetitions in a set is programmed, it will not allow consistent stimulation to be developed, which is required to produce a training effect.

Thus, when formulating race-pace sets, the total volume swum should be at a minimum three times race-distance with a suggestion to favor five to ten times the event distance¹. The set considered here does fulfill the necessary volume of repetitions criterion.

A second aspect of overload that warrants consideration is the degree of fatigue that is experienced by the swimmer.

- In the traditional format of training, where every repetition is completed irrespective of the degree of fatigue in the athlete, often the fatigue is excessive. The performance level displayed and the levels of glycogen depletion and lactic acid accumulation are of such a magnitude that performance is non-specific (below desired race-pace) and no learning of techniques (neuromuscular patterning) can occur. Consistent exposure to levels of stress with those characteristics leads to overtraining.
- In the USRPT format, when a repetition is slower than the desired race-pace, the swimmer misses the next repetition and enjoys more recovery than is possible in the usual 20-second rest period. When sufficient fatigue has occurred to thwart the desired level of performance, that level of performance disruption is known as a "training effect" (Rushall & Pyke, 1991). In the practical implementation of USRPT, a swimmer is allowed to fail two more times after extra recovery is allowed before the set is abandoned. Those extra efforts with more rest are employed to make sure that a true training effect has been achieved as opposed to chance or unusual events that could be responsible for missing the target race-pace time of one repetition.

Employing the USRPT criterion for and response to race-pace failures ensures that training effects occur and that the swimmer does not incur excessive detrimental fatigue. Doing that deems USRPT to be self-regulatory against the development of excessive fatigue. A USRPT swimmer derives the maximum benefits of the training set and avoids the destructive effects of the exhausting volume-completion orientation of traditional training. USRPT swimmers should

¹ When 10 times race-distance is programmed it is hypothesized that the volume covered serves to prepare swimmers for longer distance races. Thus, training at 200-m race-pace and completing 1400 m is a good preparation for racing 400 m although the training stimulus was not exactly specific. An improvement in 400-m performance is likely although it might not be maximal.

not suffer long-term exhaustion because they are prevented from incurring glycogen depletion and prolonged excessive lactic acidosis.

Recovery

The amount of rest time between each ultra-short rest interval needs to be of a duration that is neither too short nor too long. The nature of rest intervals has been studied.

Beidaris, Botonis, and Platanou (2010) illustrated the complexities of training responses when intervals and rest periods vary. Interval (4 x 50 m) sets with different rest periods (5, 10, and 20 seconds) were compared to the physiological responses obtained from a maximal 200 m swimming effort. It was found that with the very short rest intervals and in the continuous swim, the physiological parameters (including oxygen consumption and blood lactate concentration) changed as the task progressed. However, when a 20-second rest interval was provided, the parameters did not change and *were of higher intensity and greater performance than in any of other experimental conditions*. Thus, interval training with a 20-second rest allowed the quality of the training response to exceed that of the other swimming options. When the number of repetitions is increased over the four used in that study, the potential is there to develop a swimmer's capacity to perform efficiently for a longer period in a 200 m race, something not provided by other training formats, which primarily have longer rest intervals. For want of any better implication, this study showed that when repeating 50 meters in a set at 200 m race-pace (i.e., maximum effort for that race distance), for the most relevant training effects to occur, the rest interval should be ~20 seconds. This is an example of how judicious the determination of beneficial training has to be in order to provide the most productive experiences for swimmers in training.²

Thus, the rest interval needs to be in the vicinity of 20 seconds for the correct energizing capacity to remain constant and therefore, stimulated within the training set. A "broken set" format, often claimed to be race-pace training/work does not fulfill this criterion.

Recovery Psychology

In the period between repetitions in an interval set, certain activities have to happen for the repetition to contribute to a training effect. When rest intervals are very short, such as five seconds as often used in broken swims, meaningful psychological and neuromuscular learning does not occur. It is possible to repeat exercise exposures too rapidly (Magill & Lee, 1984). A rest interval has to allow the athlete to reflect/analyze the repetition just completed, to employ internal or external feedback, and to develop a plan for a modified response in the next repetition. The amount of cognitive awareness in the rest period varies greatly within and between individuals. Time for the brain to encode the significant aspects of the repetition has to be provided. It is believed that a 20-second rest in interval training in swimming would allow these mental activities to occur for interval repetitions of 50, 75, and 100 m. The "broken set" format with rest intervals of <20 seconds considered in the Beidaris, Botonis, and Platanou (2010) study does not fulfill this criterion.

Summary

Good intentions and adventurous planning of training activities are to be encouraged. Occasionally, the inventiveness of a coach when planning training components strays beyond the boundaries of effective stimulation of training effects that directly contribute to competitive

² This writer recommends 15-second rest intervals when the work distance is 25 m and 20 seconds for all other interval training distances between 50 and 100 m.

performance improvements. A traditional "broken set" format does not fulfill research-justified boundaries. The USRPT format meets the requirements to produce training effects.

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