SWIMMING SCIENCE BULLETIN

Number 52©

Produced, edited, and copyrighted by

Professor Emeritus Brent S. Rushall, San Diego State University

USRPT: REST-INTERVAL SELECTION

Version 1.0

Brent S. Rushall, PhD

February 24, 2015

Perhaps the most basic premise in *Ultra-short Race-pace Training* (USRPT) is that effective training should contain the greatest number of race-pace skill executions as possible. That statement recognizes that the skills and techniques of swimming are race-dependent and unique to each swimmer. How much training should occur to provide the best training stimuli is often asked. It is not possible to place numerical values within an answer because so many variables determine the opportunities for training experiences and human gender, physical endowment, state of training, training history, and many other factors produce the requirement to recognize the individual needs of every swimmer. A coach is faced with the challenge of providing the best opportunities for training experiences that will transfer positively to competitive settings and demands. USRPT attempts to do that. However, in setting out guidelines for the provision of beneficial training experiences, there arise times when the exact guidelines are difficult to and at worst cannot be implemented. This presentation discusses one feature that can be adapted to better suit training organization.

USRPT requires swimmers within a lane group to initiate a repetition within a set on a uniform interval. For example, swimmers in one lane might depart for a 50 m repetition on 50 seconds. Since 50-m repetitions should be interspersed with 20-second rest intervals, the repetition time would be 30 seconds. However, very few swimmers have target times that are perfectly coordinated with 15 seconds of rest for 25-m repetitions and 20 seconds of rest for repetitions longer than 25 m. Compromises have to be made to facilitate good group training so that the conditions of swimming are the best that can be offered in the facility and for the size of the training group.

A common dilemma arises when a swimmer's target time is not a convenient number to get a convenient take-off time. If the bounds of USRPT are strictly adhered to, the reality of starting a repetition on a difficult to discern time, such as 52 seconds, is disruptive to training organization. This leads to the first challenge and adaptation of the work + rest interval for swimmers in a lane group. Sweep hand pace clocks are best read in 5-second time intervals. The visual capacity to read actual second marks on the clock face is often difficult when distance from the clock, visual acuity (water in the eyes, rapid re-focusing), and visual problems of some swimmers are

considered. If a group is instructed for the first swimmer to leave on a major 5-second division on the clock every 50 seconds, the arithmetic to adjust the time for each successive repetition is not difficult. For the remaining swimmers, leaving on a 5-second interval after the previous swimmer is also relatively easy to comprehend. Well-organized repetitive training experiences do occur when swimmers commence their repetitions consistently and knowingly. Digital pace clocks are easier to read by swimmers but are no more helpful when a "theoretical true" 32 seconds for the repetition swimming and 20 seconds of rest (a 52-second interval) is attempted. Although simple in arithmetical structure, some calculations and remembered information are required for every repetition. Given the distractions of what is supposed to be concentrated on in every USRPT repetition, confusing and take-off-time errors very commonly occur when exact interval times are attempted. A simple accommodation is required to facilitate training-squad organization.

The theoretical true repetition interval of 52 seconds for 50-m swims can be used as an example. The closest "whole 5-second intervals" to 52 seconds are 50 and 55 seconds.

1. *A 50-second interval*. If swimmers are instructed to leave every 50 seconds, then a 32-second race-pace would not allow 20 seconds of rest but a reduced rest of 18 seconds. Swimming a set with a shorter rest would make the set harder to sustain race-pace to achieve a substantial number of repetitions before the first failure. One would expect slightly fewer successful repetitions to be achieved with 18-second rests than with 20-second rests. A swimmer would be challenged to strive for race-pace maintenance under more difficult conditions of somewhat rapidly developing fatigue. That practice set would produce a reduced number of ideally possible strokes but under conditions that would better replicate the fatigue challenges in the latter part of a race.
2. *A 55-second interval*. If swimmers are instructed to leave every 55 seconds, then a 32-second race-pace would allow 23 seconds rest, slightly more than the 20-second theoretical guideline. The slightly longer rest should facilitate a greater number of successful repetition completions before the first failure in the set. The swimmer would experience a greater volume of practice swimming in fatigue conditions that would not accrue as fast as when an 18-second rest interval was used.

Both 50- and 55-second intervals facilitate an organized training session. The experience of the swimmer is slightly different in each set. In practices where too-short and too-long rest intervals are used, it has been noticeable that the extra five seconds normally produces a marked increase in the number of successful repetition completions. The increase is particularly individual but could be often as much as 40% more completions. In distance swimmers, it could be even more. Consequently, the two sets requiring the same race-pace repetition time have the same biomechanical demand (i.e., the skills/technique for the intended race) but different physiological and psychological demands. Is that variation good or bad?

While the simple articulation of USRPT premises suggests that one pace produces one set of movement requirements, it is known that techniques undergo change-phases as races progress (Oxford et al., 2010; Seifert, Chollet, & Chatard, 2007). The movements to maintain a velocity also undergo changing psychological perceptions and adaptations in a race. Training has to provide opportunities to experience the greatest number of race-pace movement repetitions in the changing physiological and psychological conditions which simulate those that occur in a race. A swimmer has to be given the opportunity to sustain a swimming velocity while adapting to

changing factors as more work is experienced. Adapting to those changes is facilitated in a set that requires 50-m swims with 20 seconds of rest. Would mixing training experiences of the same repetition velocity but with one set allowing 18 seconds of rest and another allowing 23 seconds of rest be that much different?

USRPT is a technique-oriented regimen. Its aim is to facilitate as many trials of the "family" of technique adaptations that occur within the changing conditions of a race's progression. It is best for a swimmer to develop the smallest repertoire of variations as possible (Chollet et al., 1997). The short-rest set presents experiences of heightened fatigue and task-challenge within the set. The long-rest set presents experiences of heightened movement-pattern repetitions as the experience progresses. Both sets facilitate repetitions of race-pace techniques that yield the same swimming velocity under stresses that mostly replicate those that occur in a race.

The number of stroke-cycle repetitions that need to be executed to instill a technique change and in particular to replace an established error is hugely greater than the number of strokes required to produce fitness improvements. Once maximal fitness is achieved, the number of stroke-cycles executed to maintain the fitness state can be reduced, often by as much as 50% (Rushall & Lavoie, 1983; Rushall & Pyke, 1991). However, the need to continually reinforce and practice a new behavior element when a technique is altered is something rarely considered by swimming coaches, particularly if they follow a traditional conditioning-emphasis in their programs. There has been no research to quantify the number of strokes needed to change a technique because it would be a folly. There are just too many variables that exist in a real-life swimming practice to be able to develop adequate control to perform an acceptable experiment to determine such a number. As a pure guess, this writer suggests that a swimmer would need to perform 50,000 stroke-cycles in a USRPT format to produce a full conditioning effect but more than 100,000+ stroke-cycles to integrate a movement element into the family of technique adjustments that should occur in a race. In all likelihood, the 100K estimate is too low. Those numbers assume that USRPT training is embraced. In the irrelevant pace experiences of traditional swimming training, there never would arise sufficient training repetitions to deliberately change a race technique(s).

Richard Schmidt (Schmidt, 1988) suggested that good instruction has the potential to alter an undesirable movement pattern or element very quickly. Unfortunately, such changes are stored in short-term memory. If the next step in instruction is not taken, the behavior change will be lost and the individual will revert to the old established feature. Consequently, if an athlete displays a desired behavior change, it does not necessarily mean it has been learned and the coach need not instruct it any more. Unfortunately, that very often is a coaching response.

To convert a momentarily-changed behavior from short-term memory to long-term memory, many trials are required with very meaningful feedback provided on each trial. The number of trials required for the development or change of behaviors was estimated by Richard Schmidt as being: i) 300 trials to create a bad habit, and ii) 3,000 trials to correct or undo the error. When instruction is poor or haphazard, those numbers balloon dramatically.

One could journey into a detailed discussion of why correct technique executions for each race-pace are required but that would distract the reader (and this writer) from the consideration at hand. That has been done elsewhere at length (Rushall, 2013). Suffice it to say that a swimming coach with a squad of experienced swimmers has to continually harp on technique changes and additions to at least produce the desirable outcome of swimming with correct technical elements,

that is, with enhanced propelling efficiency.[1] That is why a great number of specific stroke cycles is so important. It is the backbone of USRPT.

When to Vary Rest Intervals within Reason

There are two common situations when a swimmer should use shorter- and longer-rest intervals rather than an ideal 15- or 20-second interval.

The first is when a swimmer does not feel fully ready to perform the most challenging presentation of a training stimulus (i.e., a short-rest interval set). It would be hoped that the slightly easier challenge of a longer than 15 or 20-second rest period for 25 m or 50+ m task-intervals respectively, would serve to elevate a swimmer's enthusiasm for training. That decision is usually made when outside-of-swimming stresses intrude upon a swimmer's readiness to perform at practice.

A second use of rest options is when a specialist swimmer (a freestyler, breaststroker, etc.) plans to do two USRPT sets for the same event at a practice. The order of the tasks involving different rest intervals is determined by the coach and/or swimmer. Usually, the order is to do the "harder" shorter-rest interval set first and then follow it with the longer-rest set. One should expect more repetitions to be completed in the second set; such is the added effect of the longer-rest interval.

One reason for this discussion is to indicate that training organization for USRPT work is important. If a coach were to strictly adhere to the 15- and 20-second rest intervals as advised in the USRPT literature (http://coachsci.sdsu.edu/swim/usrpt/table.htm) a well-populated training session could dissolve into chaos. The choice of the 20-second rest interval is based solely on the work of Beidaris, Botonis, and Platanou (2010).

It makes no point to attempt USRPT stimuli if swimmers do not achieve a critical mass of strokes in the set (recommended as a total of three times the target event distance). In any form of training, sessions that are too brief are to all intents and purposes useless when one is striving for performance excellence. When factors work against an acceptable attempt to improve the completions in a particular training set, a slightly more accommodating rest-interval can be programmed.

Closure

The use of both shorter- and longer-rest intervals facilitates the following.

1. The greatest number of stroke-cycles at a race-pace technique is achieved.
2. Practice session organization, particularly the timing of individuals' repetition initiations, is facilitated.
3. Swimmers still have a training challenge through a longer-rest set when they are not fully prepared to do the most challenging USRPT program possible (i.e., when they are tired, troubled by outside-of-swimming problems, etc.).
4. The various levels of race-stress are replicated adequately through the provision of both rest forms. The quicker onset of fatigue in the shorter-rest format yields a benefit that

[1] This statement is made against the recognition of the fact that when swimmers reach a certain age with a very large history of swimming incorrectly that no manner of instruction or volumes of behavior practice could be experienced that would produce the substitution of a new vital movement element to replace the entrenched element. There does come a time when changing a swimmer's technique is a virtually hopeless cause.

closer replicates the speed of onset of the difficult stages of races. However, the experience cannot be too difficult because the critical mass of total distance covered of three times the race distance has greater preference over "getting tired".

It is best to match ideal programming parameters when using USRPT. However, minor modifications of the rest-interval can be tolerated provided they are within the bounds described above. The acceptable rest-interval ranges for USRPT are:

i. For 25 y/m repeats 13 to 18 seconds but always attempting to be 15 seconds, and
ii. For 50 y/m or longer repeats 18 to 23 seconds while always attempting to be 20 seconds.

References

Beidaris, N., Botonis, P., & Platanou, T. (2010). *Physiological and performance characteristics of 200 m continuous swimming and 4 x 50 m "broken" swimming with different interval time demands.* A paper presented at the XIth International Symposium for Biomechanics and Medicine in Swimming, Oslo, June 16–19, 2010. [http://coachsci.sdsu.edu/swim/training/beidaris.htm]

Chollet, D., Pelayo, P., Delaplace, C., Tourny, C., & Sidney, M. (1997). Stroking characteristic variations in the 100-m freestyle for males of differing skill. *Perceptual and Motor Skills, 85,* 167-177. [http://coachsci.sdsu.edu/swim/biomechs/chollet.htm]

Oxford, S. W., James, R., Price, M., & Payton, C. (2010). *Coordination changes during a maximal effort 100 m short-course breaststroke swim.* A paper presented at the XIth International Symposium for Biomechanics and Medicine in Swimming, Oslo, June 16–19, 2010. [http://coachsci.sdsu.edu/swim/biomechs/oxford.htm]

Rushall, B. S., (2013). *A swimming technique macrocycle*. Spring Valley, CA: Sports Science Associates [Electronic book - http://brentrushall.com/macro/index.htm].

Rushall, B. S., & Lavoie, N. F. (1983). A call to re-focus serious sport training. *SPORTS, W-1*.

Rushall, B. S., & Pyke, F. S. (1991). *Training for sports and fitness*. Melbourne, Australia: Macmillan of Australia.

Schmidt, R.A. *(*1988*). Motor control and learning: A behavioral emphasis*. (Second Edition). Champaign, IL: Human Kinetics.

Seifert, L., Chollet, D., & Chatard, J. C. (2007). Changes during a 100-m front crawl: Effects of performance level and gender. *Medicine and Science in Sports and Exercise, 39,* 1784-1793. [http://coachsci.sdsu.edu/swim/biomechs/seifert2.htm]