

Psychological Intervention on Fatigue Management of the Central Nervous System

Si Gangyan, Raymond C.H. So, Jiang Xiaobo
Hong Kong Sports Institute

Objective In those timed competitions, in particular those speed endurance competitions, in order to finish the competition in the shortest time and delay the occurrence of fatigue, athletes would use some kind of pacing strategy. Si *et al* (2009) addressed that pacing strategy, indeed, is a way adopted by the central nervous system to manage exercise fatigue, i.e. pacing strategy is a manifestation of the central nervous system's fatigue management strategy, it is also an expression of the psychological endurance capability under the extreme state.

Therefore, the main objective of this research is to examine the effect of fatigue-overcome belief training and the use of psychological skills (relaxation, imagery, self-talk, two types of attention skill) on the fatigue-overcome belief and psychological skills in elite male rowers under maximum intensity or limit state, and the effect of changes brought about by psychological interventions on several aspects: the pacing strategy adopted by rowers who are on the rowing ergometer for 6 minutes at maximal intensity; athletic performance; physiological and biochemical indices; and rating of perceived exertion.

Experimental Design and Methodology Eighteen provincial-level professional male rowers were selected, average age was 18.6 (standard deviation = 2.3), and the experiment was to set up an experimental and a control group, to have the pre-post test, and a nonequivalent quasi-experimental design was adopted. Firstly several psychological indices were examined: the "Questionnaire on overcoming fatigue under high intensity training"; the "Questionnaire on psychological skills" (Bull, Albinson & Shambrook, 1996); the "Self-talk questionnaire on sport" (Zervas, Stavrou & Psychountaki, 2007); as soon as psychological intervention is finished, the "Questionnaire on social validity" (Thelwell & Greenlees, 2003) was used to test subjects' subjective sense of the effectiveness of psychological intervention. Tests to examine physiological indices included two times of using the rowing ergometer for 6 minutes at maximal intensity; RPE in two 6-minute tests; EMG of trapezius, latissimus dorsi, rectus femorus, vastus medialis and vastus lateralis in two 6-minute tests; heart rates in two 6-minute tests; blood lactic acid levels after the two 6-minute tests.

The subjects were then divided into experimental group (n = 11) and control group (n = 7). The experimental group received psychological intervention for two consecutive weeks, psychological intervention includes the cognitive reconstruction of the subjects' beliefs in overcoming fatigue, the learning and mastering of psychological skills, consciously expectation and preparation for pacing strategy; while the control group was taught psychological knowledge which had no relation to overcoming fatigue. After two weeks, a post-test was carried out, and all testing conditions and indices were the same for the pre- and post-test.

Data Analysis Paired-sample T test was used to analyse the difference between pre-test and post-test for experimental group and the control group. Covariance analysis was used to study the difference between the experimental group and the control group.

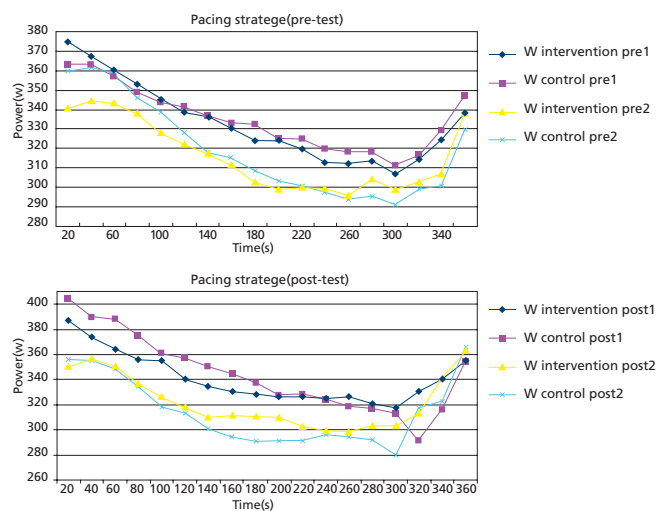
Results Data drawn from the "Questionnaire on overcoming fatigue under high intensity training" indicated that controlling belief was significantly different in the covariance analysis between the experimental group and the control group. The paired-sample T test and covariance analysis indicated that psychological skill imagery, psychological preparation, attention control ability, and self-talk ability which are important for rowing athletes were significantly different between the experimental group and the control group. The results from the "Questionnaire on social validity" showed that the subjects had better evaluation on the effectiveness and satisfaction level of this psychological intervention.

There was no significant difference between the pre-test and post-test score in respect to blood lactic acid and heart rate for athletes of the experimental group and the control group. The 6-minute rowing

ergometer test at maximal intensity, which provided an assessment of the athletic performance, showed that in the second testing, the performance of the experimental group were significantly better than the performance of the control group, and for the experimental group, the rowed distance of the two post-tests were significantly better than the rowed distance of the two pre-tests.

The influence of psychological intervention to the pacing strategy can be shown in the following aspects. Firstly, the accelerating point in 6-minute testing process: that of the experimental group in the post-test appeared one unit of time (20 seconds) sooner than in the pre-test; while the accelerating points of the two pre-tests for the experimental group appeared one unit of time (20 seconds) sooner than for the control group. Secondly, the athletic performance, i.e., the total distance rowed in the 6-minute test: covariance analysis suggested that that was significant difference (p -value = 0.05) between the experimental group and the control group in the second testing. The paired-sample T test of pre-test scores and post-test scores for the experimental group suggested that the pre-test scores and post-test scores were significantly different in both the first testing and the second testing.

Figure 1. Pacing strategy variation diagram



Conclusion

1. Psychological intervention, which is based on the central nervous system control mechanism theory of the pacing strategy, has significant effect on a subject's scores in respect to his belief in overcoming, imagery, attention control ability, psychological preparation, self-talk; this also was an indication of the progress of a subject's psychological endurance capability.
2. Psychological intervention enhanced a subject's psychological endurance capability, improves the subject's initiative consciousness in respect to managing fatigue in the central nervous system, so as to improve the pacing strategy in the 6-minute rowing ergometer test at maximal intensity, and improve the athletic performance.

References

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