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Cyclo-cross Performance and Physiological/Psychological parameters

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Abstract

Background: The new models of exercise performance consider both physiological and psychological parameters to better understand the performance (Marcora 2008: Eur J Appl Physiol 104: 929-931). Despite this, to our knowledge, no study tried to analyse jointly both physiological and psychological determinants of cycling performance. Several studies identified that peak power output and ventilatory/lactic thresholds were strong predictors of the performance in mountain bike and road cycling (Impellizzeri *et al.* 2005: J Sports Sci 23(1): 41-47; Hawley and Noakes 1992: Eur J Appl Physiol 65: 79-83). For psychological aspects, anxiety, self-confidence and a modified state of mind called Flow has been proposed as main determinants of the performance (Curry *et al.* 1999: Dossier EPS 43: 26-45; Jackson and Eklund 2002: J Sport Exerc Psy, 24, 133-150). Unfortunately, physiological and psychological determinants of cycling performance never were studied jointly. We used a French national cup of cyclo-cross to analyse some physiological and psychological parameters in young cyclists.

Purpose: To study the relationship between cyclo-cross performance and physiological/psychological parameters.

Methods: 12 cyclo-cross competitors (6 U_{19} and 6 U_{23}) took part in this study. Their performances (final ranking of the race) were recorded during the first round of the French national cyclo-cross cup. During the following week, they performed constant duration tests in order to determine their maximal mean power output for duration of 1s (P_{1s}), 5s (P_{5s}), 30s (P_{30s}), 4min (P_{4min}) and 20min (P_{20min}). They also answered two psychometric questionnaires (Flow State Scale-2, Jackson and Eklund 2002; and "Echelle d'état d'anxiété competitive", Curry *et al.* 1999) in order to determine their levels of Flow, self-confidence, cognitive and somatic anxiety during the competition.

Results: Significant relationships were found between final ranking and P_{4min} ($r = -0.94$; $p < 0.05$) and P_{20min} ($r = -0.89$; $p < 0.05$) for the U_{23} group (figure 1). No significant relationship was found between the performance and P_{1s}, P_{5s}, P_{30s} and levels of Flow, self-confidence, somatic, cognitive anxiety. The level of Flow was homogeneous and relatively high in all the subjects (3.4 ± 0.5 on a scale of 1 to 5).

Discussion: The results of this study show that the U_{23} cyclo-cross performance could be related to P_{4min} and P_{20min} but not to psychometric questionnaires scores. In accordance with Pinot and Grappe (2011: Int J Sports Med 32: 839-844), these results suggest that the ability to produce high power output at both maximal aerobic power and anaerobic threshold is an important determinant of cyclo-cross performance. However, the lack of relationship between the performance and the psychometric scores shouldn't be used to minimize the impact of psychological parameters in establishing a performance. It would be relevant and valuable to develop new methods and research tools to assess and analyse the relationship between cycling performance and psychological parameters.

Conclusion: The performance in cyclo-cross would partly depend to the ability to produce high level of power output at intensities close to both maximal aerobic power and anaerobic threshold (P_{4min} and P_{20min}). More accurate and sensitive questionnaires or research tools will be needed to better understand the psychological dimension of cyclo-cross performance.
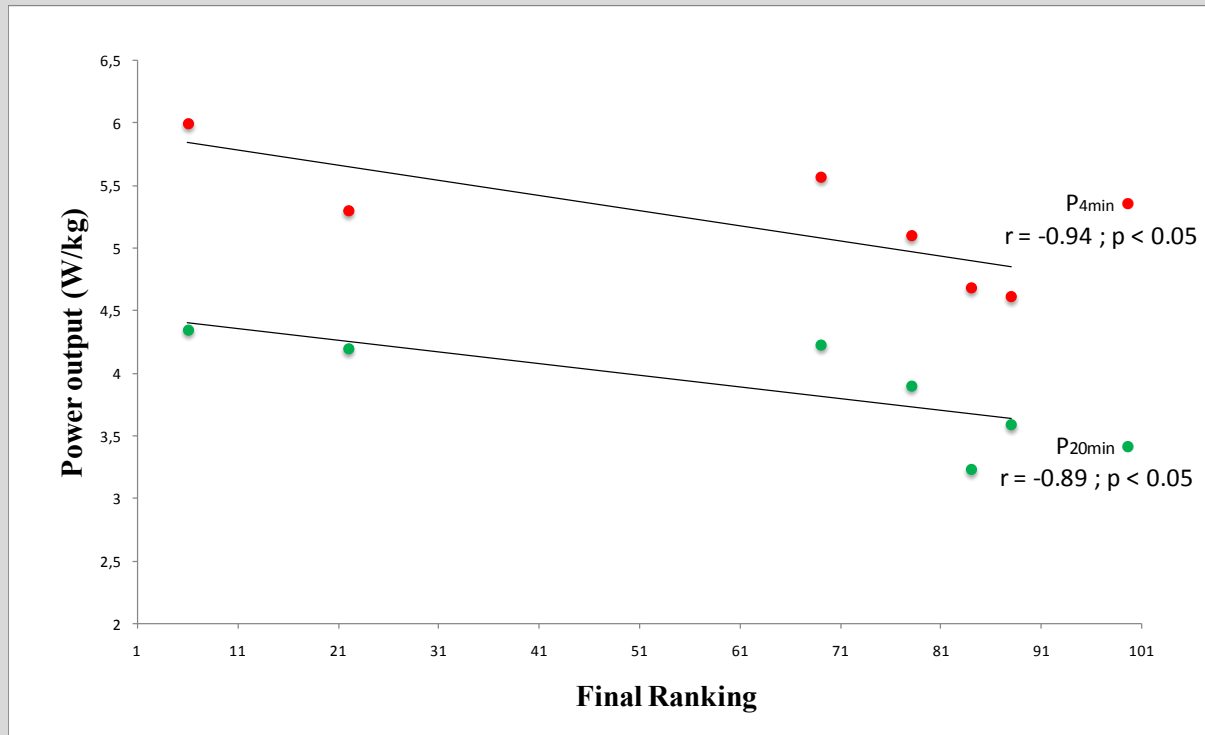
Figure 1. Relationships between race final ranking and P_{4min} and P_{20min} in U_{23} group

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