

MODEL OF THE RISK ASSESSMENT OF WHOLE-BODY VIBRATIONS IN CYCLING: CASE OF COBBLESTONE ROAD

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ABSTRACT

Vibrations occur in everyday activities, whichever work and sports. Two varieties of vibrations undergone by the human body can be distinguished: the whole-body vibration and local vibration. According to Griffin (1990), "Whole-body vibration occurs when the body is supported on a surface that is vibrating. Local vibration occurs when one or more limbs are in contact with a vibrating surface". In sports, mechanical vibration has two antagonist aspects: it can be used for training, but also may cause disorders under uncontrolled conditions. In the industrial field, vibration transmission and risk assessment are widely studied to prevent disorders and different methods are described to decrease the effects of vibration exposure. Unlike the industrial field, sports use neither standards nor guidelines to vibration risk assessment. Standards and guidelines existing in the industrial field provide advice as to measurement and evaluation of the vibration and exposure limits. In the world of cycling, vibrations are liable to cause appearance of traumatism in the back and in the hand-arm system causing discomfort and eventually leading to a decrease in performance. Discomfort depends on the type of road and bike. At the same time, discomfort perception reduces performance and affects the cardiopulmonary system. These are the reasons why the bicycle industry shows growing interest in the vibratory behavior of bikes and makes efforts in order to optimize them. During cycling races as the Paris-Roubaix, athletes are exposed to severe levels of vibrations for as long as 90 minutes. In this case, experimental tests indicate that the maximum duration of exposure is 30 minutes according to the standard EN ISO2631 and the European directive that defines the vibration exposure limits (this result needs a verification). This justifies, for both health and performance concerns, the need to know and control this vibration dose. After a description of standard EN ISO2631, this article proposes an assessment of the vibration dose in the whole body from a modeling of the excitatory source, the cobblestone and from intrinsic transmissibility functions of the cycle obtained in laboratory conditions. Then, a discussion on the variation of modeling parameters will be conducted. Finally, the estimated dose is compared to tests under real conditions.