Reliability of simulator driving tool for evaluation of sleepiness, fatigue and driving performance\footnote{Corresponding author at: Université de Caen, UFR STAPS, 2 bd du Maréchal Juin, F-14032 Caen Cedex, France. Tel.: +33 2 31 56 72 83; fax: +33 2 31 56 72 72. E-mail address: damien.davenne@unicaen.fr (D. Davenne).}

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\section{Introduction}

Driving during the night for long periods is a significant cause of road accidents, particularly on highways (Horne and Reyner, 1995; Pack et al., 1995; Philip et al., 1996; Mitler et al., 1997; Sagberg, 1999). In addition to a disruption of circadian rhythms (Benoit and Foret, 1988; Mitler et al., 1997), two other symptoms combine to contribute to deteriorate driving performances. The first one is sleepiness. This symptom is mainly due to extension of wakefulness (homeostatic and/or chronobiological influences) (Borbely, 1982; Akerstedt and Folkard, 1995). Sleepiness at the wheel is a well-known risk factor for traffic accidents, particularly on highways (Horne and Reyner, 1995; Philip et al., 1996, 1999, 2001; Sagberg, 1999; Garbarino et al., 2001; Sagaspe et al., 2008). The second symptom is fatigue which is known to occur when driving requires sustained attention over long periods of time (Lal and Craig, 2001; Thiffault and Bergeron, 2003; Ting et al., 2008). Fatigue has been shown to significantly decrease real driving performance during prolonged and monotonous driving (Lal and Craig, 2001; Sagaspe et al., 2008).

These symptoms (i.e., fatigue, sleepiness) combined with time of day contribute to a deterioration of drivers’ performance when they drive for hours at night, but even so many drivers combine...