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## Driver's emotional state and vulnerable road user detection

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In 2014, slightly over 3380 deaths occurred on metropolitan French roads (Observatoire National Interministériel de Sécurité Routière [ONISR], 2015). For pedestrians and cyclists **the percentage of fatal accidents increased by around 4, and 7% respectively since 2010**. In addition, accidents involving pedestrians and cyclists are mostly caused by other road users as motorists, truck or bus drivers making pedestrians and cyclists vulnerable road users [VRU].

Previous investigations showed that VRU visibility for road users (drivers) was a crucial main issue. To address this issue, first of all, attention management to VRU while driving must be investigated. For example, Hole, Tyrrell, and Langham (1996) show that **expectations and knowledge about a stimulus would modulate attention** to it. However, recent research in the field indicated that driving is also influenced by emotion. **Several studies highlighted a specific harmful impact of negative emotions on several processes involved during driving activity** (Ellis, and Moore, 1999; Lemerrier, and Cellier, 2008), especially for anger (Stephens, and Groeger, 2009; Stephens, Trawley, Madigan and Groeger, 2013)

Further, Rogé, El Zufari, Vienne, and Ndiaye (2015) found that a short film which delivered information to car drivers about pedestrian, cyclist and motorcyclist vulnerability modified the intensity of negative emotions felt by motorists. In addition, among all emotions experienced during the film viewing, only **anger intensity was positively correlated with a change in the visibility distance of VRU** (i.e., road distance between a car driver and a VRU when the motorist claimed he has seen him). The greater is the distance, the more visible the VRU is for the driver (Rogé, Douissembekov, and Vienne, 2012).

Therefore, in our study, we only wanted to test the role of different anger intensities on VRU detection abilities. For this reason, we chose to set up a **VRU detection task on a car driving simulator** (in order to avoid real-life risky situations). Anger-elicitation was carried out using short film clips (see Schaefer, Nils, Sanchez, and Philippot, 2010). These films made no reference on driving or road safety and elicited different anger intensities. Film clips were watched by participants before we asked them to complete driving sessions in which they had to detect pedestrians and cyclists.

Furthermore, anger can also be characterized by specific physiological patterns that could be recorded (Kreibig, 2010). For these reasons, **particular emphasis was placed in our study on emotional assessment in order to get as much feedbacks as possible on individual emotional state during and after driving**. Thus, cardiac and ocular measures were recorded during the driving sessions while emotional self-assessments were carried out after each session to know in what extent all measures matched. By this way we were able to explore the relation between experienced emotional intensity and VRU detection abilities. It was also expected to **highlight physiological and behavioural patterns linked with different anger intensities** attempting at the same time to **provide some answers about an optimum anger intensity likely to be beneficial for driving**.

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