Body and mind in driving abilities: how electrodermal correlates can explain the improvement of hazard perception in a virtual training

Evelyn Gianfranchi, Michela Sarlo, Mariaelena Tagliabue

Department of General Psychology, University of Padua

Introduction

This study has been developed in the field of Road Safety, in which hazard perception represents a crucial ability to predict the potential occurrence of dangerous events in order to prevent them and their outcomes. Recent evidence showed that inexperienced drivers have a greater percentage of Skin Conductance Responses (SCRs) while driving in a virtual environment, than during the passive view of risky scenarios (Tagliabue and Sarlo, 2015).

The aim of this study is to investigate the psychophysiological mechanisms through which learning in hazard perception develops in inexperienced drivers, using virtual reality technology in order to guarantee a safe context.

Method

16 undergraduates (mean age: 20 years old; driving experience: less than 2,5 years) drove a moped-riding simulator (the Honda Riding Trainer – HRT, specifically designed for hazard perception training- **Fig.1**) for two sessions. During the HRT training we collected data on electrodermal activity, through the use of an amplifier system and a video-camera. All the participants were administered the same 5 courses per session according to the degree of difficulty, representing peripheral road at the HRT. In each session, the same 39 potentially hazardous scenes were shown and we recorded changes in electrodermal voltage (SCRs) in proximity of hazardous events (**Fig. 2**).

In the second session, we expected to observe an overall improvement of riding performance, together with earlier SCRs onset associated with the detection of hazard.

Fig. 1: The Honda Riding Trainer simulator (Vidotto, Bastianelli, Spoto, and Sergeys, 2011)
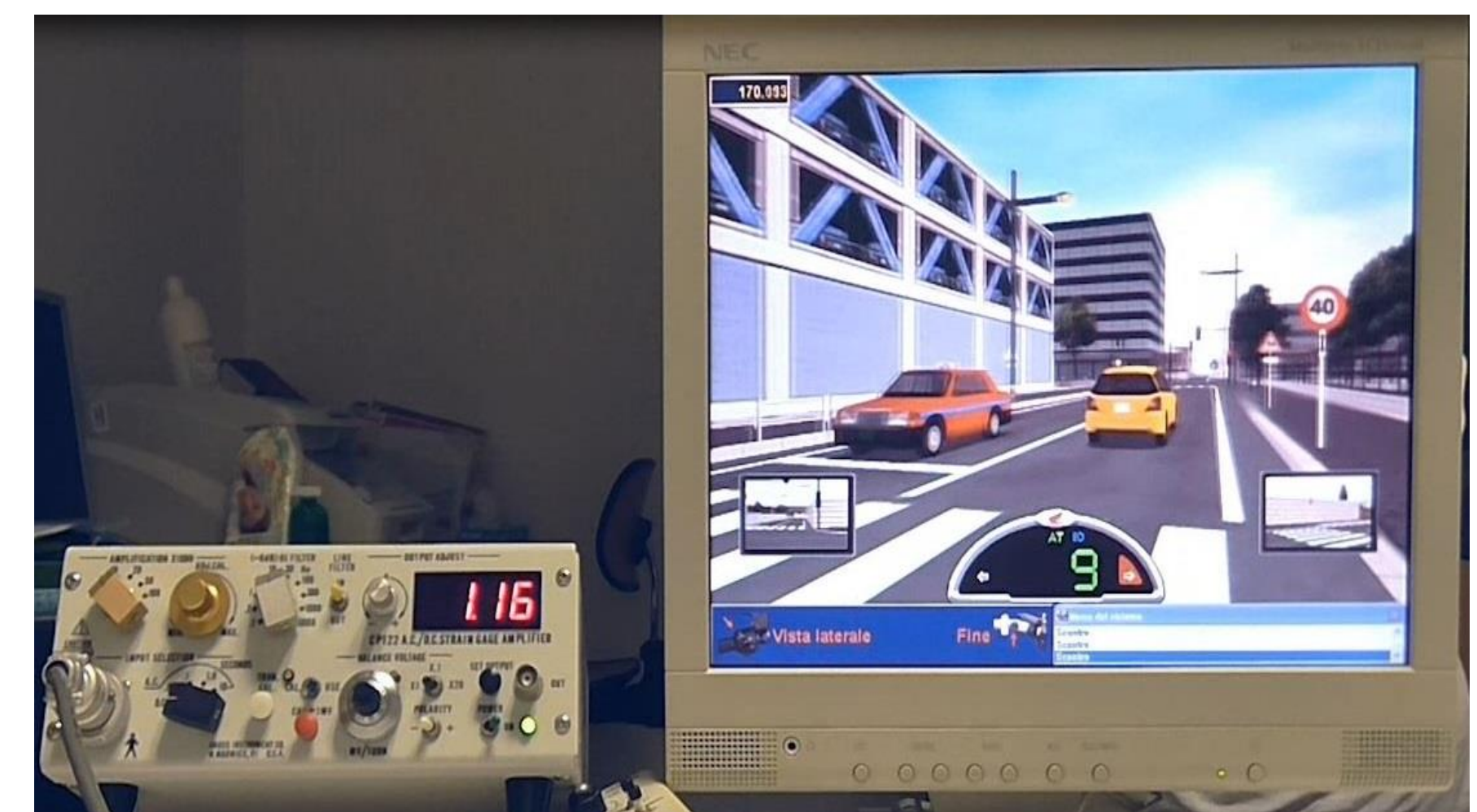

Fig. 2: simultaneous registration of skin conductance voltage and HRT performance

Results

The design was a 2 *Sessions* X 5 *Courses* repeated-measure design. The dependent variables were the percentage of **accidents**, the percentage of **SCRs** and the **mean onset anticipation** of SCRs.

We found a **reduction in accidents** (**Fig. 3**) with the progress in training, both within and between *Sessions*. The **percentage of SCRs decreased along the courses** (**Fig. 4**) while the **SCRs onset is significantly anticipate** in the second *Session* ($F(1,13)=7.41$, $p<0.05$).

Fig. 3: Participants' percentages of accidents in the different courses administered ($F(4,56)=6.19$, $p<0.001$)
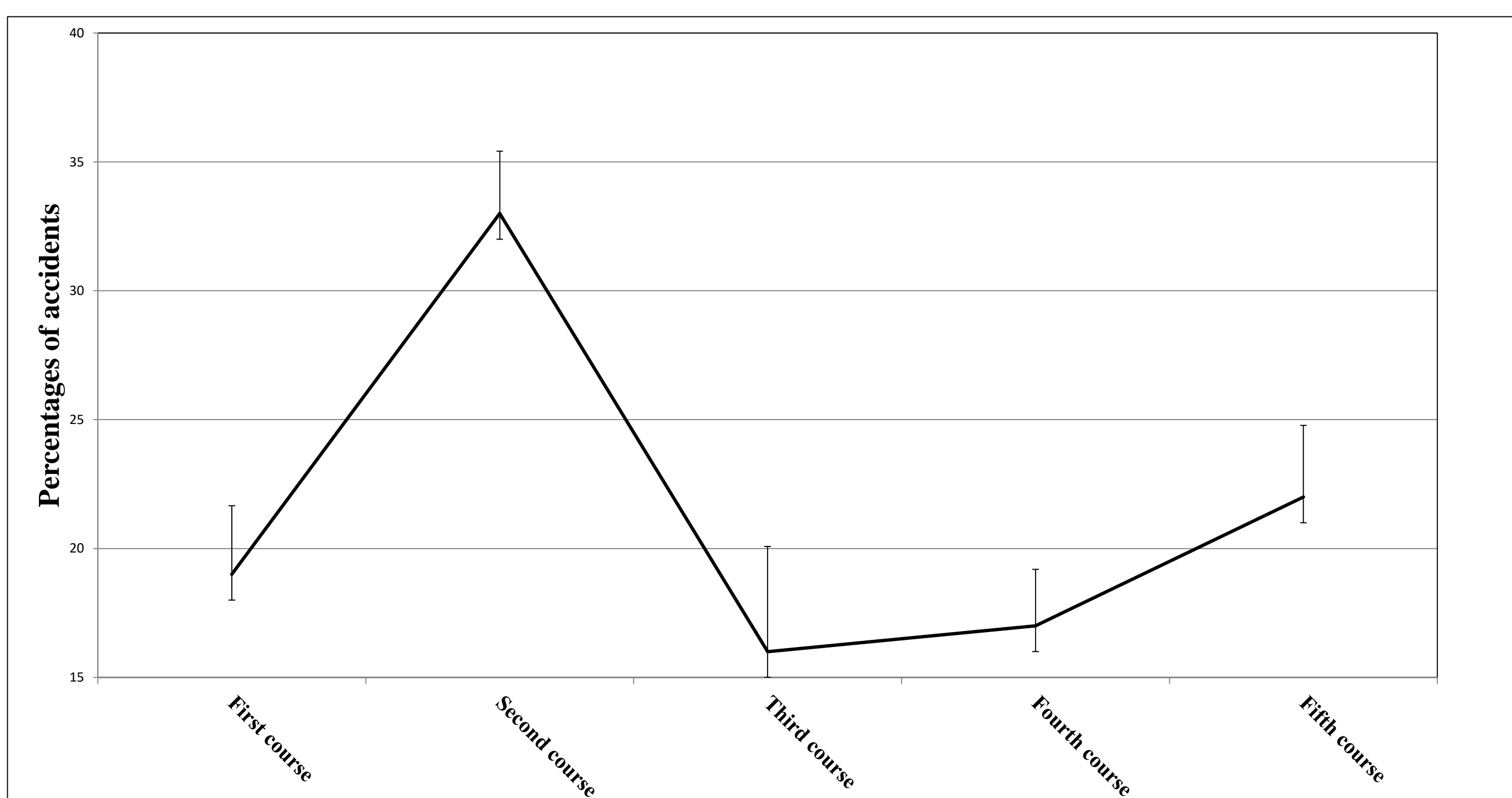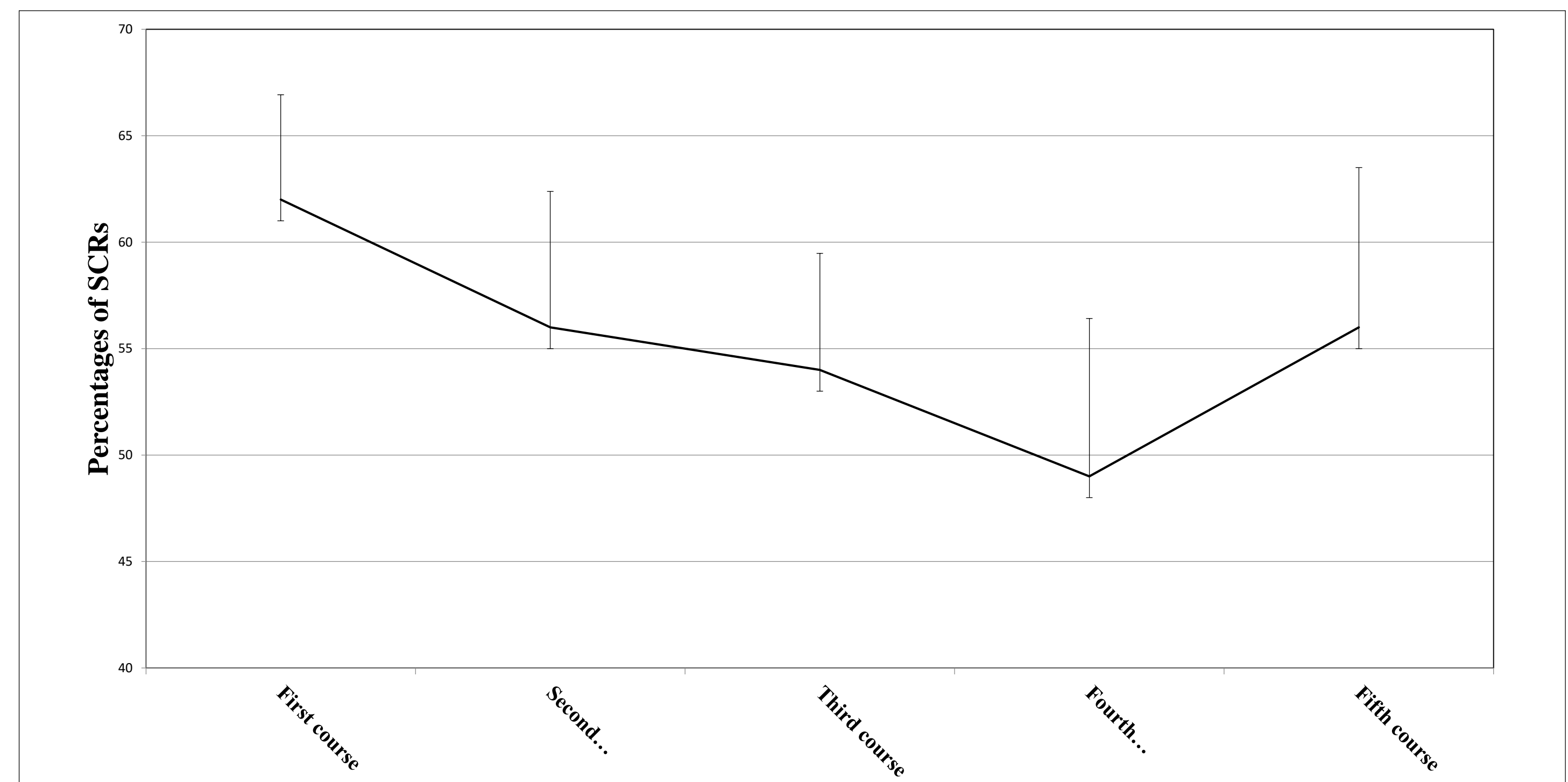
Fig. 4: Participants' percentages of SCRs in the different courses administered ($F(4,56)=2.67$, $p<0.05$)

Discussion

These results represent a further contribution to the comprehension of implicit mechanisms underlying hazard perception and its development, that might become a turning point both for road education and road safety. In particular, taken together, the results of SCRs analysis indicate that **the training is effective** in improving the ability to behave in such a way that the hazard does not occur at all (SCRS % reduction). This is confirmed by the anticipation in the SCRs onset, indicating **an earlier implicit response to hazards that might enhance the likelihood ability to avoid them**.

References

Tagliabue, M. e Sarlo, M. (2015). Affective components in training to ride safely using a moped simulator. *Transportation Research Part F*, *35*, 132-138

Vidotto, G., Bastianelli, A., Spoto, A., Sergeys F. (2011). Enhancing hazard avoidance in teen-novice riders. *Accident Analysis & Prevention*, *43*, 247–252.