Fit-to-drive after stroke and traumatic brain injury: a combination of performances in cognitive tests and driving simulator

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Introduction
After suffering brain damage people are often interested in returning to drive. An accurate evaluation is necessary to determine the patients' fitness to drive. On-road test is the best method for assessing driving abilities but could be neither safe nor challenging enough to find out incompetent driving ability (Patomella et al., 2006). The advantages to use a driving simulator are different: 1) provide a safe environment for the driver and the evaluator (Bédard et al., 2010); 2) enable presentation of situations that would not be available on the road or that would be too risky; 3) make it possible to test everyone under the same conditions, regardless of weather or location; 4) make it possible to test everyone under difficult conditions (i.e., low visibility) and where emergency or avoidance maneuvers may be required; 5) it is ecologically valid since people's behavior on a simulator is similar to their behavior on the road (Bella, 2008) and, finally, 6) simulator driving test is cheaper than on road test and it has less logistical problems. The aim of this study is to find out if there are differences in driving ability between TBI, stroke and controls using an evaluation that includes not only paper-and-pencil and computerized cognitive tests, but also a driving simulator (DS).

Materials and methods
One TBI and one Stroke patients with lesions in their right or left hemisphere were recruited. Two healthy comparison subjects, similar in age to the patients, were recruited. Clinical and demographical characteristics of the participants are summarized in Table 1. Each patient was assessed using a protocol that includes cognitive tests and a DS session. The control group was assessed using the DS only. On DS, participants were instructed to drive under three different conditions.

Results
Table 2 shows participants score on DS conditions. Table 3 shows patients scores on neuropsychological tests.

Discussion and conclusion
The DS could be a useful tool for the assessment of drive fitness above all the patient's behavior during the driving. However this is a pilot study with few patients and other future studies are needed to use this driving simulator on the clinical setting.

On the first condition, where participants have to drive straight on and the evaluator look at the variation in the road position, patients tend to swing while driving more than the controls. On the second condition, where participants drive in a street with multiple crossroads TBI patient doesn't follow the rules on different situations and he makes many errors, while stroke patient doesn't follow the rules. On the third condition, where participants drive in a highway, each patient make many behavioral errors but only the stroke patient doesn't follow the rules. It could be possible even that attention deficits, as underline on neuropsychological tests, make strenuous to do many things at the same time as in a driving situation is required.

References