

and the period test-trauma. The internal consistency of the questionnaire was good with a Cronbach  $\alpha$  coefficient to 0.80. Reproducibility between relatives and patients was good, but these assessments significantly differ from that of the professionals, who tended to rate more severely the disorders. Unlike the Australian authors, we found no significant correlation between the patients' RSAB scores and their results on the Stroop Test and DSST.

*Discussion and conclusion.*— In view of the first results, the properties of the French version of the RASB appear promising in terms of easiness to handle, sensitivity, reproducibility and internal consistency. Further research is necessary on the concurrent validity in order to obtain a complete validation of the tool.

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### Calculation and number processing troubles in patients with traumatic brain injury

M. Villain<sup>a,\*</sup>, C. Tarabon-Prevost<sup>b</sup>, E. Bayen<sup>b</sup>, P. Pradat-Diehl<sup>b</sup>

<sup>a</sup> Service de médecine physique et réadaptation, ER6 UPMC, AP-HP, groupe hospitalier Pitié-Salpêtrière, 47, boulevard de l'Hôpital, 75013 Paris, France

<sup>b</sup> Service de médecine physique et réadaptation, hôpital de la Salpêtrière, Paris, France

\*Corresponding author.

*Keywords:* Traumatic Brain Injury; Ecological assessment; Calculation; Number processing

Cognitive impairment is a common and prominent sequela of traumatic brain injury (TBI). Number processing and mental arithmetic require the intervention of multiple cognitive functions. These abilities may be altered, thereby compromising patient autonomy. However, these disorders are rarely evaluated. Validated tests often lack sensitivity unsuited for these patients.

*Aim.*— The aim of our study is to assess number processing and calculation in patients with TBI and their impact on daily activities.

*Materials and methods.*— Using a numerical processing battery (BENQ), we assessed the long-term effects of severe or moderate TBI in patients who returned home. BENQ is a standardized ecological scale, which includes 11 tasks corresponding to manipulation of numbers in situations similar to those of everyday life: telling time, estimating prices and making change. The results are compared with an analytic battery: EC301 and an estimation task extracted from TLC2.

*Results.*— We included 8 patients aged from 29 to 57 years old (mean 44 years old). The average total score on the BENQ is 35.87 on 41 (SD=2.85). Three subjects obtained a pathological score in both the BENQ and the estimation task of TLC2. The patient who had the lowest score at the BENQ also obtained the lowest score in the EC301. Specific difficulties in estimation and problem resolving emerged from the evaluation.

*Discussion.*— We have highlighted in ecological situations calculation and number processing deficits in patients with traumatic brain injury. The BENQ is therefore a good assessment tool in patients with TBI. Thus, deficits can be objectified and appropriately rehabilitated. Based on our study, this test is currently being revised in order to improve its psychometric qualities.

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### Neuropsychological evaluation of the abilities necessary to return to drive after a brain damage

V. Bourrat Salducci<sup>a,\*</sup>, P. Delhomme<sup>b</sup>, M. Enjalbert<sup>a</sup>, G. Egizii<sup>a</sup>, R. Benbouzid<sup>a</sup>, O. Bosch<sup>a</sup>

<sup>a</sup> Centre Bouffard-Vercelli, cap Peyrefite, 66290 Cerbère, France

<sup>b</sup> IFSSTAR, Versailles, France

\*Corresponding author.

*Keywords:* Ability to drive; Brain damage; Neuropsychological evaluation

*Objective.*— The purpose of this work was to pre-test a neuropsychological assessment, evaluating the abilities necessary to return to driving after brain

damage. Physical medicine and rehabilitation teams are regularly confronted with this problematic. We know that a pluridisciplinary assessment (physician, neuropsychologist, work therapy specialist, driving school teacher) is necessary. However, an important amount of research remains to be done in order to establish a harmonious set of tests and to help make changes to current regulations.

*Material/Patients and method.*— Based on the cognitive model of driving of Michon and on the works of C. Fattal since 1994, we elaborated a neuropsychological series of tests assessing various cognitive functions necessary to drive: attention, executive and visuospatial disorders. This protocol was conducted with a group of 89 patients with brain damage (brain injury, stroke, tumor. . .). Then, subjects were assessed by an approved driving school teacher during five sessions, especially trained for this type of pathology and after that the patients were divided into two groups: “able to resume driving” or “unable to resume driving”.

*Results.*— On the whole, all the participants were under the normative average for most of tests. But the differences in performance between the two groups were statistically significant. Moreover, from the 70<sup>th</sup> patient included and onward, and although the pre-necessary statistical requisites were not entirely respected (effective of the “inapt” group too small) we used the double-blind method and predicted the aptitude or the inaptitude of each patient: this prediction appeared in conformity with the conclusion of the driving teacher for the last 20 patients.

*Discussion.*— Our results authorize us to think that it is possible to predict the capacity or incapacity of resuming driving after brain damage and thus by using specifically selected tests associated with an ecological assessment.

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### Conscious behavior after traumatic brain injury: Anatomico-functional support and therapeutic prospects

J.-J. Lemaire<sup>a,\*</sup>, B. Pontier<sup>b</sup>, J. Coste<sup>a</sup>, T. Gillart<sup>c</sup>, L. Sakka<sup>a</sup>, F. Feschet<sup>d</sup>, J. Gabrillargues<sup>e</sup>, E. Coudeyre<sup>f</sup>, J. Luauté<sup>g</sup>

<sup>a</sup> Service de neurochirurgie, IGCNC, université d'Auvergne, CHU de Clermont-Ferrand, 63000 Clermont-Ferrand, France

<sup>b</sup> Service de MPR, IGCNC, université d'Auvergne, CHU de Clermont-Ferrand, Clermont-Ferrand, France

<sup>c</sup> IGCNC, département d'anesthésie-réanimation, université d'Auvergne, CHU de Clermont-Ferrand, Clermont-Ferrand, France

<sup>d</sup> IGCNC, université d'Auvergne, Clermont-Ferrand, France

<sup>e</sup> Unité de neuroradiologie, IGCNC, université d'Auvergne, CHU de Clermont-Ferrand, Clermont-Ferrand, France

<sup>f</sup> Service de MPR, CHU de Clermont-Ferrand, Clermont-Ferrand, France

<sup>g</sup> Service de MPR, hospices civils de Lyon, Lyon, France

\*Corresponding author.

*Keywords:* Coma; Consciousness; Tegmentum; Thalamus; Basal ganglia; Default-mode network; Precuneus

*Objective.*— Most brain-injured patients with severe and chronic consciousness disorders are in a therapeutic deadlock. This concerns mainly vegetative or neurovegetative patients, and patients in minimally conscious state. Chronic coma is an exceptional condition; certain conditions of akinetic mutism, which are more frequent, can be included in severe and chronic consciousness disorders. The goal is to review the functional connectivity of conscious behaviours and relational arousal, in particular since the introduction of modern clinical imagery.

*Description.*— The connectivity described in this work relies mainly on two magnetic resonance imaging structural studies of the deep brain: a high-resolution atlas (voxel = 250  $\mu$ m side; 4.7-Tesla) of a human anatomic piece; an extensive study of deep fascicles (diffusion tensor imaging and tractography; voxel = 1.25  $\times$  1.25  $\times$  1.5 mm<sup>3</sup>; 3-Tesla) on 6 healthy subjects. The results show the support of the functional connectivity of consciousness that involves the mesencephalo-pontine tegmentum, the basal ganglia, the hypothalamus and the thalamus. These deep located regions are connected with the cortex through three main paths: thalamic, ganglionic and rostroventral. The thalamic path rises from the tegmentum, uses the central tegmental tract, and reaches the reticular and dorsomedial thalamus; from the thalamus it spreads to the cortex, the limbic system, the striatum and the pallidum. The ganglionic path uses the lenticular

nucleus and projects to the cortex. The rostro-ventral path goes through the ventral tegmental area (below the thalamus) and the posterolateral hypothalamus, and then reaches the frontobasal region; this path uses the basal forebrain bundle. *Prospective.*—The knowledge of structures controlling conscious behaviours can enable to better understand different types of severe and chronic consciousness disorders. This also could allow proposing adjusted therapeutic options including physical medicine, rehabilitation, pharmacology and neuromodulation.

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### Apathy and impulsivity after traumatic brain injury

A. Arnould<sup>a,\*</sup>, L. Rochat<sup>b</sup>, P. Azouvi<sup>c</sup>, M. Van Der Linden<sup>b</sup>

<sup>a</sup> *Service de médecine physique et de réadaptation, hôpital Raymond-Poincaré, 104, boulevard Raymond-Poincaré, 92380 Garches, France*

<sup>b</sup> *Unité de psychopathologie et neuropsychologie cognitive, université de Genève, Geneva, Switzerland*

<sup>c</sup> *Service de MPR, hôpital Raymond-Poincaré, Garches, France*

\*Corresponding author.

**Keywords:** Apathy; Impulsivity; Psychosocial reintegration; Traumatic brain injury

*Introduction.*—Apathy and impulsivity are two disorders frequently encountered after severe traumatic brain injury (TBI). However, there has been little research on the underlying nature of these behavioural modifications.

*Objective.*—To assess components of apathy and impulsivity after TBI, their psychosocial consequences, and the burden experienced by the relatives.

*Method.*—38 close relatives of severe TBI patients were asked to complete four questionnaires: the UPPS impulsivity scale, short version [1], the apathy inventory [2], the Sydney psychosocial reintegration scale [3] and the Zarit Burden Inventory [4].

*Results.*—TBI patients showed on the UPPS significantly higher levels of urgency, lack of premeditation, and lack of perseverance, and a significant decrease of sensation seeking, as compared with their pre-injury status ( $P < .05$ ). Apathic symptoms were reported, concerning the three dimensions of apathy. Psychosocial problems, and the relatives' burden both significantly and positively correlated with loss of initiative ( $P < .01$ ) and with all dimensions of impulsivity ( $P < .05$ ), except with sensation seeking. A positive significant correlation was found between lack of perseverance on the one hand and lack of initiative ( $P < .01$ ) and loss of interest ( $P < .05$ ).

*Discussion.*—TBI patients showed, in comparison with pre-injury, a significant increase of both impulsivity and apathy. These modifications were significantly correlated with psychosocial problems and the relatives' burden. The underlying cognitive and motivational bases of these changes need to be further studied.

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### Treatment of apathy with Zolpidem (Stilnox<sup>®</sup>): Two double-blind, placebo-controlled single case studies

S. Mathieu<sup>a,\*</sup>, K. Autret<sup>b</sup>, A. Arnould<sup>a</sup>, C. Travers<sup>a</sup>, S. Charveriat<sup>a</sup>, C. Vandenhelsken<sup>a</sup>, G. Jegousse<sup>a</sup>, F. Genet<sup>a</sup>, P. Azouvi<sup>a</sup>

<sup>a</sup> *Hôpital Raymond-Poincaré, MPR Pr-Azouvi, 104, boulevard Raymond-Poincaré, 92380 Garches, France*

<sup>b</sup> *Centre Saint-Helier, Rennes, France*

\*Corresponding author.

**Keywords:** Zolpidem; Apathy; Brain injury; Evaluation; Double blind

*Introduction.*—There is to date no recognized treatment of apathy secondary to brain injury. There have been several reports of its paradoxical effect in patients with brain pathologies, showing transient but reproducible improvement in aphasia or arousal of minimally conscious patients [1]. Functional neuro-imaging revealed an improvement of regional brain perfusion.

We report here the effect of zolpidem on apathy in 2 patients with brain injury. Effects were evaluated in double-blind, placebo-controlled design, using behavioral scales and neuropsychological tests.

*Case description.*—1: 46-year-old man, 2 years after a severe right hemorrhagic stroke, showing: left spatial neglect, dysexecutive syndrome, attention disorders, incapacitating fatigability and apathy. Zolpidem allowed behavioral improvement, as shown with the Apathy Inventory, and the Inventory of behavioral dysexecutive syndrome, but without any modification of neuropsychological testing.

2: 35-year-old woman, 12 months after an anoxic encephalopathy, showing: minimally conscious state with very limited verbal and motor activity. Zolpidem allowed a behavioral improvement, as evidenced by the Coma Recovery Scale Revised, but no increase in cognitive performances.

*Discussion.*—In both cases presented, the paradoxical effect of zolpidem was very beneficial in terms of behavior, especially allowing arousal and taking initiative and leading to greater participation in daily life activities and interaction with the environment. There was, however, no significant effect on cognitive testing. These effects should be further investigated in a larger sample of brain injured patients.

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### Ecological assessment of cognitive functions in children with acquired brain injury: A systematic review

M. Chevnard<sup>a,\*</sup>, C. Soo<sup>b</sup>, J. Galvin<sup>b</sup>, C. Catroppa<sup>b</sup>, S. Eren<sup>b</sup>

<sup>a</sup> *Service de rééducation des pathologies neurologiques acquises de l'enfant, pôle de rééducation et de réadaptation de l'enfant, hôpitaux de Saint-Maurice, 14, rue du Val d'Osne, 94410 Saint-Maurice, France*

<sup>b</sup> *Murdoch Childrens Research Institute, Melbourne, Australia*

\*Corresponding author.

**Keywords:** Acquired brain injury; Child; Assessment; Cognitive; Ecological

Childhood acquired brain injury (ABI) often leads to impairment in cognitive functioning, resulting in disabilities in both the home and school environment. Assessing the impact of these cognitive deficits in everyday life using traditional neuropsychological tests has been limiting. The aims of this review were to (i) systematically review the literature in order to identify existing ecological assessments of cognitive functioning that have been used in childhood ABI; (ii) describe the identified measures in terms of their psychometric properties, clinical utility and overall advantages and disadvantages.

*Method.*—Eight databases were searched (until May 2010) for scales (tests or questionnaires) which are:

- focused on ecological assessment of cognitive functioning;
- applicable to children up to 18 years of age;
- with published data in an ABI population;
- in English. The title and abstract of all papers were reviewed independently by two reviewers.

*Results.*—Database searches yielded a total of 12,475 references, of which 15 scales met the inclusion criteria for the review, focusing on executive functions ( $n=8$ ), memory ( $n=2$ ), general cognitive abilities ( $n=2$ ), visuospatial skills ( $n=2$ ) and attention ( $n=1$ ). The tasks consisted of four tasks using observation of actual performance in a natural environment, five questionnaires and six functional “paper and pencil” type tasks, developed with ecological validity in mind. While all tests had some information on their psychometric properties, there was a lack of information in many cases. However, discriminant validity