BEHAVIOURAL OBSERVATIONS STEP 3: VIGILANCE OF NIGHT-TIME DRIVERS

E. Tse [1], S. Bao[1], M. Campbell[1], N. Carson[1], H. Hussaina[1], K.S. Maher[1], J. Jeyaratnam[1], N. Beyzaei[1],

M. Kemethofer[2], M. Seidenberger[3], K. Spruyt[4], S. Lewis[5], O. Ipsiroglu[1], G. Kloesch[2].

[1] Paediatrics, Sleep/Wake-Behaviour Research Lab, BC Children's Hospital Research Institute, Univ. of British Columbia, Vancouver, Canada;

[2] Institute for Sleep-Wake-Research, Medical University of Vienna;

[3] Austrian Automobile and Touring Club, Vienna, Austria

[4] Developmental Neuropsychology, Lyon Neuroscience Research Centre, Integrated Physiology of the Brain Arousal Systems, Universite Claude Bernard Lyon 1, Lyon, France;

[5] Medical Genetics, BC Children's Hospital and BC Women's Hospital & Health Centre, University of British Columbia, Vancouver, Canada

Introduction: Changes in vigilance experienced throughout the day depend on the quality of night-time sleep, and are characteristic features of individuals experiencing fatigue. To standardize vigilance assessments, we reviewed videos of night-time drivers with a structured rating system and investigated how untrained research assistants (RAs) rate vigilance.

Methods: Night-time driving videos of 60 adult volunteers recorded between 2 and 4 AM were provided by the Institute for Sleep-Wake-Research (ISWF, Vienna) and the Austrian Automobile Club (OEAMTC). After 30 and 90 minutes of driving, two 4.5-minute videos from 14 out of 60 participants were analyzed.

(A) RAs rated participants using the Karolinska Sleepiness Scale (KSS); these values were compared with drivers' self-ratings.

(B) Open-ended and pictogram-based behavioural descriptions of participants were made. Descriptions were separated into (i) task-oriented (i.e. driving); (ii) non-task oriented (i.e. non-driving); and (iii) posture-oriented (e.g. stretching) behaviours.

(C) For each participant, RAs predicted which video was recorded earlier.

(D) Four videos were reviewed with a Delphi consensus process, determining to what extent prepared pictograms could support analyses.

Results: (A) KSS participant and observer ratings for the earlier (median, participants: 3.0, observers: 4.25) and later recordings (median, participants: 6.5, observers: 6.1) were comparable, but not significant (Chi-square: earlier $p<0.6$; later $p<0.4$). (B) Open-ended descriptions revealed differences between the three categories of spontaneous behavior in the course of the night: task-oriented (earlier: 42%, later: 36.6%); non-task oriented (earlier: 49.5%, later: 54.8%); and posture-oriented (earlier: 8.7%, later: 8.6%) behaviours. Similar trends were found with pictogram-based descriptions: task-oriented (earlier: 39.2% to later: 31.3%); non-task oriented (earlier: 47.2% to later: 54.5%); and posture-oriented (earlier: 13.6%, later: 14.2%). (C) In 42% of cases, RAs correctly predicted which of the two videos were recorded earlier (Kappa < 0.0). (D) Discussions identified missing icons (e.g. self-stimulation) to inform future design.

Conclusion: Although RA KSS ratings corresponded to KSS self-ratings of the participants, RAs failed to identify correctly early-from late-night video recordings. This misalignment needs further investigations since spontaneous behaviour clearly changes in the course of the night, which could be found in both, open-ended and pictogram-based descriptions. Nevertheless, the pictogram design has to be developed further to support the establishment of "benchmark" behavioural patterns of differing vigilance levels for clinical observation.