Development and validation of a new neuropsychological computerised battery to evaluate cognitive function in patients with obstructive sleep apnea.

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Background: Obstructive Sleep Apnoea (OSA) is a common medical disorder characterised by repetitive episodes of upper airway obstruction during sleep, usually associated with reduced blood oxygen levels. Research has shown that OSA leads to neurocognitive impairments similar to those demonstrated following sleep deprivation (1). These neurocognitive impairments can be found in vigilance, memory, psychomotor speed, executive function, language abilities and/or visuospatial constructional abilities (2,3) and can be partially explained by varying degrees of hypoxia (tissue oxygen deprivation), hypercarbia (elevated blood carbon dioxide) and fragmented sleep.

Aims: Our main aim is to develop a new user-friendly computerised smartphone cognitive assessment that can discriminate performance between OSA patients and non-OSA control participants, and show validity between neurocognitive impairments in OSA patients and oxygen desaturation or sleep fragmentation. In the long-term, we will collect pre- and post-treatment data to measure cognitive improvements following a new intervention to treat OSA.

Methods: To ensure internal validity, we first tested 30 healthy control participants with the new cognitive assessment based on a computer vs. smartphone. The assessment measured the cognitions of attention, vigilance, inhibition and divided attention using a standardised stimulus array. The order of the computer versus smartphone versions were counterbalanced (one-week interval) and the order of the tasks was pseudo-randomised.

Results and Discussion: We found strong correlations between the computer and smartphone tasks, with no significant differences for errors and omissions variables. Reaction time was significantly different between devices perhaps due to differences in system refreshment rates and screen size, but without altering the correlation power. These results support the use of the smartphone version for detecting cognitive impairments associated with OSA.

References

1. Durmer JS, Dinges DF. Neurocognitive Consequences of Sleep Deprivation. Semin Neurol [Internet]. 2005 Mar;25(01):117–29. Available from: http://www.thieme-connect.de/DOI/DOI?10.1055/s-2005-867080

2. Olaithe M, Bucks RS, Hillman DR, Eastwood PR. Cognitive deficits in obstructive sleep apnea: Insights from a meta-review and comparison with deficits observed in COPD, insomnia, and sleep deprivation. Sleep Med Rev [Internet]. 2018 Apr;38:39–49. Available from: https://doi.org/10.1016/j.smrv.2017.03.005

3. Beebe DW, Groesz L, Wells C, Nichols A, McGee K. The neuropsychological effects of obstructive sleep apnea: A meta-analysis of norm-referenced and case-controlled data. Sleep. 2003;26(3):298–307.