

Impact case study (REF3b)

<p>Institution: University of Winchester</p>
<p>Unit of Assessment: A4 <u>Psychology</u>, Psychiatry and Neuroscience</p>
<p>Title of case study: Cognitive performance under challenging circumstances.</p>
<p>1. Summary of the impact Dr Kneller's research on cognitive performance under challenging circumstances demonstrates impact in two areas:</p> <ol style="list-style-type: none"> 1) Informing practice in diving. Kneller's research has demonstrated the effects of nitrogen narcosis on memory, and how anxiety may compound its severity. This has implications for recreational, commercial and military diving and has been recognized by diving industry sources. 2) Improving eyewitness identification within the context of crimes. Kneller's research has informed practice in the process of eyewitness identification for victims of crime. Her findings have impacted on policing practice in terms of how suspect line-ups are conducted and her expertise recognized within practitioner circles.
<p>2. Underpinning research Kneller's research on cognitive performance when diving has significant implications for safety and diving practice. One of the biggest hazards facing divers is nitrogen narcosis, the temporary alteration in consciousness caused by breathing compressed air when descending below 30-40 metres. Impairments to judgement and decision-making affected by this state pose considerable hazards for professional divers, particularly those engaged in technical activities. The research aims to better understand which cognitive mechanisms are affected by nitrogen narcosis, and how narcosis interacts with anxiety. The aim is also to provide guidelines on how to help divers recognise when they may be under the effects of narcosis, to reduce work place accidents and fatalities, and to develop practical methods by which to reduce the effects of narcosis in divers when undertaking tasks underwater.</p> <p>The underpinning research consists of four studies. This work was conducted in collaboration with Dr Malcolm Hobbs, owner of West Bay Divers in Honduras. The first (Hobbs & Kneller, 2009) explored narcosis-induced memory decrements to understand at what time performance may be impaired. The second study showed that anxiety (especially in novice divers) exacerbates performance deficits presumed to be caused by narcosis (Hobbs & Kneller, 2011). A third study was funded by the Professional Association of Diving Instructors (PADI) Foundation. It developed and tested a novel, more transportable and inexpensive physical dexterity task with which to test divers' manual dexterity and psychomotor performance (Kneller, Higham & Hobbs 2012). The fourth study used an established levels-of-processing approach and found that narcosis affects both encoding and retrieval processes (Kneller & Hobbs, 2013). These findings suggest that divers engaged in effortful cognitive tasks under water (such as locating and memorising details about mines) would benefit from strategies which lessen narcotic memory impairment.</p> <p>Kneller's research in eyewitness testimony also provides useful insights into cognitive performance under another type of challenging condition: that involved in gathering information from victims of crime. The research relates to procedures by which identification evidence is gathered by the police from witnesses to crimes. When a victim of crime is identifying a suspect, they are doing so in a usually very charged and emotional circumstance and accuracy of their subsequent recall is critical. Kneller's research here follows on from her PhD which resulted in a seminal publication on the accuracy of sequential vs. simultaneous line-up procedures (Kneller et al., 2001), which itself has been cited 41 times in PsycINFO as of 28/03/2013. Dr Kneller has continued with this research programme to investigate the veracity of video line-up procedures used by forces in England and Wales, and the use and effectiveness of the optional 'matrix' presentation, a component of the Promat line-up system (a common eyewitness identification method). The research, carried out in collaboration with Surrey Police, found that video line-ups are preferable to sequential line-ups in producing accurate decisions, and that the use of the matrix leads to no reliable change on accuracy rates (Wilcock & Kneller, 2011), indicating appropriate use of Promat software.</p>
<p>3. References to the research Hobbs, M. & Kneller, W. (2009). Effect of nitrogen narcosis on free recall and recognition memory</p>

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in open water. *Undersea & Hyperbaric Medicine*, 36, 73-81.

Hobbs, M. & Kneller, W. (2011). Anxiety and Psychomotor Performance in Divers on the Surface and Underwater at 40m (131ft). *Aviation, Space and Environmental Medicine*, 82, 20-25.

Kneller, W., Higham, P., & Hobbs, M. (2012). Measuring manual dexterity and anxiety in divers using a novel task at 35 - 41 m/115 - 135 ft. *Aviation, Space and Environmental Medicine*, 83, 54-57.

Kneller, W., & Hobbs, M. (2013). The levels of processing effect under nitrogen narcosis. *Undersea and Hyperbaric Medicine*, 40, 239-245.

Wilcock, R., & Kneller, W. (2011). A comparison of presentation methods of video identification parades. *Applied Cognitive Psychology*, 25, 835-840.

4. Details of the impact

Kneller's work investigating cognitive performance in challenging circumstances has had significant reach and importance in the two fields in which they have been applied (diving and eyewitness testimony for victims of crime). For research on diving, her findings are important in terms of safety and practice of diving. Undersea divers have to cope with numerous hazards and risks associated with marine high pressure environments. One hazard is the occurrence of nitrogen narcosis, which is experienced in deep sea dives. Narcosis causes significant cognitive and psychomotor impairments in divers, and is a significant contributing factor in diving-related accidents and impaired work-related performance. However, the study of narcosis has historically been an under-researched area and further studies are still required to establish the extent and nature of cognitive impairments at specific water depths and how its effects might be minimised. Understanding of the cognitive effects of narcosis has implications for diver safety and performance in recreational, commercial, and military diving.

Kneller's research on diving has also been particularly useful in highlighting that the anxiety felt by divers in deep water may magnify narcotic impairments underwater. At least four diving schools (West Bay Diving School, Roatan, Honduras; Big Blue, Dahab, Egypt; Nautilus Watersports, Port Vila, Vanuatu and Eastleigh Sub Aqua Club, Hants, UK) throughout the world have considered this research when evaluating their diving procedures. Additionally, it has also led to an improved manual dexterity tool for testing divers which is smaller, more easily transportable, cheaper and quicker to set up underwater than that previously used (Purdue Pegboard or screw plate test). These are important factors when considering the limited amount of time available to either train or gather data from divers underwater. This new tool is now used by the staff of West Bay Divers in Honduras when conducting deep diver training with their customers (approx. 500 per year). In addition, the research on the effects of narcosis on recall and recognition memory has shown that narcosis-induced memory decrements cannot be explained simply as an impairment of either encoding or retrieval strategies. Findings to date have been published in specialist industry-specific journals (e.g. *Undersea & Hyperbaric Medicine*) with the aim of disseminating the knowledge to the diving community and researchers in this area.

For Kneller's work on eyewitness identification, there is direct impact in policing practice. It has long been recognised that eyewitness identification evidence can be highly fallible and is a major factor in wrongful convictions in many countries (e.g. <http://www.innocenceproject.org/>). In light of this, psychologists have been studying methods to increase the accuracy of eyewitness identification performance for a number of years, including methods by which a line-up can be presented. In England and Wales, current police practice is to use identification parades on video in a semi-sequential manner. After showing the line-up twice, police have the option to show witnesses a screen with all nine line-up members at the same time (the 'matrix' format). The idea was that this format might improve line-up identification rates. However, while this format has not been formally assessed in this way, its use in another context (the simultaneous line-up) has been shown to increase false identification rates. Wilcock and Kneller (2011) found that the matrix had neither an advantageous nor a detrimental effect on identification accuracy. This work suggests that existing UK practice is appropriate (whether the matrix is used or not); it also supports best practice for administering about 50,000 Promat line-ups that are run each year in the UK. In addition, the work demonstrated that the UK video line-up procedure was superior to the sequential line-up recommended by researchers in the USA. Publication of this study led to Kneller being invited to present at a symposium for practitioners in the field held by London South Bank University in September 2012. The event was attended by 62 people, and a majority of attendees were police officers and other criminal justice system practitioners. In addition, the project has been referenced

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in a 2013 discussion article published in *Policing* (a leading policy and practice publication) by Horry et al. regarding current practice of video identification of suspects.

As a result of her knowledge and research in this area, Kneller has been commissioned (along with other members of the South East Eyewitness Network group led by Prof. Valentine) to produce a report for the British Psychological Society regarding the current evidence-base to inform best practice in obtaining identification evidence.

5. Sources to corroborate the impact (indicative maximum of 10 references)*Cognitive effects of diving—*

- Research reported in E-Slate (2009, 2011 & 2012), the on-line journal of the American Academy of Underwater Sciences (AAUS). This is a non-profit, self-regulating body dedicated to the establishment and maintenance of standards of practice for scientific diving. It publishes references to industry-relevant research. The references are: E-Slate (2009), volume 3, issue 7, page 4; E-Slate (2011), volume 5, issue 2, pages 5-6; and E-Slate (2012), volume 6, issue 3, page 6.
- Letter from West Bay Divers, Honduras confirming the impact of Kneller's work on diving practice.

Eyewitness identification—

- Feedback report and list of attendees from of the Methods for Eliciting Eyewitness Evidence symposium held by London South Bank University, September 2012.
- Email correspondence from South East Eyewitness Network group confirming involvement in British Psychological Society report.
- Letter from Prof. of Psychology, Goldsmiths University confirming impact of Wilcock and Kneller (2011) study.
- Horry, R., Memon, A., Milne, R., Wright, D.B., & Dalton, G. (2013). Video identification of suspects: A discussion of current practice and policy in the United Kingdom, *Policing* (Advance Access published March 12, 2013). doi: 10.1093/police/pat008.