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A Peer Reviewed International Journal for the Advancement of Clinical Skills - 'docendo ac discendo' - 'by teaching and learning'



In this issue:

Studying living anatomy: the use of portable ultrasound Clinical reasoning and interactive board-games Inter-professional simulation

Communicating with confused elderly patients The African Working Time Directive

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The International Journal of Clinical Skills looks forward to contributing positively towards the training of all members of the healthcare profession.

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Foreword

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Since its inception, the International Journal of Clinical Skills (IJOCS) has provided a unique platform for the teaching and learning of clinical skills in a variety of healthcare disciplines. It has become a well established peer reviewed Journal publishing a diverse range of clinical skills articles.

The Editorial Board consists of people active in the field of clinical skills teaching and this is reflected in the journals philosophy to encourage sharing of ideas and practice. Pertinent contributions aim to meet the current needs of researchers and practitioners.

Clinical skills teaching is going through a definite 'growth spurt' at present with increasingly responsive models, manikins and e-learning programmes - not dismissing financial investment that comes along with this. High quality clinical simulation is becoming more sophisticated as a teaching and learning methodology. The need to equip health professionals with the skills and competencies to improve patient-safety is one of the drivers behind this growth. However, alongside the purchase of the 'Sim'-men/women/babies and linked e-learning, let's not forget the importance of personal

interactions through faculty support, i.e. experienced clinical teachers. In addition, simulated patients and the delivery of interprofessional sessions, bring clinical simulation closer to the realms of reality and validity, for both undergraduate and postgraduate health professionals.

The use of simulated patients, relatives and carers is well established in clinical communication education. More recently, additional interesting and innovative approaches to clinical communication teaching are in various stages of substantive core curricula and special study activity across medical schools in the UK.

The IJOCS is now established in the world of clinical skills publications by providing a niche specific arena that welcomes quality research, thereby promoting excellence in healthcare internationally. The wide range of papers covering research, discourse and reflection in clinical education and practice, plus the inclusivity of interprofessional approaches in one publication, raises the validity of this journal. There remains room for research based evidence to support teaching and practice of patient-centred clinical learning. The IJOCS welcomes additions to the literature that encourage critical debate.

Without doubt, the International Journal of Clinical Skills has continued to exceed its original ambitions and I wish it growing success.

Time Cill

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Use of a secondary task paradigm to measure medical student's mental workload during a simulated consultation

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Abstract

The mental workload of medical students was measured using a secondary task methodology with the aim of investigating whether their mental workload exceeded their mental capacity during a simulated consultation. A method previously used to measure the workload of anaesthetists during simulated anaesthesia was applied successfully. The results suggest that mental workload is likely to be a limiting factor in the performance of medical students and that under these conditions poor communication may not be due to poor communication skills.

Introduction

Mental workload is a term often used to describe the amount of mental effort involved in performing any given task. Assuming that there is a limit to the rate at which information can be processed by the human mind (mental capacity), mental workload is the proportion of this capacity in use at any time and will vary depending on the demand and difficulty of the task in hand [1].

The measurement of workload is considered important in fields such as aviation and nuclear power, and more recently medicine, because of its' implications for safety, staffing levels, and the effects of automation [2]. Jordan noted:

"Mental workload is a measure of efficiency that has been widely used in assessing the usability of products where the time in which to carry out tasks is fixed and where error rates are low. This includes, for example, in-vehicle systems, systems in aircraft and control panels for safety critical processes. The higher the level of mental workload when driving a car or operating a nuclear power plant, the greater the likelihood of an error occurring" [3].

Workload can be assessed concurrently in real-time using several different methods [4]. These include:

- 1. Procedural the demands of the task, for example, the number of items of information delivered or the number of decisions made.
- 2. Psychological the subjective rating of workload, usually using a questionnaire completed by each subject at the end of the procedure.
- 3. Physiological the response of the subject to the task, for example, heart rate, sweating or pupil dilation.
- 4. Secondary task

The secondary (subsidiary) task paradigm [5] superimposes a minimally intrusive second task, the performance of which is easily measured, on the primary task under study (i.e. administering anaesthesia or flying a plane). The chief problem with this technique is finding a secondary task that can be repeated often, is acceptable to operators and is not intrusive. Examples include simple mathematical problems [2], latency of response to vigilance lights [2], and record keeping [6].

Under normal conditions, the primary and secondary tasks can be completed to a high standard. However, if the workload associated with the primary task approaches capacity, performance on a secondary task will deteriorate. Therefore, if a subject's secondary task performance is monitored, any decrease is therefore likely to be due to excessive mental workload [7].

The stimulus to this study was the observation that students who demonstrated excellent communication skills during informal sessions sometimes became grossly insensitive during more challenging sessions. Our thesis was that the problem was excessive mental workload due to the multiple, competing tasks, for example, asking questions, listening, thinking of the next question on the list and formulating a hypothesis.

The aim of this study was to repeat a methodology used to assess the performance of trainee anaesthetists during a simulated anaesthetic crisis [8] to determine whether excessive mental workload was present or not. While this methodology has been used to measure mental workload during skilled tasks such as laparoscopy [9], anaesthetic emergencies [10] or the workload of primary care physicians [11], it is not yet established as a tool for measuring communication skills.

Methods

Following ethical approval, volunteers were sought from 2nd year Graduate Entry Medical Students at Swansea University. The research was conducted outside of their allocated curriculum time. No personal data was recorded and all files were allocated a number.

A small wireless device was strapped to the subjects arm using a soft material strap and holster. A computer programme designed by one of the research team (MO), randomly generated a signal every 10 - 30 seconds. The signal was sent via *Bluetooth*TM to the device, causing it to vibrate; the vibration was terminated by pressing a trigger button on the device. The time of stimulus delivery and subject response time were logged automatically throughout the study period.

During a 5 minute *baseline period* the student was given time to become accustomed to the device and to read background information on the simulated patient.

The experimental period began with a simulated patient's entry into the consulting room. Each student was given 5 minutes to complete a simulated consultation, after which time the patient left the room.

During the following 5 minute *wash out period*, the student was allowed to relax and was debriefed on the scenario. The wireless device was then removed and the data collection terminated.

The simulated patient was an actor and was asked to play a patient who had been recalled to fracture clinic following a failure to identify a fracture at an initial presentation a week earlier. The patient's consultation had been delayed and he was having to take time off work. Each subject was required to explain that a further x-ray was needed and that a plaster would be required for the next 6 weeks. The actor was instructed to be annoyed at the delay in diagnosis and need for immobilisation. Overall, the scenario was similar to those normally experienced by students during their weekly clinical skills teaching and designed to be taxing, but not threatening.

The aim of the study was to investigate whether there was a significant change in response times during the *experimental* period of the study compared with the *baseline and wash out* periods. As explained, prolongation of the response times would be taken as evidence of excessive mental workload.

Statistical analysis used Wilcoxon Signed Ranks Test (Microsoft SPSS 16.1.) to compare response times during the baseline period and the experimental period (pair 1) and between the baseline period and the washout period (pair 2). The null hypothesis was that there should be no difference between the three periods.

Results

Nine subjects completed the experimental protocol. In each case the subject and actor interacted as expected and all data were captured by the computer as planned.

During the *baseline period*, the mean response time of subjects remained consistently low with a mean of 546.34 milliseconds (ms). The recordings of all subjects are shown in Figure 1.

Figure 1: Data for all subjects (n = 9)



During the experimental period, mean response times increased to a mean of 700.89 ms. However, it was clear that the response times of a few subjects increased markedly while others remained low. When shown as mean response time in each of the three periods, all but one of the subjects showed an increase in response times during the experimental period, shown in Figure 2.





During the *washout period*, mean response times decreased to a mean of 569.91 ms with a marked decrease in variability, similar to the *baseline period*. When analysed separately, each subject showed either a stable, low response time, or showed short periods of prolonged response time, with three examples shown in Figure 3.

Figure 3: Data from three subjects



Statistical analysis showed that there was a significant difference between baseline and experimental periods (Z = -2.547, p < 0.011) but that there was no significant difference between baseline and washout periods (Z = -1.125 significance p < 0.260).

Discussion

The communication skills of doctors have often been criticized as being poor and this has been linked to later, poor professional performance [12]. This has often been blamed on a deficiency in the skills identified in guides such as the Calgary-Cambridge Guide [13].

Using this paradigm, the failure of a doctor or student to communicate effectively equates to a deficiency in these communication skills. The remedy for this deficiency is then easily identified as an increase in curricular time devoted to communication skills or their examination. Indeed, a recent commentator suggested that "we may need to make examinations more modular and make it mandatory for students to pass the communication skills component" [14].

However, the data presented here suggest a more complex problem. Some of those studied showed a marked decrement in their secondary task performance during the simulated consultation, which suggests that their mental workload was exceeding their capacity.

This finding is perhaps surprising, as the task was not designed to be particularly difficult and the students under study had been taking histories from actors for over 12 months. The inference from these data is that taking a structured history from an actor, or a patient, is not a simple process, but one that requires considerable mental workload. Further, it seems likely that excessive mental workload is a far more common problem in the clinical environment than has been previously recognised. Indeed, in the real, clinical environment where time pressure, emotion and fear of failure are likely to be markedly increased, mental workloads may be far higher, even for experienced clinicians.

If true, the solution to a doctor's poor communication skills may not be an increase in communication skills training. It might equally be that more training in the structural process of history taking would reduce the mental workload of a doctor and allow them to use their already effective communication skills.

It must be accepted that this is a small pilot study and that the results cannot be extrapolated to the clinical environment until the technique has been formally evaluated. In particular, it is possible that the delay in responding to the stimulus could be due to some unidentified factor.

However, similar methods have been used in other areas, for example, to measure the effect of introducing an interactive whiteboard into an emergency department [15], performance during simulated laparoscopy [16] or the workload of Spanish physicians [11].

In addition, the baseline and stressed results were similar to the times recorded under baseline conditions, 683 ms and 961 ms, in

a previous study using the same methodology [8]. The increase was greater in that study which featured a clinical scenario of patient collapse, rather than the consultation studied here.

Schuwirth and van der Vleuten [17] have suggested that the reduction of clinical performances into their component knowledge, skills and attitudes for assessment can compromise the validity of those assessments. We would suggest that mental workload may provide unique insights into performance that may assist both the teaching and assessment of complex skills such as communication.

In conclusion, this is the first study we are aware of that has measured the mental workload of students using an objective test of mental workload. The data suggest that the mental workload of some of the students observed exceeded their capacity and that this was likely to be a limiting factor in their performance.

This is a new area for medical research and may suggest that we need to view the performance of clinicians in a more complex and holistic way if we are to improve performance.

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