

## Fit for Duty: Research Methodologies Shedding Light on the Health Status of Paramedics and Effects on Job Performance

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### **Introduction**

We have been invited to provide commentary on the wellbeing of paramedics. SW as an operational paramedic, and SM as an academic paramedic researcher.

An increase in capability and community expectation coupled with an increase in demand has placed both external and internal pressures on paramedics (1, 2). Where paramedic performance is measured, paramedic wellbeing has been less considered (3). Ongoing caseloads, daily exposure to human suffering and continual shift extensions or missed meals can cause a physical and an emotional toll (1-3).

A recent review of paramedicine personnel determined that paramedic stress and burnout are among the highest within the emergency service network when compared with police and fire (4, 5). Further data conclude that ongoing exposure to traumatic events coupled with broken rest can lead to psychological impairment (6, 7).

Although resilience in paramedic staff is a testament to the professions character, the increasing operational demand, lack of apparent regard for operational fatigue management, and ongoing traumatic exposure will likely negatively impact paramedics' capacity to respond with ideal performance (8-10). The question arises of how to measure these intrinsic factors in paramedics; which might be contributing to fatigue, decreased resilience, and burnout.

The demands of paramedic job performance are influenced by a multitude of factors, many which have not received extensive attention in the literature. What is known is that the demands of this role can be physical, emotional (11) and cognitive(12). With high rates of injury, and many markers of poor health present in paramedics (4, 13, 14). An as yet underexplored area are the links between job performance, physiological response and resilience. There is also growing evidence that paramedics risk developing work-related health problems such as post-traumatic stress disorder (PTSD) (13, 15, 16) and may not have longevity in their career compared with other health occupations(17, 18). This was the impetus for the "Fit for Duty" research project recently completed by Sandy, studying New South Wales Ambulance paramedics in this region of Australia.

### **Research *in situ***

Paramedic care to the population of 7.8 million people in New South Wales is delivered by the state government organisation: NSW Ambulance. In the 2015/16 reporting period, the service responded to 1,115,635 requests for service. This was

an average of 3,048 responses per day(19). The service employs over 4,500 staff, most of whom are paramedics reporting to work in either of the two distinct geographic rostering areas: metropolitan and regional.

Given the present research on paramedic health, researchers were interested in exploring two questions: Does being a paramedic affect health status and does health status affect being a paramedic. Results to the first question were derived from a self-reported survey of NSW Ambulance paramedics (n=747) exploring how they viewed their health status. These results were compared to normative data from the Australian population and have recently been published in the Irish Journal of paramedicine (20) The full article can be viewed here

<http://irishparamedicine.com/index.php/ijp/article/view/109/245>.

## Methodology

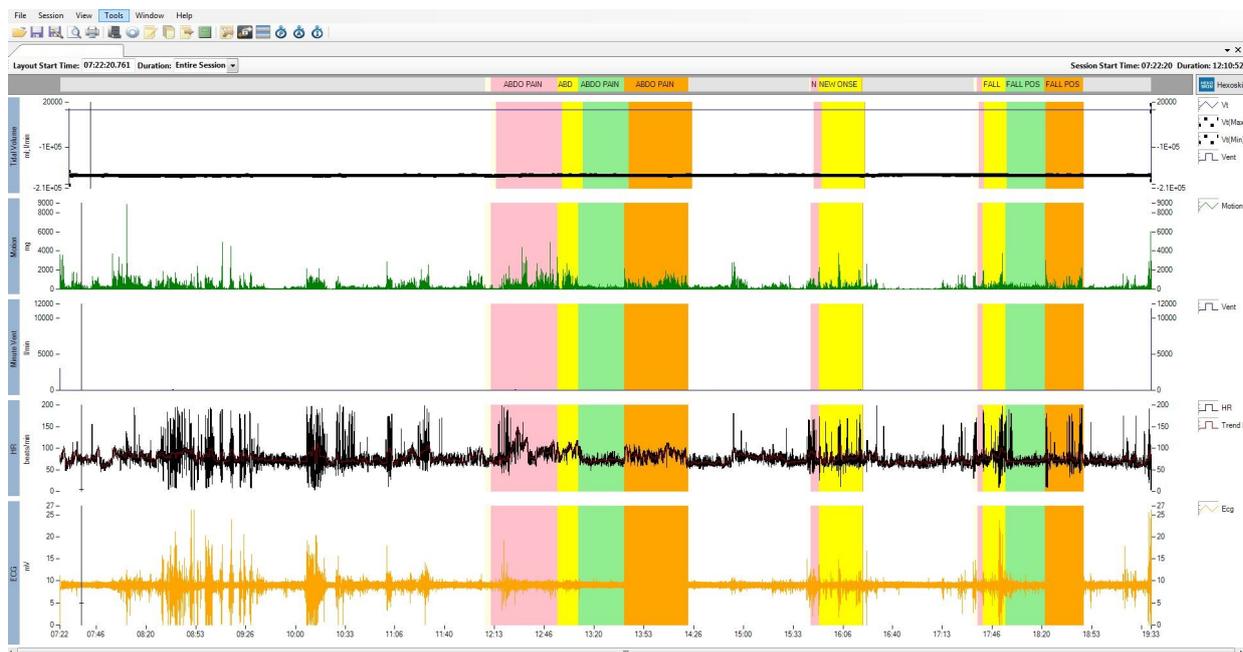
In developing methodology to address the second question (*does health status affect being a paramedic?*), researchers employed a unique approach to studying paramedics' (n=32) physiological responses to emergency calls. Smart textiles (the Hexoskin biometric shirt) were employed to monitor performance (see Figure 1).



**Figure 1:** Hexoskin biometric shirt worn under paramedic uniform continuously records heart rate, respiratory rate and volume, steps, energy expenditure and g-force production.

This examination of the demands of paramedic job performance served to establish a descriptive profile of occupational task performance. Paramedics' heart rate (HR) and respiratory rate (RR) were continuously recorded before, during and after

emergency calls. Self-reported measures of blood pressure (BP) and Rate of Perceived Exertion (RPE) were also recorded. Researchers also conducted maximal cardiorespiratory fitness testing on 14 of the 32 to establish VO<sub>2</sub> max and heart rate max. And in a novel approach to researching paramedics, a tri-axial accelerometer recorded levels of Occupational Physical Activity (OPA) (expressed as g-force) during emergency calls (including cardiac arrest calls) and throughout shifts. All these data were correlated with calls attended to establish trends and examine linkages to variables (e.g. age, gender, level of certification, Body Mass Index, shift type (day or night), Priority Code, and chief complaint using Vivosense software (see Figure 2).



**Figure 2:** One paramedic shift showing HR, RR and g-force data merged with call data. Stages of the calls are colour coded (Assignment- cream, Enroute- pink, On Scene- yellow, To Hospital- green, and At Hospital- tangerine).

Over a 6 month period, these paramedics in metropolitan and regional postings completed over 230 shifts, responding to almost 1,000 emergency calls. With part of this project aiming to define the context of paramedic job performance; the data revealed interesting findings not yet explored in previous research on paramedics *in situ*. Comprehensive findings will be reported on in future articles. For the moment, technology in measuring paramedic physiological performance has met a growing willingness to explore paramedic wellness and resilience.

Our modelling identified trends in paramedics that elicit significant physiological changes and an accounting of the occupational physical activity levels. Paramedics on shift may not be as consistently physically active as thought, but are still subjected to intermittent physical demands that are significant (for example CPR performance). It appears that posting, Body Mass Index and call type will influence

physiology. Importantly, cardiorespiratory fitness appears to have a significant attenuating effect during shifts and calls.

### **Conclusion:**

Whilst the operational demands on paramedics are likely to follow contemporary trends and continue increasing; paramedics will continue to respond accordingly to meet this challenge. However, the increase in operational demand, coupled with the ongoing development of advanced pre-hospital clinical skills places operational paramedics under significant stressors. The intrinsic factors experienced by paramedics are likely contributing factors to fatigue, low resilience and burnout. It is therefore imperative that we understand how paramedics respond physically and cognitively to deal with the demands of the job. This project has a team comprised of paramedics, paramedic researchers, ambulance service management and exercise physiologists. In order to fully explore, understand, and inform these findings will take the willingness of these parties in remaining committed to improving paramedic health. Paramedic services and paramedics need to value the health of the paramedic provider and future research must be supported to continue exploration of this complex issue and what it will mean for the future profession and workforce.

1. Armitage E. Role of paramedic mentors in an evolving profession. *Journal of Paramedic Practice*. 2010;2(1):26-31.
2. Mahtani KR, Eaton G, Catterall M, Ridley A. Setting the scene for paramedics in general practice: what can we expect? *J R Soc Med*. 2018;111(6):195-8.
3. Gayton SD, Lovell GP. Resilience in Ambulance Service Paramedics and Its Relationships With Well-Being and General Health. *Traumatology*. 2012;18(1):58-64.
4. Maguire BJ, O'Meara P, Brightwell R, O'Neill B, Fitzgerald G. Occupational injury risk among Australian paramedics: an analysis of national data. *Med J Aust*. 2014;200(8):4.
5. Varker T, Metcalf O, Forbes D, Chisolm K, Harvey S, Van Hooff M, et al. Research into Australian emergency services personnel mental health and wellbeing: An evidence map. *Aust N Z J Psychiatry*. 2018;52(2):129-48.
6. Bradford A. Life in recovery: Rebuilding from trauma. *Int J Trauma Nurs*. 2002;8(3):70-5.
7. McFarlane AC. The long-term costs of traumatic stress: intertwined physical and psychological consequences. *World psychiatry : official journal of the World Psychiatric Association (WPA)*. 2010;9(1):3-10.
8. O'Meara P, Boyle M. From roadside to hospital: A pilot study to investigate the factors influencing the time taken to deliver trauma patients to the hospital. *Australasian Journal of Paramedicine*. 2008;6(3):12.
9. Scully PJ. Taking Care of Staff: A Comprehensive Model of Support for Paramedics and Emergency Medical Dispatchers. *Traumatology*. 2011;17(4):35-42.
10. Woollard M. The role of paramedic practitioner in the UK. *Australasian Journal of Paramedicine*. 2015;4(1):1-9.
11. Blau G, Bentley MA, Eggerichs-Purcell J. Testing the impact of emotional labor on work exhaustion for three distinct emergency medical service (EMS) samples. *Career Development International*. 2012;17(7):626-45.

12. LeBlanc V, MacDonald R, McArthur B, King K. Paramedic performance in calculating drug dosages following stressful scenarios in a human patient simulator. *Prehosp Emerg Care*. 2005;9(4):6.
13. Sterud T, Oivind E, Hem E. Health Status in the ambulance services: a systematic review. *BMS Health Services Research*. 2006;6(82):10.
14. Studnek JR, Bentley M, MacCrawford J, Fernandez AR. An Assessment of Key Health Indicators among Emergency Medical Services Professionals. *Prehosp Emerg Care*. 2010;14(1):14-20.
15. Halpern J, Maunder RG, Schwartz B, Gurevich M. Identifying, describing, and expressing emotions after critical incidents in paramedics. *Journal of Traumatic Stress*. 2012;25(1):111-4.
16. LeBlanc V, Regehr C, Birze A, King K, Scott AK, MacDonald R, et al. The Association Between Posttraumatic Stress, Coping, and Acute Stress Responses in Paramedics. *Traumatology*. 2011;17(4):10-6.
17. Rodgers LM. A five-year study comparing early retirements on medical grounds in ambulance personnel with those in other groups of health staff. Part 1: incidences of early retirements. *Occup Med*. 1998;48(1):7-16.
18. Rodgers LM. A five-year study comparing early retirements on medical rounds in ambulance personnel with those in other groups of health service staff. Part 2: causes of retirements. *Occup Med*. 1998;48(1):19-32.
19. NSW Ambulance. *NSW Ambulance Year in Review*. Sydney, Australia: NSW Ministry of Health; 2016.
20. MacQuarrie A, Robertson C, Micalos PS, Drinkwater EJ, Crane J, High R, et al. Fit for duty: the health status of New South Wales paramedics. *Irish Journal of Paramedicine*. 2018;3(2):1-10.