

Review

Emergency care education in South Africa and the unique requirement of physical preparedness: A scoping review

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<https://doi.org/10.33151/ajp.18.878>

Abstract

Introduction

The Bachelor of Health Sciences Degree in Emergency Medical Care (BEMC) is a unique program in that students operate in both emergency care and rescue contexts, unlike international paramedic degree programs which focus only on emergency care. The learning activities associated with the rescue content are physically strenuous and therefore BEMC students need to be physically and mentally prepared to engage in diverse austere environments. Although South African BEMC programs have a common medical rescue curriculum, approaches to the training and assessment of physical preparedness vary between the institutions. The objective of this research was to explore the knowledge gap through the review of literature that describes the unique physical preparedness requirements in the field of emergency care education.

Methods

We conducted a scoping review in the form of a narrative literature review.

Results

Seventy-five (n) articles were initially identified, however, only four were relevant to the objective of this study. This highlighted the paucity of literature describing the unique physical fitness requirements of the BEMC program and the current challenges experienced by educators in the field.

Conclusion

While physical preparedness training exists in higher education institutes and there are assessments conducted at these higher education institutes, none of these assessment tools have yet been scientifically validated which creates a challenge for educators. The current knowledge gap within EMC education is therefore the absence of a scientifically validated task-oriented physical preparedness assessment tool which addresses the desired physical attributes and abilities of EMC students linked to the BEMC curriculum and associated learning experiences.

Keywords:

paramedic; emergency medical care; physical fitness; physical performance; physical tasks; occupational fitness; fitness for duty; physical training

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Introduction

Since their inception in the late 1980s, emergency medical care (EMC) programs offered by South African higher education institutions (HEIs) have included a focus on physical fitness. This appears either as a selection criterion and or as a part of the program itself. In South Africa, there are three EMC programs which lead to professional registration with the Health Professions Council of South Africa (HPCSA) Professional Board for Emergency Care (PBEC). These are: a one-year Higher Certificate in Emergency Medical Care (NQF 5), a two-year Diploma in Emergency Medical Care (NQF 6) and a four-year Bachelor of Health Science Degree in Emergency Medical Care (NQF 8) (1). The National Qualifications Framework (NQF) provides a framework within which the South African qualifications system can be constructed to represent a national effort at integrating education and training (2). Of the three, the Bachelor Degree in Emergency Medical Care (BEMC) is the longest standing qualification.

The BEMC program produces clinicians who are competent in the knowledge, attitude, insight and skills required to function both in emergency medical care and medical rescue contexts. The dual nature of South African BEMC programs is unique in that most international paramedic 'degree' programs focus only on emergency care and do not include training in medical rescue (2). In contrast, South African BEMC graduates are prepared to operate in both emergency care and rescue contexts. Consequently, the BEMC program features several medical rescue modules. These include high angle rope rescue; motor vehicle rescue; fire search and rescue; industrial and agricultural rescue; wilderness search and rescue; aquatic rescue; aviation rescue; hazardous materials rescue; confined space rescue; trench rescue and structural collapse rescue (2).

Participating in learning activities associated with the above-mentioned rescue modules is a physically strenuous undertaking. Consequently, BEMC students need to be physically fit, active and healthy individuals who are physically and mentally prepared to engage in diverse austere environments (3). This said, although all South African BEMC programs have a common core medical rescue curriculum as described above, approaches to the training and assessment of physical fitness vary between institutions. These differences have become the focus of ongoing debate.

An important starting point for those wishing to engage in debate around this topic is the development of a shared common understanding relating to the differences between physical fitness, physical preparedness and physical activity. These terms (in the vocational context of emergency care and rescue) have historically been used interchangeably. However, each has a specific definition. Physical activity consists of any bodily movement which is produced by the contraction of skeletal muscles resulting in an increase in caloric requirements. Exercise is a type of physical activity which consists of a

planned, structured repetitive movement in order to improve or maintain the components of physical fitness (4). Physical fitness is largely defined as a state of good health and the ability to perform sports, occupations and daily activities (5). Physical fitness may be broadly divided into two categories: a) general physical fitness which refers to an individual's general state of health and wellbeing and b) sport or task-oriented fitness (6). Task-oriented fitness deals with the degree to which an individual is able to cope with the physical demands of their chosen profession without excessive fatigue (6). In this article, we introduce the term 'task-oriented physical preparedness' which is to be read as an overarching term that includes physical and task-oriented fitness.

The above definitions aside, there remain divergent views about the extent to which university students should be engaging in activities that promote physical preparedness. Some academics see physical training as a non-academic, low order psychomotor skill. Consequently, concern arises that the development and or assessment of physical preparedness does not speak to the higher education level and associated outcomes of a degree qualification. While the analysis of physical fitness about its credit value, NQF level and associated cognitive and psychomotor complexity continues to be debated, there is overwhelming scientific evidence that supports the need for all individuals within the EMS context to possess the physiologic capacity to perform normal everyday activities safely, independently and without excessive fatigue (7,8). Previous literature highlights that levels of physical preparedness should be such that individuals can manage their work related tasks comfortably and efficiently, leaving sufficient energy to enable leisure activities and any unforeseen emergencies (7,9). Another well-accepted benefit of being physically fit is the positive impact it has on an individual's overall health in order to avoid injury and illness (10). Improving the physical preparedness for emergency care providers has been shown to lessen the injury rates or health risks associated with the operational tasks and reduce the severity of the injuries (11-13). Thus, by implication, if an EMC student is to operate effectively (and most importantly safely) in the emergency medical care and medical rescue environments, they would need to possess certain minimum levels of physical preparedness to undertake these physically demanding tasks (3).

Besides the known benefits of being physically prepared as described above, there are equally well known consequences associated with poor levels of physical preparedness. These include increases in the risk of injury and illness among emergency care providers acquired during the performance of their operational duties (11). Work-related injuries and illnesses are problematic in that they have the potential to negatively affect, not only the emergency care provider, but also their colleagues and members of the public they are there to assist (14). By extrapolation, for a BEMC student to operate effectively and safely in the emergency medical care and medical rescue environments, they too would need to possess certain minimum

levels of physical preparedness (3). Basically, BEMC students who are unfit and unable to perform tasks as required by the curriculum may not only experience problems with academic success and progression but may also encounter challenges with their general health and wellness as well as delivering an acceptable level of patient care (15,16).

Taking the above into account, determining the exact nature of task-oriented physical preparedness for specific cadres of professionals becomes important. This is however not as easy as one would assume for although task-oriented physical preparedness requirements of firefighters, police officers and emergency care providers are well documented and several validated physical preparedness assessments for these emergency responders exist (17-20), there is currently no literature describing the components of physical fitness or the levels of physical preparedness required by BEMC students. The absence of physical preparedness guidelines is problematic in that BEMC students engage in both emergency medical care and medical rescue. An additional challenge facing South African BEMC educators is that, although their students must meet physical preparedness requirements to safely and successfully engage in the BEMC program, there is currently no validated way of assessing a student's level of physical preparedness specific to the activities associated with the BEMC program.

In summary, there are neither international nor national guidelines that speak to the physical preparedness requirements of an individual that is required to undertake both emergency medical care and medical rescue as part of their academic program and or operational duties. While some international guidelines speak to minimum physical preparedness requirements for operational emergency care providers, fire fighters and police officers (21-24), the same is not true for BEMC students. There is a paucity of literature describing the unique physical fitness requirements of the BEMC program and the current challenges experienced by educators in the field. There is an urgent need for additional work and research focussing on benchmarking approaches to the development of physical preparedness for South African BEMC students, including the validation of associated assessments.

Objectives

Before this study, little or no published literature existed that accurately described the uniqueness of South African emergency medical care programs about their medical rescue components and the associated requirement of physical preparedness. The objective of this research was to explore this knowledge gap through the review of literature that describes the unique requirement of physical preparedness in the field of emergency care education and highlight the current challenges experienced by educators with regard to the absence of validated standardised assessment strategies.

Methods

A non-systematic, narrative review of the literature was conducted. Literature was identified by searching the predetermined electronic databases PubMed, ResearchGate and ScienceDirect. Along with the principle search strategies, reference lists from existing sources were also utilised to identify other probable publications that may not have been identified during the primary literature search of the electronic databases.

Search terms included terms and combination of terms, relating to the physical preparedness of emergency care personnel. The search terms were 'physical fitness', 'operational readiness' and 'physical preparedness'. Other search terms included words such as 'paramedic', 'emergency care provider', 'emergency medical care student', 'firefighter', 'police' and 'military'. These terms were searched for together using the Boolean terms 'AND' and 'OR' during the literature search.

Eligibility for inclusion was based on the following criteria: all literature was accessible in English, the full text version of the article had to be accessible and the studies had to be focussed on adult humans. Due to the paucity of literature on this topic, no date range was set and both peer and non-peer reviewed articles were considered relating to the search terms. In addition, policy documents from the regulatory authorities within South Africa were also included to provide context. Literature which did not comply with the above inclusion requirements was excluded.

The abstracts of the articles were reviewed for relevance to the objective of the study. In total, of the initial 75 (n) articles that were identified only four were found to be specifically relevant to the objective of this study. Although many articles were found that addressed physical fitness in emergency care providers, police and firefighters, these were all specific to the operational work environment and not related to the unique objective of this study.

Results

The four articles were all quantitative in nature, however only one of these articles related directly to the study objective as it addressed the implementation of a physical training program as part of the education and training program for paramedic students. Due to the virtual absence of peer-reviewed scientific publications, policy documents, learner guides and minimum standards documents were also consulted in the production of this manuscript. Table 1 summarises the main results of these studies.

Discussion

All EMC programs presented at HEIs are accredited by various regulatory bodies inclusive of the PBEC, Council on Higher Education and to a certain degree the Department of Higher Education and Training (25,26). The programs also need to

be compliant with the South African Qualification Authority requirements for registration of qualifications on the NQF (2). The education and training of emergency care providers is regulated by the HPCSA and HEIs wishing to offer the BEMC program are required to comply with the minimum standards of the qualification as stipulated by the PBEC (26-28). While they now enjoy the same legitimacy and credibility, emergency care programs including the BEMC are new arrivals on the South African higher education landscape and do not have as long a history as medicine, nursing and related health science programs. Therefore, postgraduate studies and research into emergency care education in South Africa is still in its infancy. This may in part account for the limited published literature that could be found focussing on this area.

The scoping review revealed that South African EMC students registered for BEMC programs are exposed to several different disciplines and learning environments due to the inclusion of medical rescue within their program. During their studies, BEMC students are required to participate in both pre-hospital and in-hospital clinical work involving patient care. This is supplemented by on and off campus simulated learning experiences often in the form of combined emergency care and medical rescue scenarios. Examples of such learning experiences would include scenarios and practical exercises focussing on rescue incidents in environments such as wilderness rescue, water rescue, confined space rescue, rope rescue and fire search and rescue. This means that an individual registered for the BEMC program would need to possess and or acquire those physical abilities and attributes to safely and efficiently participate in each of the

diverse environments they would encounter during the course of their training and on graduation (13,29-33). This diversity is unique to the BEMC program, compared to a lifeguard, emergency care provider, firefighter or police officer which require to be physically prepared for a very focused job task with set physical demands that are well documented.

The importance of physical preparedness in the BEMC program is emphasised in both the South African Qualification Authority exit level outcomes as well as the PBEC minimum standards document (2,26). Current practice in South Africa is that all four of the HEIs offering the BEMC program ensure that the EMC students undergo some form of physical preparedness training. At three of the HEIs, the students register for a physical preparedness module as part of the academic program where periods of the academic timetable have been specifically allocated to physical training. All the HEIs offering the BEMC program do however ensure that the students undergo a physical preparedness assessment in order to ensure that their students are suitably prepared to undertake the emergency medical care and medical rescue modules safely and efficiently. However, these assessments are not standardised and most are not geared to address the specific physical preparedness requirements and components of fitness linked to this very unique program (Table 2). One study indicated that there is no literature available to determine whether the current physical preparedness programs and assessments adequately address the needs and physical preparedness requirements of the EMC student (34).

Table 1. Summary of articles

Title	Author, year	Country	Population	N	Studies	Peer-reviewed
Physiological response of emergency care students during a simulated extrication of a patient trapped in a light motor vehicle – implications for exercise testing	Parr, 2009	South Africa	Emergency medical care students	20	Simulated extrication of a patient trapped in a light motor vehicle	Yes
Physical performance characteristics of South African male and female emergency care students	Davies, 2008	South Africa	Emergency medical care students	38	The differences in physical work capacity of male and female emergency care students	Yes
Do EMS college students fit enough for the future occupational?	Aljaloud, 2018	Saudi Arabia	Emergency medical services students	139	Assess occupational physical fitness via three assessments	Yes
Physical fitness of paramedic students during vocational training – a follow-up study	Paakkonen, 2018	Finland	Paramedic students	40	Measured maximal oxygen consumption and muscle strength at baseline and one year follow-up	Yes

Implementing a validated task-oriented physical preparedness assessment can be achieved through a process referred to as a 'physical employment standard' (PES). A PES identifies a minimum level of physical preparedness which is required in order to perform critical and essential profession specific tasks (35). The process of establishing a PES includes conducting a job analysis to identify the physical demands associated with the key operational tasks; developing safe and reliable simulations of these tasks that represent the actual job; establishing the efficacy if using selection tests and/or generic fitness tests to assess personnel; and proposing an evidence-based PES. Although literature exists on the development of a PES for firefighters and paramedics, there is currently no PES that has been conducted taking into consideration the physical demands associated with the BEMC program (36,37).

Taking the above into account, it is logical that HEIs offering EMC programs are responsible for the training and assessment of their students' levels of task-oriented physical preparedness. Fulfilment of such a responsibility becomes problematic in the absence of a scientifically validated tool to inform and guide such assessments.

Conclusion

This scoping review showed that, although South African BEMC programs have been around for some time there is little research and literature describing local EMC education and training. BEMC programs in South Africa are unique programs in that they include components of medical rescue, thus requiring

students to be physically prepared. While a historical focus on physical preparedness has always existed in HEIs offering EMC programs and physical fitness assessments are conducted, none of the assessments currently used have yet been scientifically validated. This knowledge gap becomes a source of ongoing debate within EMC education locally. There is a need for further research around the development of a scientifically validated task-oriented physical preparedness assessment tool for South African EMC students.

Competing interests

The authors declare no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

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Table 2. Current physical preparedness assessments (2,3,26)

HEI	Physical preparedness assessment components
HEI 1, 2, 3	<p>Students register for a physical preparedness module and engage in formal rostered physical training sessions weekly as part of the academic timetable</p> <p>This physical preparedness assessment is currently utilised by three of the HEIs offering the BEMC program, and the assessment makes use of absolute standards</p> <p>Swimming competency is assessed via a 200 m swim within a maximum time of 6 minutes</p> <p>There is then a mandatory 15-minute rest period</p> <p>Cardiorespiratory endurance is assessed via a 5 km run within a maximum time of 32 minutes and 30 seconds</p> <p>There is then a mandatory 15-minute rest period</p> <p>Muscular endurance is assessed via a 30 second flexed arm hang test</p>
HEI 4	<p>Students do not register for a physical preparedness module and or engage in formal rostered physical training sessions as part of the academic timetable</p> <p>This physical preparedness assessment is currently utilised by one of the HEIs offering the BEMC program, and the assessment makes use of normative standards based on age and gender</p> <p>Push ups to exertion</p> <p>Sit-ups (1-minute)</p> <p>Multi-stage fitness test (beep test)</p> <p>Basic swimming proficiency:</p> <ul style="list-style-type: none"> • float on back for 2 minutes • float on front with face submerged for at least 30 seconds • tread water for 5 minutes • swim 50 m unaided

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