

**TEACHING STRATEGIES****The stress paradox: How stress can be good for learning**Joy R. Rudland<sup>1</sup>  | Clinton Golding<sup>2</sup> | Tim J. Wilkinson<sup>3</sup><sup>1</sup>Education Unit, University of Otago, Wellington, New Zealand<sup>2</sup>Higher Education Development Centre, University of Otago, Dunedin, New Zealand<sup>3</sup>Education Unit, University of Otago, Christchurch, New Zealand**Correspondence**

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**Abstract****Context:** This article explores the myth that stress is always bad for learning. The term “stress” has been narrowed by habitual use to equate with the negative outcome of *distress*; this article takes an alternative view that ultimately rejects the myth that demonises stress. The avoidance of *distress* is important, but a broader view of stress as something that can have either positive or negative outcomes is considered.**Proposal:** We propose that stress is important for learning and stress-related growth. We explore the little-mentioned concept of *eustress* (good stress) as a counter to the more familiar concept of *distress*. We further consider that the negative associations of stress may contribute to its negative impact. The impact of stress on learning should be deliberately and carefully considered. We offer a hypothetical learning journey that considers the cause of potential stress, a stressor, and how a stressor is moderated to result in stress that may influence learning either by positively challenging the learner or by functioning as a hindrance to learning.**Conclusions:** In thinking more positively about stress, health professional educators may better support the student's learning journey.**1 | INTRODUCTION**

This paper explores the common assumption that stress is bad for learning. We first describe how psychology, education and studies in occupation have used the broad term “stress” and then how this term has been narrowed by some to equate with an outcome and further narrowed to describe a negative outcome, *distress*. We also consider other research that suggests stress may be positive, with particular emphasis on how the customary framing of stress as inevitably bad masks the beneficial aspects of challenging situations. Ultimately rejecting the myth that demonises stress, we take a broader view of “stress” as something that can have either positive or negative outcomes. We reject the idea that stress is always to be avoided and propose a hypothetical learning pathway that positions stress as a necessary part of learning: a “stressor” prompts learning; moderation of the impact of the stressor occurs with a realisation of the stress experienced by the learner and finishes with how the stress is “actualised” in respect to the learning that has taken place and the associated effect of the learning. We propose a number of strategies that health professional educators may consider in order to enhance this learning pathway.

**2 | HISTORICAL AND CURRENT USES OF “STRESS”**

The term “stress” is used in both popular culture and the academic literature, notably that from psychology and education. In modern popular literature, as is evidenced by numerous stress-related self-help books, stress is often considered to be a sickness<sup>1</sup> and the term “stress” is frequently equated with an adverse outcome of an experience.<sup>2</sup>

Originally, the terms “stress” and “distress” were seen as two different concepts. The term “stress” was initially used in the contexts of metallurgy, physics and mathematics, or as a verb meaning “to give particular emphasis”. By contrast, the term “distress” was used more frequently to describe biological manifestations such as respiratory and cardiac distress or digestive disorders. The concept of individuals being in distress, as opposed to biological systems, became evident in the 1950s with reference to, for example, people in distress, the distress of schoolchildren, and the distressed student.<sup>3</sup>

In health professional education today, the words “stress” and “distress” have come to be casually equated. The presence of stress

tends to be portrayed as a hindrance to learning. Numerous articles in health professional education have reported “stress” in relation to a variety of stimuli including deficiency of knowledge,<sup>4,5</sup> lack of competence,<sup>4,6</sup> patient interaction,<sup>7</sup> questioning,<sup>7</sup> examinations, assessments and assignments,<sup>4,7,8</sup> and relationships with staff and teachers and the learning environment.<sup>5,6</sup> However, most of these studies look at what causes stress and often have a distinct bias or assumption that stress is bad and should be avoided. Consequently, the reduction of stress and the adoption of mental health strategies have been widely considered.<sup>9</sup>

It is true that medical students and doctors can perceive high levels of distress in education in comparison with other students<sup>10,11</sup> and professionals.<sup>11</sup> This can include “distress” associated with the bullying or humiliating of a learner.<sup>12</sup> The authors do not underestimate or diminish those stressors that equate with unreasonable or poor behaviour, maltreatment or unacceptable discrimination in learning environments. These behaviours have no place in health professional education and should not be appraised for anything other than what they are: unacceptable and damaging to learning.<sup>13</sup>

However, focusing only on distress may be limiting as it curtails recognition of the positive benefits of stress in health professional education. The term “eustress”, coined by Selye,<sup>14</sup> means “a beneficial or healthy response to a stress, associated with positive feelings”<sup>15</sup> and is described as “an optimal amount of stress”.<sup>16</sup> Literature about work-based stress similarly refers to an “optimal amount”<sup>17</sup> of stress. Eustress as a positive outcome of stress has been positively associated with high performance in sports<sup>18</sup> and work.<sup>19</sup> There is a clear distinction between “distress” and “eustress” as two different outcomes of a stressor.<sup>20</sup>

Various scales to measure levels of stress have been developed, but these quantify stress without considering the difference between positive and negative effects. Research looking at both distress and eustress, as they relate to health professionals, is relatively recent<sup>21</sup> and has included the development of a distress–eustress scale (termed “hassles and uplift”),<sup>22</sup> which opens the possibility of identifying and quantitatively framing stress in a positive manner.

There is much evidence that stress does not equal distress. In health professional education, increased perceived stress has been associated with increased levels of personal achievement in nursing students: those students with stress were more likely to go on to register as nurses, and less likely to burn out or to leave the course.<sup>23</sup> Importantly, the reporting of stress does not predict overall distress.<sup>24</sup> Some common sources of stress have been found to have no association with distress, such as difficulty and amount of work. Further, distressed and non-distressed students can experience the same stressors.<sup>24</sup> Stress has been linked to enhanced motivation, support-seeking behaviour and working harder.<sup>25</sup> Stress has been found to improve mental function, boost memory<sup>26</sup> and speed up brain processing.<sup>27</sup> It has also been found that a stressor after learning “emotionally laden content” can enhance memory.<sup>26</sup>

However, deleterious effects of stress on clinical reasoning have been reported<sup>28</sup> and from an educational perspective stress may be associated with narrowing attention<sup>27,29</sup> and reduced performance ability.<sup>27</sup> Although high levels of stress have been associated with

poor academic performance, studies looking at subjective performance and stress have conflicting results.<sup>30</sup>

The Yerkes–Dodson law is often used to describe stress and performance. It proposes both a linear and an inverted U-shaped relationship between arousal and rates of learning, and was developed through observations of mice subjected to various electric shocks as they attempted to return to a nesting box.<sup>31</sup> The linear relationship related to rates of learning has generally been ignored,<sup>32</sup> but the inverted U gained huge popularity. The inverted U proposes that learning increases with physiological stimulation (stress) to a point at which the stress becomes too great and performance decreases. However, this law is unlikely to apply to human learning because the shocking of rodents performing simple physical tasks is not analogous to complex human psychology and context-related stress, and there is little empirical evidence in human learning to support this law. With reference to a single component of human learning, such as attention, it is clear that high levels of stress can both enhance and impair cognitive performance, which cannot be explained in terms of the Yerkes–Dodson law.<sup>32</sup> Although the Yerkes–Dodson law may be a myth, if applied to human learning, we mention it because it is popular and to guard against over-generalisation or -utilisation.

In summary, the original meaning of “stress” may have been conorted and as a consequence the potential values of stressors and the experience of stress have been undermined and diminished. Placing emphasis on distress in the context of exploring stress offers an incomplete picture.<sup>21</sup> Stress may be useful for learning, but we first need to repackage the potential value of stress.

### 3 | STRESS AS POSITIVE FOR LEARNING

To challenge the myth that “stress is bad”, we start by providing clearer and more precise definitions for the educational context.

**A stressor** = a force that is applied.<sup>33</sup> Considering the learning context, this force is rephrased as a *challenge or learning expectation* (eg learning how to perform an invasive procedure, being questioned by a teacher, preparing for an assessment, or the learning environment).

**Stress** = a realisation by the learner that a stressor(s) exists (eg “I feel stress[ed] because of the examination”). This is a manifestation of the convergence of not only the stimulus (the stressor), but also of the learner and the broader environment. It may include a psychological, physiological or behavioural response to the stressor.

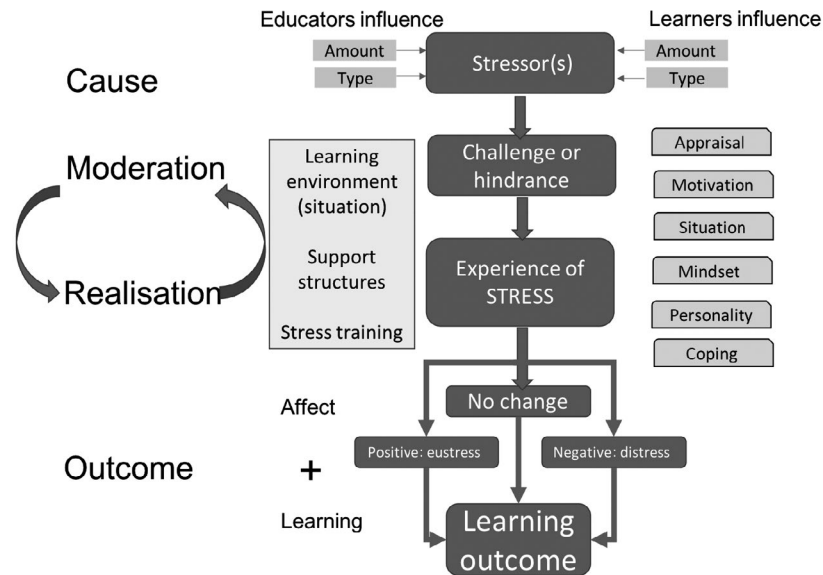
**Outcome** = affective disposition + learning. The affective disposition is generated and learning is achieved.

Distress = a negative affect as a result of stress.

Eustress = a positive affect as a result of stress.

Learning is either evident or not.

Put simply, stress results from the interpretation of a situation as challenging or hindering, and hence stress is different from the stressor. In



**FIGURE 1** The pathway from the application of a learning stressor to its outcome

addition, stress may result in negative or positive affect, and may or may not result in learning.

This more precise definition makes it possible to explore the value of stress for learning. Our definition returns the term “stress” to its original intent and differentiates it from the outcome, the result of stress. In returning to this understanding of stress, we can revisit the influence stress may have on learning.

#### 4 | A HYPOTHETICAL LEARNING PATHWAY INVOLVING STRESS

In this section, we present an account of learning that includes stressors and stress as parts of a learning journey. There are several models of stress, especially with respect to stress at work,<sup>17</sup> and we lean heavily on Spector’s<sup>34</sup> compelling transactional model of stress, in which stress is a convergence between the environment and an individual.<sup>16,34</sup> We acknowledge the importance of the learning environment, specifically in the workplace, on learning (Figure 1).

##### 4.1 | The stressor(s): the cause of stress in learning

It may be argued that learning has to start with a stressor(s). This may simply be the difference between what is known and what needs to be learned. It has been proposed that transformative change cannot occur without the stimulus of stress or crisis,<sup>35</sup> which results in what is termed “stress-related growth”. As learning often occurs during an emotional episode, feeling positively stressed may be beneficial for learning.

It is useful to consider theories of learning at this juncture. Constructivism and transformative learning theories align well with the concept of a stressor as a necessity for the subsequent

development of learning. Constructive learning theory requires a learner to be actively involved in the process of constructing meaning or knowledge,<sup>36</sup> whereas transformative learning results in a change in a person’s viewpoint.<sup>35</sup> Both of these theories require the learner to engage with potential internal dissonance (a stressor).

A stressor may not necessarily be determined by the “amount” of learning to be done, but may refer to the “type” of learning expected. Challenge may come in many guises, such as in learning about a difficult topic, completing a skill or extracting important elements from a complex patient history. Both the student and the educator may be able to influence the amount and type of stressor applied, although this is frequently dictated by the educator and also the features of a work environment.

A stressor can be considered as an isolated challenge, but challenges may be combined and be additive. In thinking about the additive effects of stressors, cognitive load is apposite in conjuring the idea that an individual stressor may not elicit a negative response, but an accumulation of stressors may result in an intolerable level of stress.<sup>37</sup> The accumulation of stressors may be greater than the sum of the individual stressors and turn the effect of the stressors from being challenging to hindering.

There are many examples in health professions practice of contexts in which a particular type of stressor cannot and should not be avoided. For example, the learning of a clinical procedure (eg intramuscular injection) may be a stressor for students, and they may feel some stress when they first attempt to perform this procedure in a patient.

In health professional education, the clinical environment is also a stressor<sup>5</sup> because of the complex interactions between learning and patient care.<sup>7</sup> Trying to reduce stressors in the health professional learning environment may be futile, unrealistic and detrimental to learning growth.

## 4.2 | Moderation

The next step in the learning journey refers to how the learner moderates the stressor. Individuals will start to modify their response to a stressor immediately, whether consciously or unconsciously. How an individual interprets the influence of the stressor will influence the kind of stress he or she experiences, and whether learning takes place. In a biopsychosocial model, a stressor is interpreted as either challenging or threatening.<sup>38</sup> From an educational perspective, the value of stress can be usefully appraised according to whether it represents a hindrance or a challenge.<sup>39-41</sup> Challenge results from difficult demands that a person may feel confident about overcoming. In education, challenge is defined as being positive and necessary to the acquiring of new mental models.<sup>41</sup> Hindrance is defined as being negative and unhelpful for learning. These are the preferred terms as they focus on the reality of learning that can often be achieved even in the most difficult of circumstances.

Whether an individual interprets stress as challenging or hindering will be influenced by a number of factors, most notably:

**Appraisal:** response to a stressor is heavily influenced by how the stressor is *appraised* or evaluated, specifically how it is cognitively mediated.<sup>16</sup> It has been suggested that there is a primary appraisal related to the importance attached to the stressor and a secondary appraisal regarding whether an individual can “cope” with the stressor.<sup>16</sup>

**Motivation of the learner:** the motive of a learner to learn is crucial in influencing whether learning will occur.

**Complexity of the situation:** the response to a stressor may be influenced by the situation, whether the environment is busy or quiet, and whether the context involves many people or a one-to-one situation.

**Mindset:** a mindset or self-belief that being under stress is useful may have beneficial effects. A large study conducted in the USA found that the belief that stress was bad for the individual served as a self-fulfilling prophecy.<sup>42</sup> The mindset that decrees that stress is bad for the health was associated with poor health outcomes.<sup>42</sup> A more recent and education-focused study found that instructions that educated students about the adaptive benefits of stress resulted in improved performance by enhancing the students' perceptions of their ability to cope with the stressful testing situation.<sup>43</sup>

**Personality traits:** a personality type that is predisposed to negative or positive responses to stressors, such as one that is perfectionist,<sup>44</sup> subject to fear of failure or introverted, may influence a response to a stressor. Resilience, defined as the ability to “cope”, is a personality trait that is particularly disposed to a positive response to stressors.

**Coping strategies:** coping strategies allow the learner to modify the feeling of stress. Individuals might have a “coping reservoir”, which allows them to cope until the reservoir is depleted.<sup>45</sup> The consideration of coping strategies places a potentially unhelpful

focus on the negative value of stress: it implies that stress is to be coped with rather than embraced. However, given that for many the nature of clinical work, irrespective of any learning occurring within it, can be depleting, recognition of the importance of strategies to fill the coping reservoir is to be applauded.

At this juncture, it would be reasonable to consider that a response to a stressor in the form of stress and the resultant outcome is totally within the ambit of the individual.<sup>17</sup> However, adopting this stance removes any responsibility from the part of the educator. Health professional educators have a role in supporting learners in interpreting stressors so that they result in eustress rather than distress.<sup>17</sup> Stressors may come from multiple sources, and performance and learning are facilitated if the stressors are related to the task or learning. The educator may help the learner to avoid stressors that are extraneous to the learning task because these will impair the achieving of the task.<sup>30</sup> Educators may also alter the complexity of the situation by determining whether a learning experience takes place in a pressured ward or in the more relaxed context of a teaching room, for example. Simulation may have an important role to play.

## 4.3 | Realisation

The moderation of the stressor by the learner may trigger a physical stress response. A physical stress response is an autonomic reaction to that stressor and is known as the first phase of “generalised adaptation syndrome”.<sup>46</sup> The response may stimulate sympathetic nervous system activity and cortisol release; the heart rate may accelerate, and sweating may occur.

This response was initially described as the “fight or flight response”. It is an acute response to danger. However, it is unclear whether a fight or flight interpretation is applicable to learning because learning is seldom dangerous. Firstly, it may not be that all autonomic reactions to stressors lead to a fight or flight response because the subjects involved in research in this area represented a biased sample: until 1995 only 17% of fight or flight research subjects were female.<sup>47</sup> In addition, to fight or flee may not be the only possible reactions: alternatives including “freeze” and “tend and befriend” responses have been proposed.<sup>47</sup> In addition, a stressor may not evoke any noticeable physiological response and even if physiological responses are evident, they do not necessarily need to be feared. Autonomic reactions to stress have been shown to improve performance at work in air traffic control. An increase in cortisol, a marker of being stressed, was found to correlate with higher peer ratings on competency and self-ratings on job satisfaction.<sup>48</sup>

Mindset can also influence how any physiological response is perceived. With a positive mindset towards stress, the perception of an increase in heart rate may be welcomed as beneficial instead of being viewed as detrimental.<sup>2</sup>

Educators have an important role in managing the learning environment to optimise the likelihood that a stressor will result in learning. Research in sport has found that manipulating the environment can buffer negative responses to stressors.<sup>49</sup> If an education institution offers support to learners, its learners will be more likely to

experience stress positively. The value of support is well articulated through Dornan et al's work looking at experiential learning environments.<sup>50</sup> The potential that greater learning may be achieved when the learner is stressed or stretched can be aligned with the educational concept of the zone of proximal development, which refers to the difference between what is easy enough for a person to do on his or her own, and harder tasks that the same individual can complete only with support.<sup>51</sup> Support allows the learner to set harder and more demanding learning tasks or, in other words, to deal with greater stressors.<sup>50,51</sup>

#### 4.4 | Actualisation: the outcome

The endpoint, the actualisation of the learning journey, is how the stressor, and the moderation and realisation of stress facilitate learning. Learning needs to have taken place at the conclusion of a learning journey; otherwise stress has no positive role in learning. Two distinct outcomes can be considered: one refers to how the learner feels about the learning experience (eustress or distress or nothing), and the other concerns whether learning has been achieved.

With respect to feelings of eustress or distress, it is not known whether distress always leads to limited learning and eustress to maximised learning. It is even unclear whether distress and eustress are on the same continuum or whether distress and eustress can be felt by the same individual simultaneously.<sup>21</sup> Whether a distressed individual can learn represents a quandary. Being distressed while learning does not seem to be either desirable or tenable. The state of eustress is desirable in savouring work<sup>40</sup> and likely in savouring the "work" of learning. Eustress has been linked to experiential learning.<sup>21</sup>

Although further research on the impact of eustress on learning is required, educators may have a role in ensuring stressors and learning are aligned and that stressors promote eustress rather than distress.

## 5 | CONCLUSIONS

In this article, we started with the myth that stress is bad for learning. This led to a need to better articulate what stress means with respect to learning. We propose that the term "stressor" be used as a noun to clarify a learning expectation that may be experienced by an individual. A learning stressor has the potential to be good or bad for learning. Along with the stressor, an individual's interpretation of and response to the stressor can make it either a positive challenge or a hindrance to learning.

The rejection of the myth allows us to propose that stressors and stress are important for learning and that we should be careful and deliberate in how we use stressors. Learning in a high-pressure workspace such as in clinical education has the potential to be stressful. However, how a stressor and the resultant stress are viewed and harnessed may improve how learners react to stress and, in consequence, influence the outcomes of learning and support the avoidance of distress as much as possible.

If we promote the notion that some stress may actually be beneficial for learning and consider the state of eustress as an important

contributor to stress-related learning and growth, we can regard stress as beneficial. This article challenges the reader to avoid demonising stress and to be open to the possibility that stress can be beneficial for learning. Paradoxically, thinking about stress as being negative may contribute to its negative impact. Alternatively, we can focus on how we embrace and maximise the value of stress, even if we sometimes need to reduce stress.

Health professional educators have continuing roles in managing the type and amount of stressors experienced by learners and in more proactively helping learners see stressors as potentially stimulating eustress. This may be achieved by helping learners to think about the nature of stressors and to reframe negative mindsets. In addition, educators may enhance stress-related growth in the form of learning if they ensure that the learning environment is free from extraneous stressors and promote those stressors that are more likely to stimulate eustress.

In exploring the myth that "stress is always bad for learning", we hope to alert our readers to the possibility that stress is necessary for learning and, by doing so, begin a constructive dialogue about how we can maximise learning in conditions of stress.

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None.

#### AUTHOR CONTRIBUTION

All authors made contributions to the conception of the work. JRR drafted the first and subsequent drafts. CG and TJW contributed to the critical revision of the paper. All authors approved the final manuscript for submission and have agreed to be accountable for all aspects of the work.

#### ETHICAL APPROVAL

Not applicable.

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