# The Neuroscience of Leadership Development:

## Preparing through experience

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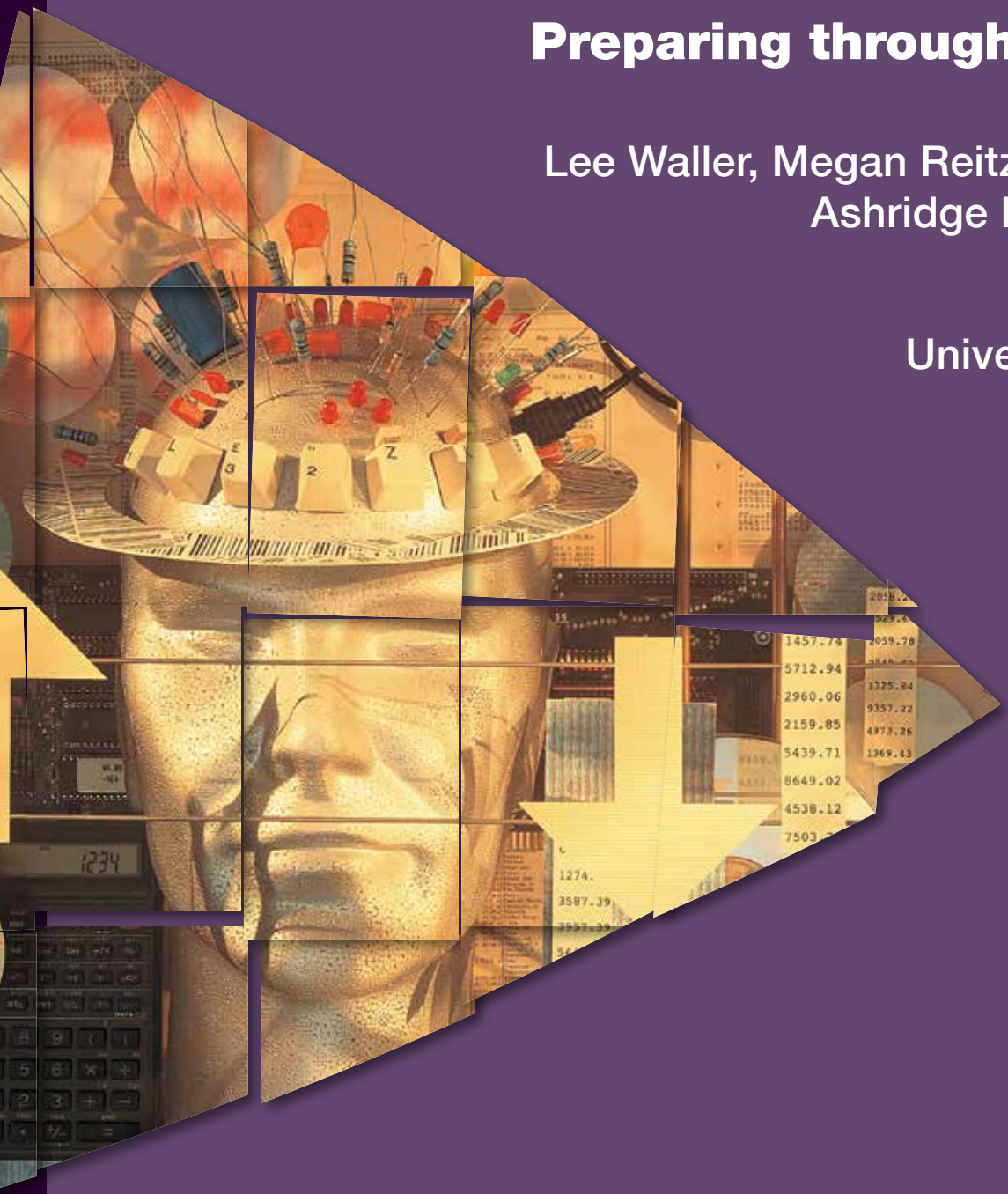

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# EXECUTIVE SUMMARY

## Introduction

It has long been understood that stimulating experiential learning events can have a lasting impact on us. We remember those events, and very often we perceive that we learn from them. However, less is understood about why we perceive them to be important in our development; what exactly is happening in the brain and body that can so facilitate learning in these circumstances; what degree of challenge is appropriate for effective experiential learning; and do we all learn from these events or do some reap more benefits than others?
It is these questions that this research sought to answer by examining individuals physiological responses to the experiential simulations used in Ashridge Business School's *The Leadership Experience (TLE)* programme.

The research is underpinned by the concept of fight or flight, the activation of our sympathetic nervous system in response to stress. It is proposed that when we believe we have the resources to meet the demands of an arousing situation, this instigates a 'challenge' response, which has been found to be associated with improved cognitive performance (Jamieson, et al, 2010). However, the perception that the demands of the situation outweigh our personal resources induces a 'threat' response, which impedes our cognitive performance (Blascovich & Tomaka, 1996). These states of challenge or threat can be measured by monitoring changes in cardiovascular efficiency (Kassam, Koslov & Mendes. 2009).

The objective of the current research was to determine whether the TLE was inducing this sympathetic nervous response and if so, whether this response was related to learning.

## Methodology

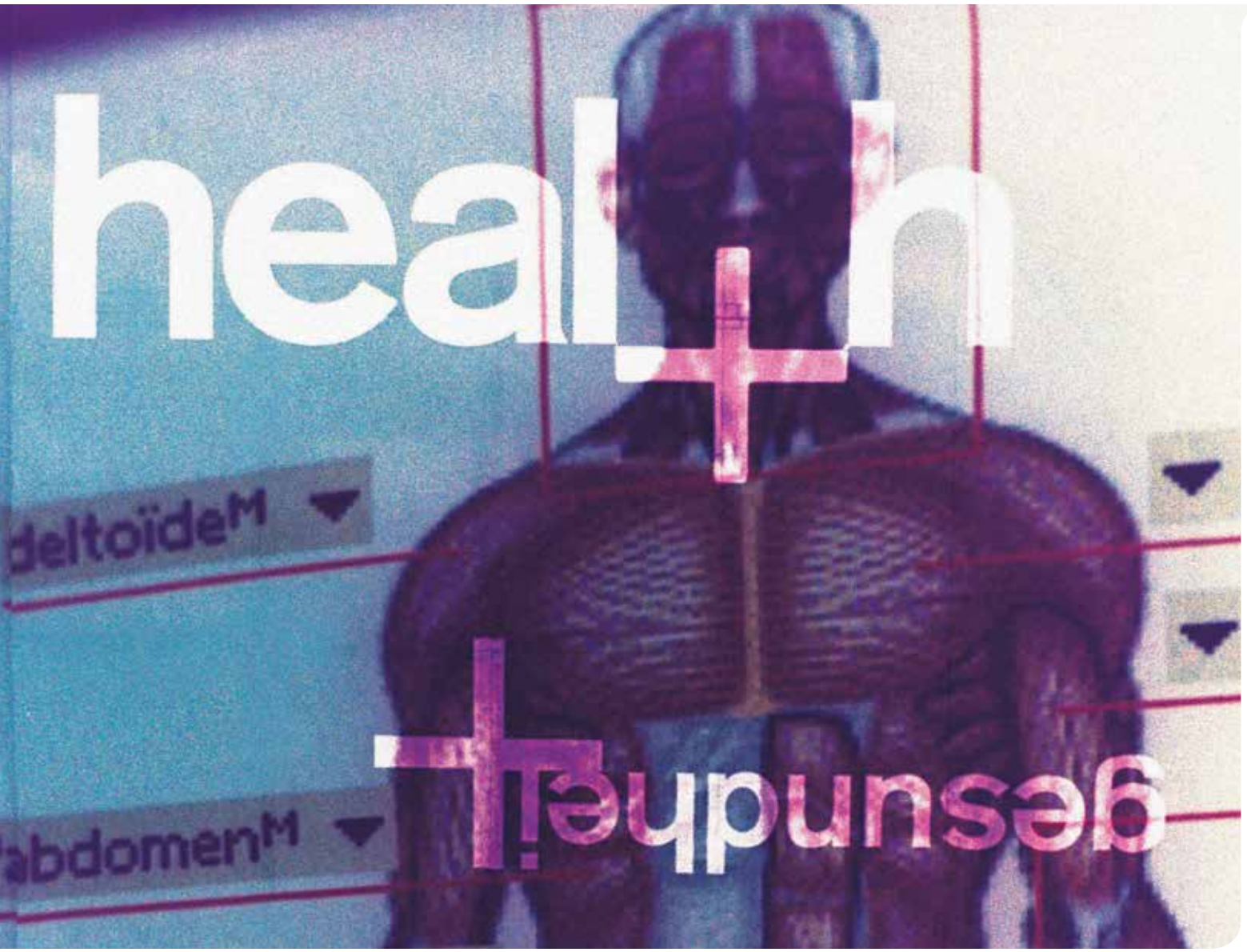
The research used a measure of the difference between resting heart rate (HR) and HR during the critical incident simulations (DHR), and correlated this with self-reports of learning to assess impact on perceived learning; and also with a variety of psychometric measures to understand which individuals benefit most from these methods.

## Findings

The research found significant correlations between DHR during the simulated critical incidents and perceived learning which were unrelated to personality type. The research also found, however, a significant correlation between DHR and learning during a group activity not expected to be related to learning for individuals with 'approach' personalities, as determined by the Behavioural Approach/ Behavioural Inhibition Scales. These findings suggest that simulations which cause arousal are associated with perceived learning for all personality types, but that those with 'approach' personalities may have higher perceived learning, either because they perceive the learning in arousal events to be greater, or because they are more engaged by virtue of their personality type.

## Conclusion and implications for practice

The findings from the research help clarify the mechanisms involved in the effectiveness of experiential learning, and contribute to our understanding of the influence of personality type on perceived learning from experiential methodologies. Such understanding has implications for business schools and learning and development professionals, suggesting that development experiences that challenge leaders are likely to result in learning that is longer-lasting.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# INTRODUCTION

In the past decade the world of work has changed greatly. Technological advances have broken down geographical borders, reduced manufacturing and operating costs, provided greater access to larger markets and cheaper suppliers, and resulted in a fast moving and competitive climate (Adler & Kwon, 2002). Working across geographies, functions and cultures presents today's leaders with greater challenges than ever before (Hogan, 2010).

An IBM survey (IBM, 2010) identified that CEOs believe they now have to operate in a substantially more volatile, uncertain and complex world. Their businesses must deal with 'increasingly interconnected economies, enterprises, societies and governments'. 79% of these CEOs shared the view that they face even greater complexity in the future, and reported serious doubts about their abilities to take advantages of the opportunities and to deal with the challenges arising from this rapidly escalating complexity.

In this fast-paced economically challenged climate, organisations need quick fixes. Most modern organisations have a talent management programme, designed to identify, develop and nurture the succession for the current Board. But these leaders-in-waiting tend to be in a hurry, and won't stay with an organisation for long if the talent management programme keeps them in a holding pattern until their bosses retire. Organisations need their future leaders to be job-ready now, and to equip them with the 20:20 foresight required to cope with the challenges of leadership. As such, business schools and executive education providers are tasked with developing highly-effective methods that result in impactful and long-lasting learning.

## How leaders learn: experience and emotion

Many leaders claim that they learn best from their own experiences in their organisations (Conger, 2004; Daudelin, 1996; Pye, 1994), and research points to the importance of learning from experience in order to prepare oneself for the future and develop as a leader (Conger, 2004; Pye, 1994). Thomas & Cheese (2005) for example, found that leaders, corporate executives, and entrepreneurs amongst others, learned more from real work and life experiences than from leadership development or MBA programmes.

But for such experiences to have long-lasting effects, they need to be emotionally charged. Le Doux (2000:175) states that *'although explicit memories with and without emotional content are formed by way of the medial temporal lobe system, those with emotional content differ from those without such content. The former tend to be longer lasting and more vivid'.* This has been illustrated by Rubin & Kozin (1984) amongst others, who interviewed students about their clearest memories and found that vividness of memories correlated with their rated importance, degree of surprise and emotionality. The neurological explanation for this lies in the structure of the brain, and the close proximity of the hippocampus, which is involved in accessing memories, to the amygdala, which is involved in processing emotion (Phelps, 2006).

Whilst emotionality is important, whether negative or positive emotions have the strongest impact is less clear. Ben-Peretz (2002, 1995) examined the critical incidents referred to by retired teachers when they

recalled their careers and found that they remembered 'job difficulties' and 'negative experiences' over 'positive experiences' in a ratio of over 3:1. Conversely, research on memory of events, such as Wagenaar (1986) and Matlin & Stang (1978) suggests that pleasant, positive, and successful experiences are remembered better than negative ones.

However, in terms of the impact on learning, rather than just recall, negative emotions may be particularly important. Ellis & Davidi (2005) amongst others (Bacon, 2007; Daudelin, 1996; Kets de Vries, 2007), suggest that failures should be regarded as better motivators than successes for drawing lessons from experience. They argue that when we encounter failure we are forced to revisit and revise our existing mental models. When we encounter success however, there is no such pressure and we are more likely to simply become more confident, perhaps complacent in our use of existing mental models (Ellis & Davidi, 2005).

## The body's stress response

Another important explanation for the impact of negative emotion on learning comes from the field of neuroscience, and from our understanding of what occurs in the brain and body during times of stress – negatively charged emotional experiences.

During such experiences our body's stress hormones produce a state of arousal, our sympathetic nervous response, which prepares us for fight or flight (Kalat, 1995). When the brain and body are moderately aroused by a situation we respond in 'challenge' state, which optimises cognitive performance such as decision-making, learning and the formation of memories (Jamieson et al, 2010). But if we do not believe we have the resources available to meet the challenge, we become over-aroused, and the body, perceiving threat, prepares to fight or retreat, sending blood away from the brain towards the extremities impeding our cognitive performance (Blascovich & Tomaka, 1996; Frankhaeuser, 1986; Henry, 1980).

The cognitive impact of these states of challenge or threat was demonstrated by Kassam, Koslov & Mendes (2009) who found that participants who exhibited cardiovascular responses consistent with 'challenge' performed better in a cognitive adjustment task than those whose cardiovascular responses were consistent with 'threat'.

Given the above, it could be argued that for leadership development experiences to have a lasting impact, they need to invoke a level of stress which will induce the body's sympathetic nervous response. However, to ensure that this arousal results in improved rather than impeded cognitive performance, such experiences need to equip participants with the resources and support to ensure they respond in 'challenge' rather than 'threat' state.

## Objective of the current research

The aim of the current research was to explore this proposition using Ashridge Business School's highly experiential *The Leadership Experience (TLE)* programme. The design of this programme was based on research which explored what Board-level leaders know now that they wished they'd known ten years ago. The research revealed that leaders experience certain critical incidents in their careers which are instrumental in how they perceive themselves and how others perceive their leadership capabilities (Poole & Carr, 2005; Reitz, Carr & Blass, 2007; Reitz, 2009). Their insights were used to develop an intensive leadership simulation that takes participants through a series of these critical incidents and allows them to experience the emotional roller-coaster associated with them in a safe and supportive environment. The objective is to facilitate the development of the

'muscle memory' related to these incidents and resource participants to cope better with the leadership challenges they may end up facing in the future.

When the programme was first developed, neuroscience was just emerging into the mainstream. The process was designed to work based on elementary insights from the field of emotional intelligence, and after several iterations there was enough anecdotal evidence to show that the process worked. However, we wanted to understand why this was so, and capture empirical, physiological evidence of individuals' responses to the programme. We were also interested to understand whether personality would have any impact on this physiological response to these stressful situations, and whether this in turn might impact perceived learning.

This led us to four primary research questions:

1. Do the experiences on the TLE authentically reflect the reality of the challenges of leadership?
2. Do such experiences lead to a sympathetic nervous response, as measured by heart rate variability?
3. Is there a relationship between any change in heart rate and perceived learning?
4. Does personality impact individual physiological responses, and if so, does this in turn impact perceived learning?


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# RESEARCH METHOD

## Participants

The research involved 28 participants on two experimental versions of Ashridge Business School's *The Leadership Experience (TLE)* programme. The group comprised nineteen males and nine females, the average age of whom was 39, ranging from 26 to 55. Participants were a mix of Ashridge Executive MBA students and employees from Ashridge client organisations, and came from both public and private sector companies.

## Procedure

The two 2-day programmes were residential, held at Ashridge Business School in Hertfordshire. Participants were fitted with heart variance monitors upon their arrival, which they were instructed to wear at all times, including whilst sleeping. The programmes consisted of a simulated exercise where participants ran a company of the future, during which time they had to deal with various critical incidents identified through the TLE research and typical of leadership challenges, such as dealing with a difficult conversation or public speaking. Also included was a group activity which was not designed to simulate a critical incident and as such was not expected to be related to learning.

Two weeks prior to the programmes participants completed a pre-programme survey which assessed state/trait anxiety, life orientation, and behavioural approach/inhibition, as detailed below in the 'measures' section, providing a baseline measure of the constructs. Following each critical incident participants were asked to reflect on the experience and complete a state anxiety questionnaire. Immediately after the programmes participants completed a learning questionnaire exploring their reported learning from the programme (Time 1). The same questionnaire was completed again after one month (Time 2).

## Measures

### *Heart variance monitors*

Heart variance monitors were used to provide a proxy measure for neural activity in the sympathetic nervous system through indicating changes in level of arousal. The difference between participants' resting heart rate overnight and maximum heart rate during the critical incidents was used to provide a measure of 'difference in HR' (DHR).

### *Learning questionnaire*

The learning questionnaire was composed of 28 questions and these were reduced to 4 factors on the basis of high correlations between items (> 0.35). The first factor was **'self as leader'** and this consisted of questions such as: *"I feel more aware of my strengths as a leader"*. This factor also included questions that related to ambiguity and uncertainty such as *"I feel more confident about dealing with ambiguous situations in the future"*, as well as handling stressful situations. The second factor, **'adapting to others'** related to responses to others and the ability to adapt when dealing with others and consisted of questions such as *"I see more clearly the need to adapt my style to suit different people in different situations"*. The third factor, **'difficult situations'** included questions such as *"I feel better able to manage conflict with my peers"*. The final factor, **'learning and development'** contained more general questions about learning and development during the programme, for instance: *"I feel more aware of the areas that I need to develop to be a better leader"*, and *"I now see more clearly my responsibility for my own learning"*. Participants were asked to indicate their agreement with statements on a five-point likert scale, ranging from 'strongly disagree' to 'strongly agree'.

### *State-Trait Anxiety Inventory (STAI)*

The STAI (Spielberger et al, 1983) comprises separate self-report scales for measuring state and trait anxiety. The state scale consists of 20 statements that evaluate how respondents feel 'right now, at this moment', such as *'I feel self-confident'*. The trait scale consists of 20 statements that assess how people generally feel. Participants are asked to indicate their agreement with statements on a four-point Likert scale, ranging from 'not at all' to 'very much so'.

### *Life Orientation Test-Revised (LOT-R)*

The LOT-R (Scheier, Carver& Bridges, 1994) assesses individual differences in generalised optimism versus pessimism. The scale consists of ten statements such *'I hardly ever expect things to go my way'*. Participants are asked to indicate their agreement with the statements on a five-point Likert scale, ranging from 'I disagree a lot' to 'I agree a lot'.

### *Behavioural Approach Scale / Behavioural Inhibition Scale (BAS/BIS)*

The BAS/BIS (Carver & White, 1994) assesses individual differences in motivational systems. A behavioural approach system (BAS) is believed to regulate appetitive motives, in which the goal is to move toward something desired. A behavioural avoidance (or inhibition) system (BIS) is said to regulate aversive motives, in which the goal is to move away from something unpleasant. The questionnaire consists of 24 statements such as *'When I want something I usually go all-out to get it'*. Participants are asked to indicate their agreement with the statements on a four-point Likert scale ranging from 'very false' to 'very true'. The BAS scale is divided into three sub-scales: drive, fun seeking and reward responsiveness. The BIS scale is not divided into subscales.

# FINDINGS

This section reports on the findings from the heart variance monitors and surveys. It details: 1) the impact of the critical incidents and group activity on participants' heart rate; 2) the relationship between changes in heart rate during the critical incidents and group activity and learning; 3) the relationship between changes in heart rate during the critical incidents and the group activity and the personality measures; and 4) the relationship between the personality measures and perceived learning.

Linear regression analyses investigated the relationship between these changes in heart rate (DHR) during the two critical incidents (CIs) (Difficult Conversation and Communication to Company) as well as the group activity, and the four learning factors. A further linear regression analysis was also used to investigate the relationship between DHR during the critical incidents and the group activity, and the personality measures, and between personality measures and the four learning factors.

## Heart rate

Measured in beats per minute (BPM), the average resting heart rate for participants was 60.21bpm, ranging from 41 – 74bpm. Using each individual's resting heart rate as a baseline measure, the average increase in heart rate for the two critical incidents and the group activity was calculated, as detailed below in figure 1.

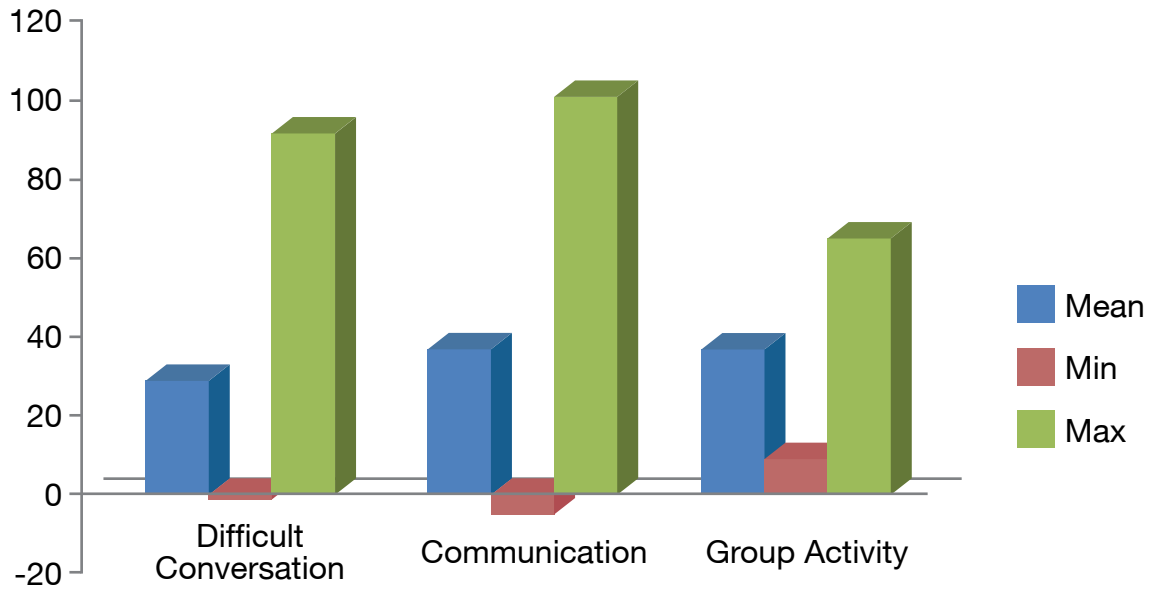



*Figure 1: Mean, min and max change in heart rate BPM between rest and Critical Incidents and the Group Activity*

## Heart rate and perceived learning

### *Difficult Conversation Critical Incident*

There were significant correlations between DHR during this CI and learning scales 'Self as Leader' (r=0.42, p=0.22), 'Difficult Situations' (r=0.39, p=0.032) and 'Learning and Development' (r=0.48, p=0.01) at Time 1 (immediate post programme). There was also a significant correlation with 'Learning and Development' at Time 2 (one month post programme) (r=0.56, p=0.003)[1].

### *Communication Critical Incident*

There were significant correlations between DHR during this CI and learning scales 'Self as Leader' (r=0.34, p=0.05) and 'Learning and Development' at Time 1 (r=0.41, p=0.03) and 'Learning and Development' (r=0.35, p=0.05) at Time 2[2].

### *Group Activity*

There were also significant correlations between DHR during this session and learning scales 'Learning and Development' at Time 1 (r=0.50, p=0.008) and Time 2 (r=0.57, p=0.002)[3].

## Heart rate, perceived learning and personality

Whilst there were no significant correlations between the change in heart rate between rest and the critical incidents and the personality questionnaires, there were correlations between the change in heart rate between rest and group activity on these questionnaires.

DHR during the group activity correlated significantly with the BAS 'Drive' and 'Reward Responsive' scales (r=0.42, p=0.024; and r=0.50, p=0.008 respectively). The scores on these scales also correlated positively with the scores on the 'Learning and Development' learning scale at Time 2 (r=0.33, p=0.048; and r=0.36, p=0.037 respectively). It is therefore possible that the relation between change in heart rate during the group activity and the 'Learning and Development' scores are mediated by an 'Approach' personality type.

[1] For the Difficult Conversation critical incident 42% of the variance in the scores relating to 'self as leader', 39% of the variance in scores relating to 'difficult situations', and 48% of the variance in scores relating to 'learning and development' at Time 1, and 56% of the scores related to 'learning and development' at Time 2, could be explained by changes in heart rate

[2] For the Communication critical incident 34% of the variance in the scores relating to 'self as a leader', 41% of the variance in scores relating to 'learning and development' at Time 1, and 35% of the variance in scores relating to 'learning and development' at Time 2 could be explained by changes in heart rate

[3] For the Group Activity, 50% of the variance in scores relating to 'learning and development' at Time 1 and 57% of the variance in scores at Time 2 could be explained by changes in heart rate

# DISCUSSION AND IMPLICATIONS FOR PRACTICE

This final section explores what we might infer from the findings from the research, and what this might mean for business schools, leadership development professionals, and for leaders themselves.

## Simulations as preparation for leadership

The first significant finding from the research was that the critical incidents involved in the programme did indeed raise participants' heart rates. This suggests that participants do actively engage in what is going on, and are concerned enough about their performance to induce a certain level of stress, as reported by some of the participants' following the Difficult Conversation exercise:

"Very effective. I really didn't think that I would be able to be so effectively immersed in the scenario."

"Viral! Pleased to have achieved a participation in both exercises. Frustrated at myself for 'committing' what seem like elementary errors in strategy. But overall feeling energised by the residual adrenalin in my circulation."

Importantly for business schools, it would seem that simulations in a leadership development setting can indeed mimic the stress of real workplace experiences and should provide a safe practice ground for leaders to test out their responses in preparation for when they encounter them for real.

This opportunity to practise with these experiences can have important implications for individuals' cognitive performance in real life situations, because such experiential learning works through a process that has been dubbed as building 'muscle memory'. This term is commonly used to describe repeated movements which lead to physiological changes and brain muscle development, such as the retention of the learned motor skills involved in riding a bike or driving a car that become stored in the brain as memory (Lee & Schmidt, 2005).

In this context however, it illustrates leadership practice which leads to an improved ability to deal with critical situations. Development of muscle memory means that when leaders face stressful situations in the future they perceive that they have the resources to deal with them, because they have experienced them before and stored their response in their memory (Reitz, Carr & Blass, 2007). This perceived resourcefulness can make the difference between leaders responding in 'challenge' mode, and performing at their cognitive peak, or in 'threat' mode, impeding their cognitive performance. In essence, developing muscle memory through simulations such as the TLE, which mimic real leadership challenges, may help leaders to feel better resourced in future stressful situations, helping them to respond at their cognitive peak, as intimated by one participant following the Communication incident:

"I feel like it was good practice and if I did it again I would do it better."

## Raising heart rate to promote learning

The second, and perhaps most important finding, was that this increase in heart rate during the critical incidents was significantly related to learning immediately after the programme for three of the four learning factors (self as leader, difficult situations, and learning and development) and to perceived learning after one month for the learning and development factor). As these findings were not impacted by scores on the psychometrics, this suggests that irrespective of personality type, if you engage in learning to the point that it raises your heart rate you are likely to perceive that you have learned across a range of measures, and this perception is likely to be maintained.

As well as supporting our observed and anecdotal evidence that the TLE programme results in impactful learning, these findings provide support for the proposition that moderate levels of stress which lead to moderate levels of arousal do indeed enhance cognitive processes and result in perceived learning that lasts, as illustrated by one participant following the Communications incident:

"I was mentally alert and felt totally ready when questions were fired at us. Answered clearly, succinctly, and honestly without waffle."

What is also important to highlight is that the relationship between increased heart rate and perceived learning was found for participants who were both involved in the exercise, and observing the exercise. This is captured by some of the participants' responses to the incidents:

"Very useful so far - particularly the interviews. Yes they have an impact because it was realistic and well played giving the opportunity to observe and experience tough conversations".

"Stressful just to watch."

This has important practical implications for those who design leadership development interventions. Providing the opportunity for all individuals on a programme to participate in an activity can prove time consuming and therefore costly. Our research suggests that as long as all participants are given the opportunity to observe others, they are still able to engage, to experience a level of stress, and to learn.

## Influence of personality

Finally, whilst there were no significant correlations between the change in heart rate during critical incidents and the personality questionnaires, we did find that those with higher scores on the BAS 'drive' and 'reward responsiveness' scales also had raised heart rate during the 'group activity', and that these higher scores were also positively related to the 'learning and development' learning scale after one month. It would appear therefore that for those with 'approach' type personalities, who are driven to achieve a goal and focus on reward, just being engaged and aroused by situations results in the perception that they are learning.

The literature tells us that those with an 'approach' personality type are more sensitive to signals of reward and non-punishment, and are more likely to engage in goal-directed efforts and experience positive emotions such as elation, happiness and hope, when exposed to the possibility of such reward (Gray, 1982). It could be therefore that these individuals were more engaged in the group activity than others, found the experience more enjoyable and were more sensitive to the possibility of learning from the experience, and as such reported greater perceived learning.

## Implications for business schools and L&D professionals

The critical lesson for business schools and those responsible for leadership development is that in order to prepare leaders for the challenges of leadership, development needs to be hard-hitting, challenging, and present the potential for failure. Carefully taking leaders out of their comfort zone into the 'stretch' zone raises their heart rate, and improves both their cognitive performance during the experience and their perceived learning from it.

This kind of learning has to be 'challenge by choice' in order for it to be ethical, but our research shows that it works irrespective of personality type. There is however, a fine tightrope to walk between the 'challenge' or 'threat' response, and as such it is critical that these experiences occur in a safe and supportive environment. We now offer our current TLE participants heart rate monitors to wear during the programme so that they can calibrate their own thresholds and learn more about how they can manage them better.

Because those with more 'avoidance' type personalities, those who are less optimistic, and those with higher trait anxiety learned as much as others from the critical incidents, it would not appear necessary to screen participants before nominating them for participation in these types of experiential programmes, provided they are happy to accept the risks involved. However, because these experiences can involve heightened emotions, it is crucial that such programmes are conducted by astute and experienced facilitators, who pay attention to how the participants are responding and behaving, and provide appropriate and supportive feedback.

There are also lessons to be learned in terms of how L&D departments evaluate the success of development interventions. Relying on the standard 'happy sheet' which typically only assesses participants' reactions to the experience, may well provide L&D departments with misleading information (Waller, 2012). Challenging experiences are unlikely to always be well received in the moment, and true learning can take time to embed. This slow-burn effect was demonstrated on a 2009 TLE, where evaluation forms which were received up to four weeks after the programme was delivered were 50% more positive than those received immediately after the event (Teckman, 2013). These statistics were further evidenced by the positive shift in qualitative feedback received after one and six months.
Teckman warns "by fetishising the instant, semi-formed opinions delivered through the immediate post-programme evaluation forms, business schools risk promoting the safe and easy over the risky but transformative." (Teckman, 2013:99).

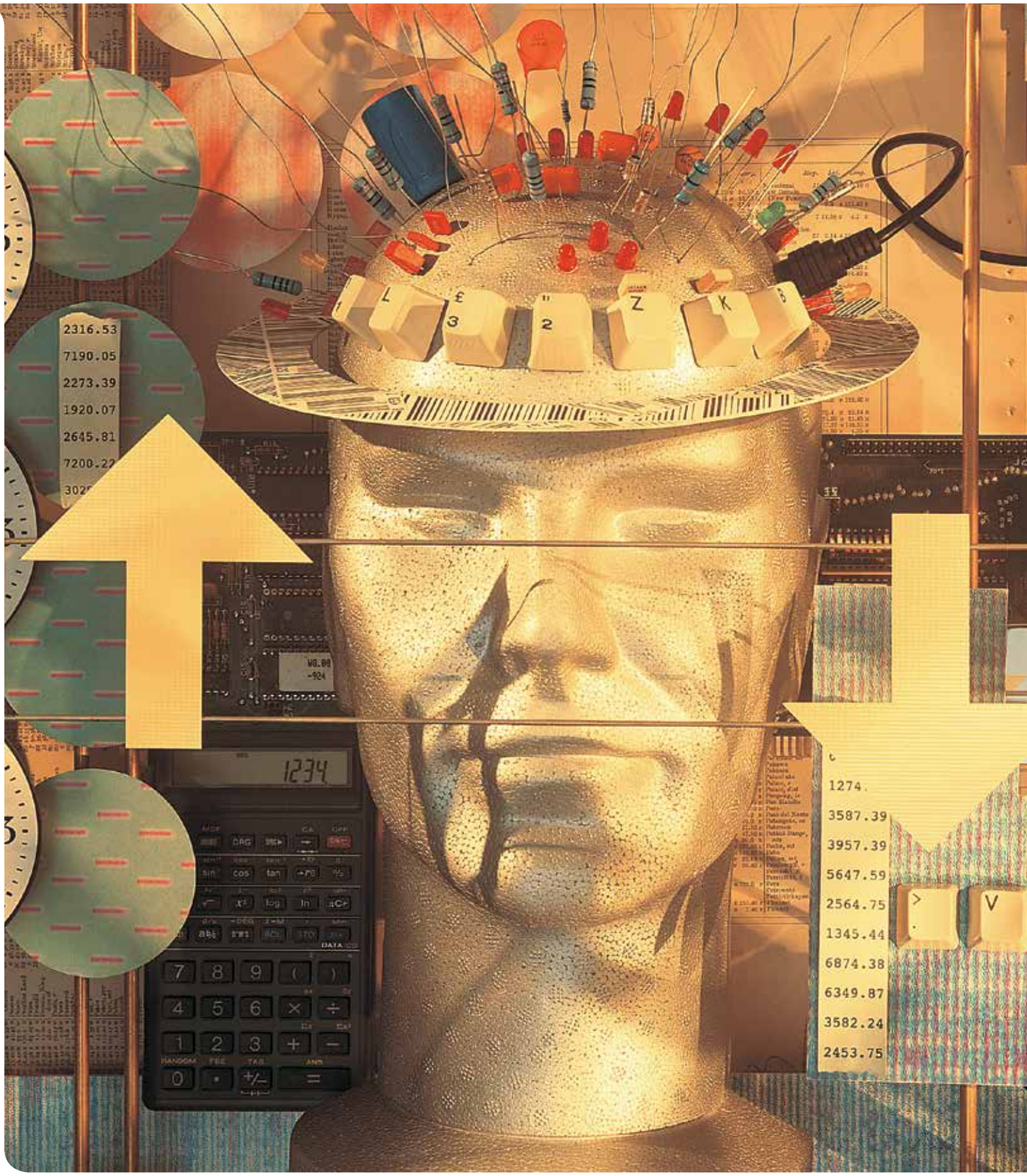
## Implications for leaders

A key lesson for leaders is that finding opportunities to practise dealing with difficult situations will help prepare them for when they encounter them for real. The act of practice will improve their sense of resourcefulness and their likelihood of being able to rise to the challenge in the future, and perform at their cognitive peak. Leaders can practise this on the job and in everyday situations, but if they want the learning faster than this, they need to design these practices to happen under pressure, and to take time for feedback and reflection in order to create leadership muscle memory for the future. An appreciation of these processes may also help leaders to understand how their physiological responses may be impacting their performance under pressure. Feeling more resourced to cope in stressful situations will help them to sustain their performance in challenging times and be better and more consistent role models for others to follow.

## In summary

Well-designed experiential learning can work, and result in learning that lasts. It does so through engaging learners, inducing a 'challenge' response which sends blood to the brain, enhancing cognitive performance in the moment, and perceived learning after the event. Through developing a sense of resourcefulness, such experiences can in turn ensure that when leaders encounter similar situations in the future they respond at their cognitive peak.

If business schools and leadership development professionals are to ensure that their interventions prepare their leaders for the challenges of leadership, it is vital that they find opportunities to incorporate such experiences into their programmes or into learning on the job to maximise their effectiveness and ensure real return on their investment.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