

Case report

Emotional and cognitive changes during and post a near fatal heart attack and one-year after: A Case Study

Andrew M. Lane ¹✉ and Richard Godfrey ²

¹University of Wolverhampton, UK, ²Brunel University, UK

Abstract

This case study reports on changes in emotions before and during an unexpected heart rate in a young, apparently healthy male with a life-long history of exercise in the absence of family history of heart problems. He completed the Brunel Mood Scale (Terry et al., 2003) to assess emotions before, during, and after the heart attack, and also describing his thoughts during these periods. Results indicate he experienced unpleasant emotions in the build up to the heart attack, feelings he attributed at the time to frustration to achieve fitness goals. He maintained an exercise regime prior to having a heart attack, a finding consistent with previous research suggesting that early diagnosis, although vital for survival, is not likely to be identified among seemingly healthy individuals. During the heart attack, he experienced a rapid emotional change characterised by a rapid increase in anger coupled with thoughts of needing to survive. The intensity of emotions and regulation strategies employed before and during the heart attack provide insight this experience, and we suggest future research should investigate emotional change during adverse conditions.

Key words: Mood, regulation, emotion, heart, diagnosis, self-awareness.

Introduction

Evidence shows that a heart attack is a major cause of premature death in the UK, accounting for approximately 125,000 deaths a year (Walker, 2002). Whyte et al. (2009) documented a case study of a heart attack survivor in a young, apparently healthy individual with a life-long history of exercise in the absence of family history. Their case study details the importance of seeking treatment early in the process and difficulties in identifying diagnosis. They highlighted a key point that “time is muscle” suggesting the earlier the person receives treatment, the less muscle damage will occur in the heart.

People agree that seeking treatment as early as possible is desirable. Evidence indicates that the internal perception of whether you yourself are having a heart attack is complex and typically, an individual will seek an alternative explanation (Walsh et al., 2004). Beliefs associated with the perceived likelihood of experiencing a heart attack influence interpretations of early symptoms (French et al., 2000). Individuals are likely to ascribe heart attack symptoms to conditions such as indigestion if they consider that having a heart attack is an unlikely explanation. For example, heart attack survivors reported to expect symptoms to present themselves as a sharp, crushing pain rather than an ambiguous and gradual increase in discomfort (Finnegan et al., 2000; Whyte et al.,

2009). Accordingly, factors related to reducing delay in seeking treatment are worthy topics of investigation (Pattenden et al., 2002).

The present case study explores emotional state changes and beliefs of a male 45-year old heart attack survivor. It is worth noting that he has described the events in other publications linked to medical data (Whyte et al., 2009). As reported by Whyte et al. what makes this case study intriguing is that the participant is a practising exercise physiologist with detailed knowledge of heart attack symptoms and associated risk factors. Despite this knowledge, he did not correctly recognise acute symptoms of his own heart attack. As a physiologist, he participated in regular screening procedures such as blood lipid profiling, blood pressure, exercise stress tests such as VO₂ max test including 12-lead ECG (Edenbrandt and Pahlm, 1988). His test results demonstrated no significant evidence of coronary risk other than moderately elevated cholesterol levels (circa 7 mmol·L⁻¹). Further, he exercised regularly, to the extent that he kept a training diary for twenty-five years. Medical convention would dictate he had almost no modifiable risk factors and very few genetic ones thus his perception of being at low risk is justifiable.

Case report

On 24th September 2007, the participant experienced a myocardial infarct and cardiac arrest requiring defibrillation three times before normal rhythm was restored (see Whyte et al., 2009). The participant indicated that detailing this account and seeking to publish its results was a goal he wished to achieve during the first few hours of recovery, hence his compliance with involvement in data collection.

The process began with the participant providing states experienced at the key times as defined by the participant. Emotional states were assessed using a mixed-method approach. Retrospective assessments of emotions at key points were collected using the Brunel Mood States (Terry et al., 2003) which assesses anger, confusion, depression, fatigue, tension and vigour (McNair et al., 1971) and modified to include scales for calmness and happiness from the UWIST (Matthews et al., 1990). A combined measure of emotions was calculated by subtracting the sum of unpleasant emotions from the sum of pleasant emotions (Calmness + Happiness + Vigour) /3 – (Anger + Depression + Fatigue + Tension) /4. A positive score reflects pleasant emotional states and a minus score reflects unpleasant emotional states.

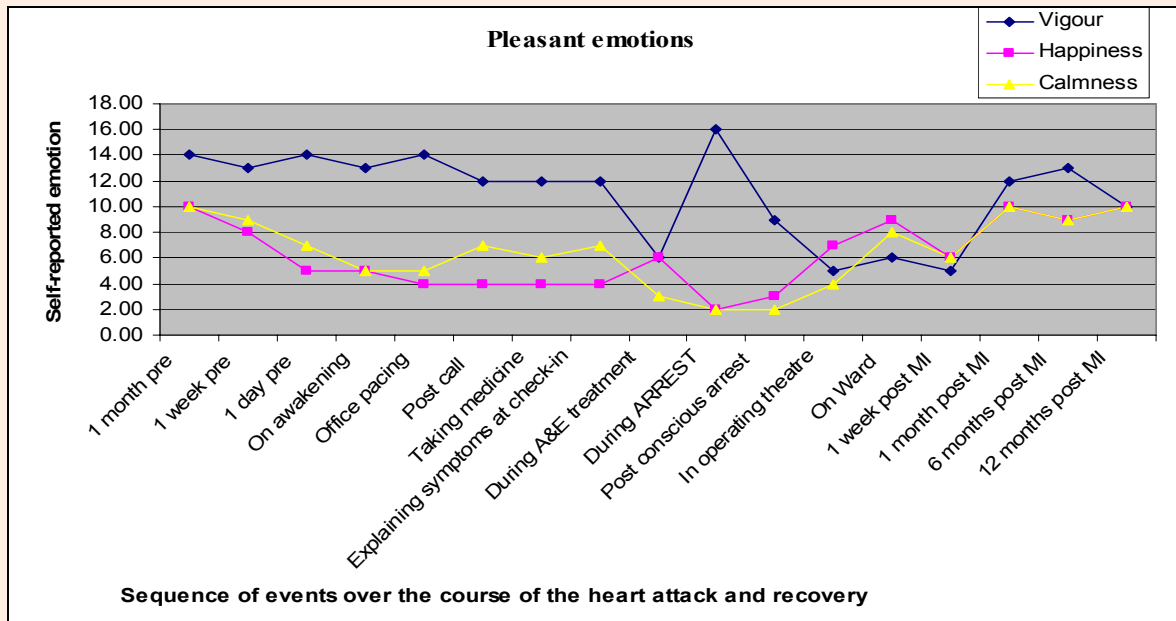


Figure 1. Changes in pleasant emotional states before, during and post heart attack.

Following this, the participant was interviewed to explore beliefs regarding the antecedents, the meaning of, and likely consequences of emotions in terms of cognition and behaviour.

Results are depicted graphically in Figure 1-4. Figure 1 shows changes in pleasant emotions; Figure 2 shows changes in unpleasant emotions, and Figure 3 shows changes in total emotion disturbance. Figure 4 describes changes in thoughts that accompanying changes in emotions. As Figure 3 indicates, he reported an increase in unpleasant emotions in the period leading up until the

heart attack. Interview data reveal he attributed increases in tension and anger in the months prior to the heart attack to frustration at not attaining fitness goals as quickly as expected. He reported feeling a sense of frustration at changes in his fitness below expectations. His knowledge of sports training is important to consider with interpreting this sense of frustration. Based on his professional knowledge of physiology and, accordingly, the volume and intensity of exercise he had set himself, he had specific expectations on the improvements in fitness which were not being met. Hence, in the absence of good

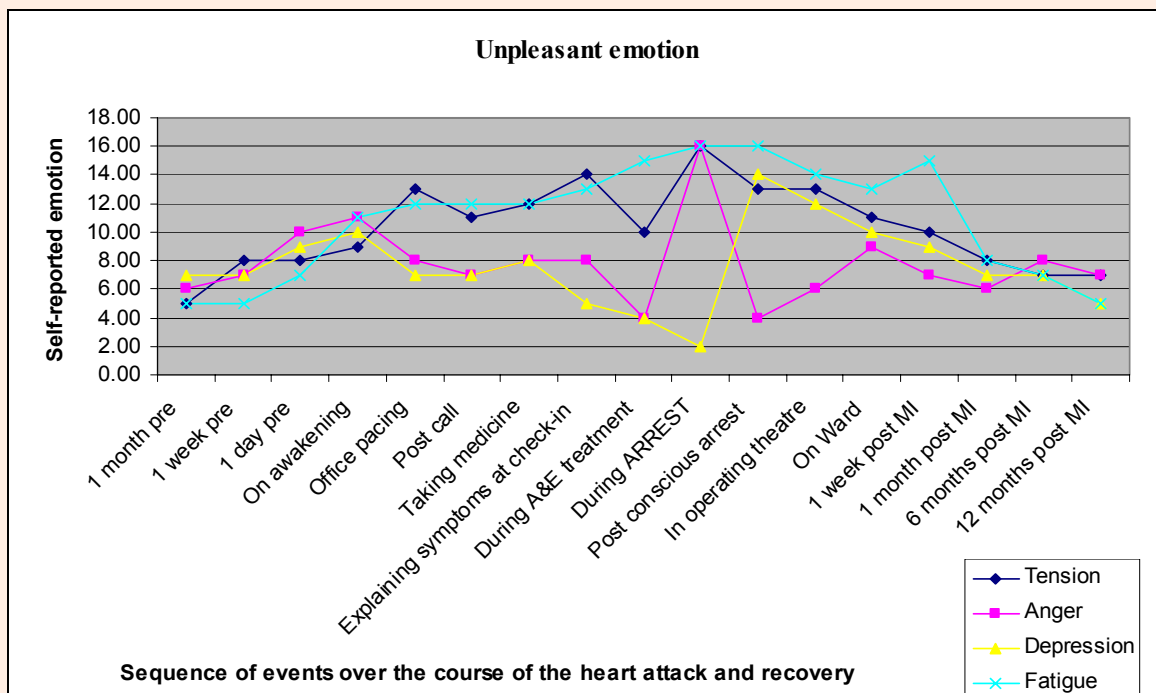


Figure 2. Changes in unpleasant mood states before, during and post heart attack.

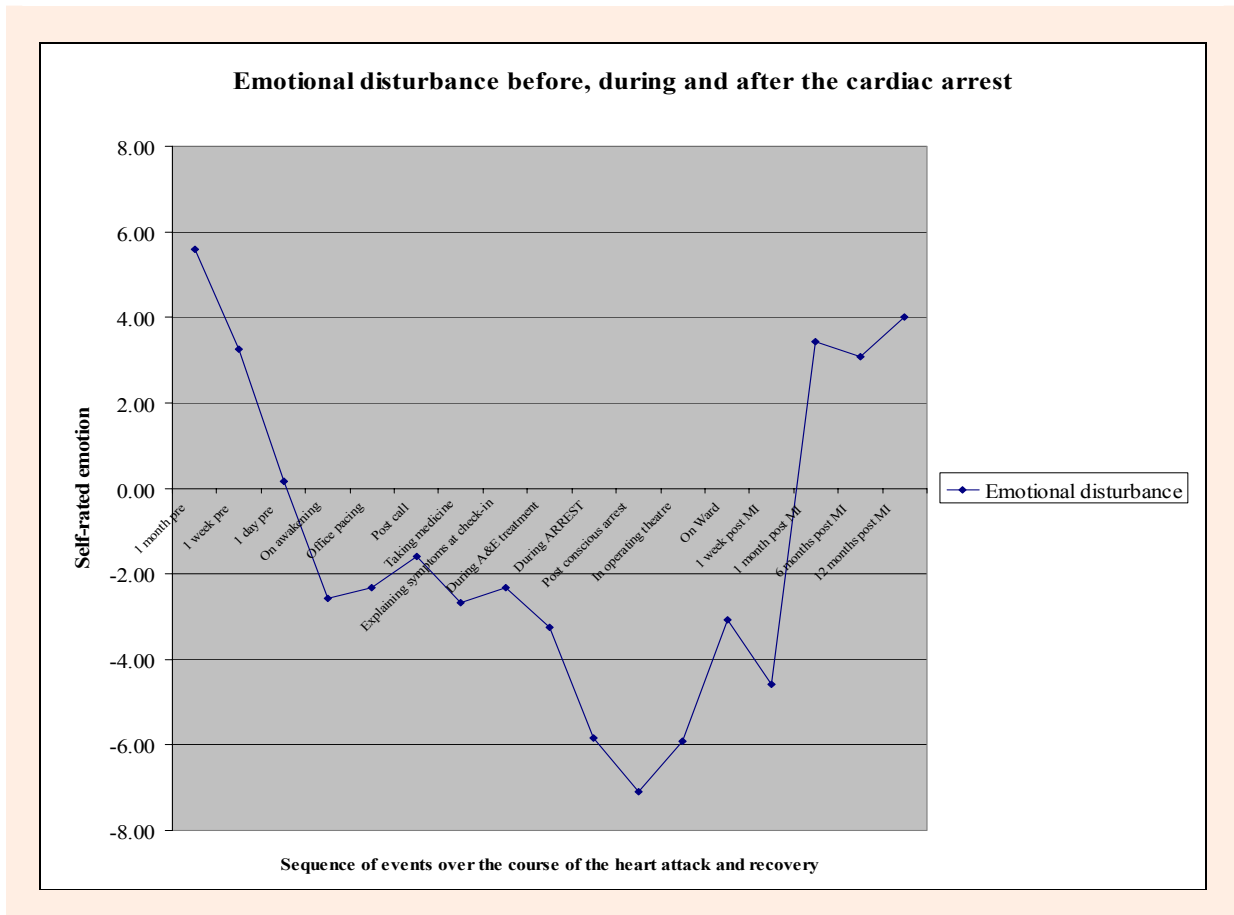


Figure 3. Emotional disturbance before, during and post heart attack.

reasons to explain his apparent lack of progress, he began to consider whether insufficient progress was linked to work-related or self-imposed pressures. It is worth emphasizing that he did not consider the possibility of impending cardiac problems.

One week before the heart attack, he reported noticing feeling unpleasant emotions (see Figure 1 and 2). He recalled feeling generally angry along with a growing

awareness that he had felt increasingly unwell for some time. He remembers attributing the cause of feeling unwell to a gastric problem, and importantly in terms of helping to explain his unpleasant emotional profile, one that did not appear to be improving (see Figures 1-3). Whilst recognising that he felt unwell, he perceived that these feelings were part of normal fluctuations in well-being and that his immune system would cope

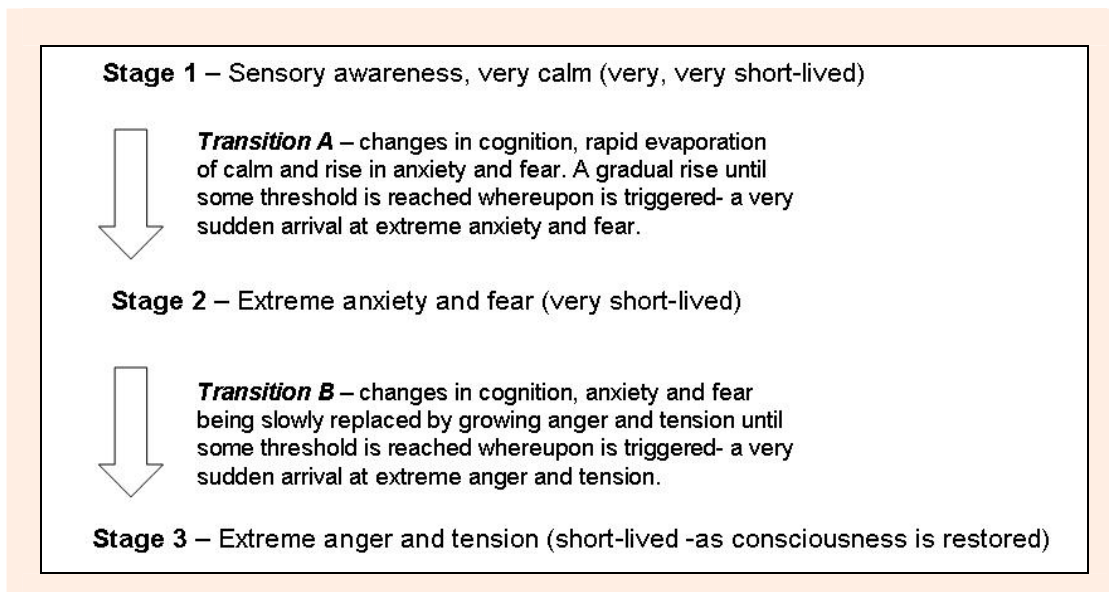


Figure 4. Stages in the evolution of emotion immediately following ‘MI-induced’ arrest, from the beginnings of consciousness to full consciousness.

successfully eventually. He increased his focus on improving fitness and so began exercising more frequently and at a higher intensity to regulate his emotions. For example, on the day before the heart attack he noted that in the morning he completed a fast interval swim session covering 3600m. He notes feeling pleased with his performance.

On the morning of the heart attack, at 6.20am, he started a sprint session on an exercise bike, a session he could not complete. He reported feeling unwell, more tired than expected and with a burning sensation in his chest. He indicated having to rest in the changing room, and the notion of having to consciously rest was unusual. At the time, his thoughts focused on a dual problem; a) a growing realisation that he might be seriously unwell, and b) disappointment of not completing the gym session. He indicated that he could not remember ever stopping a session early. The philosophy of not giving up is commonly enacted in his history of participating in sport and exercise. He was an experienced and regular exerciser who regularly engaged in repeated bouts of exercise at a reasonably high intensity, competing in karate, and achieving the established plan for each fitness session on a regular basis. On one level, he begins becoming aware that something might be wrong with his health, but on another level, he rationalised this thought using physiology knowledge. He concluded at the time that it could not be serious enough to require substantive treatment.

After driving to work, he began to feel progressively unwell with increased chest pains and retrospectively feeling increasingly more anxious and fatigued (see Figure 3). At this point, he believed that such symptoms were attributable to indigestion. His next action of significance was to telephone a friend of over 15 years, a colleague (a fellow physiologist who worked with athletes across a range of fitness), who is also a training partner, and a cardiac specialist. After describing his symptoms and having sought assurances that these problems could be gastric in nature, he noticed feeling less tense and assured if symptoms were associated with a heart problem, his colleague would know. It is worth emphasising that he was beginning to consider the possibility that his symptoms could be stemming from a potential heart condition. He was cognisant of research findings showing males tend to under-report heart attack symptoms and so there are very often delays in receiving appropriate treatment (Perkins-Porras et al., 2006). It is interesting to note that his colleague still maintains that the symptoms presented, when taken with his medical history and no discernible risks of any heart condition, were unlikely to be indicative of having heart attack (see Whyte et al., 2009).

At this point, his chest pain was increasing rapidly. His strategy was to try to ignore the pain and cope with intense unpleasant emotions. He hit himself repeatedly and with some force to change the focus of the pain. His reading of physiological research in which athletes seek to manage pain during training and competing provided a background for him to rationalize his behaviour. The sequence of events saw him seeking further medical advice for gastric problems, continuing to take associated medication, coupled with growing anxiety, depression,

fatigue, and chest pains (see Figure 2 and 3). He eventually asked a work colleague, a female lecturer, to take him to Accident and Emergency (A & E) which she did so without questioning, and at this point his anxiety and chest pains were considerable, remaining so for the short trip to A & E.

After explaining his symptoms at reception his emotional profile improved reporting to feel a sense of happiness, attributing this to a sense of optimism over the 'fact' that someone would deal with what he now perceived as a potentially serious health issue. Following his explanation, at A & E reception, events moved quickly, and he received rapid attention from a number of medical staff. Whilst this was clearly a serious medical condition, he records being aware of feeling a sense of relief following identification and the initiation of treatment of the cause of ill health. It is worth noting that despite being news of a serious condition, the diagnosis led to further improvements in pleasant emotions. However, he reports feeling confident that effective treatment was imminent, and began an informed discussion with medics.

Shortly after this point, he went into cardiac arrest. He described that whilst being transported to an ambulance he felt an extreme emotional change. He describes it as:

"I felt light headed and everything went black; an inky, black darkness then nothing. At first I felt calm as I became aware of subdued lighting somewhere ...above me. But then I felt a very rapidly growing sense of panic and terror, of a need to 'get there'...to the light. The desire to survive was overwhelming in its ferocity, frighteningly so. I felt like I was flailing. I was shouting, an incoherent, and to me completely inaudible, shout for help at the top of my lungs. It felt like I was trying to swim against a tide of treacle with an anchor tied to my ankles. But, at any cost I was going to get there."

Following this, he reports becoming aware of where he was, that is on a bed in a hospital room. His medical record shows that it had taken three attempts to bring him back to consciousness with a defibrillator. He had no awareness of the temporal nature of this process, and although it felt like a long time, he has rationalized this since, as being a spike in time. The language he used represents both its intensity and brevity.

Emotional states in the 'cath lab' (operating theatre) and subsequent recovery are characterised by gradual improvement in pleasant emotions. A month post heart attack he estimates his mood had returned to normal. It should be noted that throughout this period, he was placed on medication and the act of taking this medicine serving as a reminder of his heart attack. In addition, a medical explanation for why the heart attack occurred remained elusive. He received speculative explanations, which given his medical knowledge he is able to discuss with medics.

Discussion

This case study explores emotional and cognitive changes of a previously healthy individual who displayed none of the risk factors associated with having a heart attack, but

had one nonetheless. Importantly, he believed he was in a low risk group (French et al., 2000), a belief corroborated by medical evidence (Price, 2001; Weinstein, 1983). Beliefs associated with the perceived likelihood of sustaining a heart attack influenced his reactions to the early symptoms. He ascribed heart attack symptoms to having a gastric origin, a thought process consistent with previous research (Finnegan et al., 2000). Findings also concur with suggestions that knowledge of heart attack symptoms may not be enough to promote prompt action. In the present study, his detailed knowledge of the physiology of the heart and risk factors for heart attack contributed to him seeking an alternative explanation, hence he did not identify the symptoms early in the process. Increases in the intensity of unpleasant emotions experienced concurrently with acute pain combined to contribute to him challenging his beliefs that the cause of these symptoms was gastric in origin. As indicated previously, males tend to under-report heart attack symptoms and so there are very often delays in receiving appropriate treatment (Pedersen et al., 2009).

In the period before heart attack diagnosis, he attributed feeling unwell and unpleasant emotions to his perceived slow rate of progression toward fitness goals. Carver and Scheier (1990) propose that the rate of progress towards goal achievement influences emotion with pleasant emotions occurring when the rate of progress meets or exceeds expectations, and unpleasant emotions occurring when the rate of change is slower than expectations. The process of recording exercise training for a 25-year period indicates the importance he placed on attaining fitness goals. Exercise provided an outlet for identifying personal achievement along with being a strategy for mood regulation (Thayer et al., 1994). He expected his fitness to improve after revising his training schedule and became frustrated when progress seemed slower than expected.

The intense emotions reported during the three attempts to bring him back to consciousness with the defibrillator are acute and worth exploring and deconstructing. He reports little awareness of its temporal nature and although it felt like a long time, he has rationalised this since, as being a spike in time. The language used represents both its intensity and brevity, and previous research indicates that such emotional experiences tend to be remembered vividly. Arguably, emotions exist to provide information on personal survival and the intensity of emotions experienced index his perception of the need to survive; this is how he has internalised this experience subsequently (Baumeister et al., 2007). As Figure 4 indicates, in stage 2 he reports feeling anxious for a short time before his feelings rapidly transformed into anger (stage 3). In the context of this case study, anger might be described as a “big gun” brought out when there appears to be no other option and consistent with how Chemtob et al (1997) term a “ball of rage”. The context Chemtob et al explore is that of combat-related posttraumatic stress disorder and in this field, the participants of their research experience a relative loss of control of their anger, and often require anger management interventions. This implies loss of anger regulation whilst sentient and in relative control of cognitive processing. In the present study

the level of sentience and cognitive awareness during the cardiac arrest and recovery phase seems incredibly plastic with rapid changes in state and, non-linear, progression to sentience. The participant reports a complete lack of self-awareness during the anger phase. The transient nature of feeling angry, although defying temporal triangulation, does seem to coincide with the participant’s sense that he was involved in a ‘massive’ and significant ‘struggle’. Only later, during conscious retrospection, did he conclude that the ‘struggle’ had been for survival, and with no idea how big or small the nut (the challenge to life) the sledgehammer (anger) was swung.

Conclusion

The present case study details emotions experienced and attempts to regulate these emotions before, during and post a heart attack. The case study used represents an intriguing case because of the participant’s extensive knowledge of risk factors and a medical history that categorised him as low risk.

References

- Baumeister, R.F., Vohs, K.D., DeWall, C.N. and Zhang, L. (2007) How emotion shapes behavior: Feedback, anticipation, and reflection, rather than direct causation. *Personality and Social Psychology Review* **11**(2), 167-203.
- Carver, C.S. and Scheier, M.F. (1990) Origins and functions of positive and negative affect: a control process view. *Psychological Review* **97**, 19-35.
- Chemtob, C.S., Novaco, R.W., Hamada, R.S., Gross, D.M. and Smith, G. (1997) Anger regulation deficits in combat-related posttraumatic stress disorder. *Journal of Traumatic Stress* **10**, 17-36.
- Edenbrandt, L. and Pahlm, O. (1988) Vectorcardiogram synthesized from a 12-lead ECG: superiority of the inverse Dower matrix. *Journal of electrocardiology* **21**(4), 361.
- Finnegan, J.R., Meischke, H., Zapka, J.G., Leviton, L., Meshack, A., Benjamin-Garner, R., Estabrook, B., Hall, N.J., Schaeffer, S., Smith, C., Weitzman, E., Raczynski, J. and Stone, E. (2000) Patient delay in seeking care for heart attack symptoms: Findings from focus groups conducted in five U. S. regions. *Preventive Medicine: An International Journal Devoted to Practice and Theory* **31**(3), 205-213.
- French, D.P., Marteau, T. M., Senior, V. and Weinman, J. (2000) Perceptions of multiple risk factors for heart attacks. *Psychological Reports* **87**(2), 681-687.
- Matthews, G., Jones, D.M. and Chamberlain, A.G. (1990) Refining the measurement of mood: The UWIST Mood Adjective Checklist. *British Journal of Psychology* **81**, 17-42.
- McNair, D.M., Lorr, M. and Droppleman, L.F. (1971) *Manual for the Profile of Mood States*. San Diego, CA: Educational and Industrial Testing Services.
- Pattenden, J., Watt, I., Lewin, R.J. and Stanford, N. (2002) Decision making processes in people with symptoms of acute myocardial infarction: Qualitative study. *BMJ: British Medical Journal* **324**(7344), 1006-1010.
- Pedersen, S.S., Yagensky, A., Smith, O.R.F., Yagenska, O., Shpak, V. and Denollet, J. (2009) Preliminary evidence for the cross-cultural utility of the type D personality construct in the Ukraine. *International Journal of Behavioral Medicine* **16**(2), 108-115.
- Perkins-Porras, L., Whitehead, D.L. and Steptoe, A. (2006) Patients' beliefs about the causes of heart disease: relationships with risk factors, sex and socio-economic status. *European Journal of Cardiovascular Prevention & Rehabilitation* **13**(5), 724.
- Price, P.C. (2001) A group size effect on personal risk judgments: Implications for unrealistic optimism. *Memory & Cognition* **29**(4), 578-586.
- Terry, P.C., Lane, A.M. and Fogarty, G. (2003) Construct validity of the

Profile of Mood States-A for use with adults. *Psychology of Sport and Exercise* **4**, 125-139.

- Thayer, R.E., Newman, R. and McClain, T.M. (1994) Self-regulation of mood: strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology* **67**, 910-925.
- Walker, M.L. (2002) Cardiac rehabilitation: the importance of patient expectations – a practitioners survey. *Journal of Clinical Nursing* **13**, 177-184.
- Walsh, J.C., Lynch, M., Murphy, A.W. and Daly, K. (2004) Factors influencing the decision to seek treatment for symptoms of acute myocardial infarction: An evaluation of the Self-Regulatory Model of illness behaviour. *Journal of Psychosomatic Research* **56**(1), 67-73.
- Weinstein, N.D. (1983) Reducing unrealistic optimism about illness susceptibility. *Health Psychology* **2**(1), 11-20.
- Whyte, G., Godfrey, R., O'Hanlon, R., Wilson, M., Buckley, J. and Sharma, S. (2009) Acute myocardial infarction in the presence of normal coronaries and the absence of risk factors in a young, lifelong regular exerciser. *BMJ Case Reports* **2009**(may25 1).

Key points

- The present case study details emotions experienced and attempts to regulate these emotions before, during and post a heart attack. Unpleasant emotions experienced before the heart were attributed to lack of progress toward fitness goals, a perception that is plausible as he was a regular exerciser.
- Early identification of heart attack is critical as "Time is Muscle" (Whyte et al., 2009) and therefore even people perceived to be at low risk should consider the possibility of such an eventuality, and seek medical treatment early in the process.

AUTHORS BIOGRAPHY



Andrew M. LANE

Employment

Professor in Sport and Exercise Psychology, Chartered and HPC registered Sport and Exercise Psychologist School of Sport, Performing Arts and Leisure, University of Wolverhampton, UK

Degrees

BA, PGCE, MSc, PhD.

Research interest

Mood, emotion, measurement, coping, and performance

E-mail: A.M.Lane2@wlv.ac.uk



Richard Godfrey

Employment

Senior Lecturer, Brunel University, UK

Degrees

BSc, PhD.

E-mail: Richard.godfrey@brunel.ac.uk

✉ Andrew M. LANE

School of Sport, Performing Arts and Leisure, University of Wolverhampton, UK