Survival psychology: the won’t to live

John Leach looks at why people perish unnecessarily, and the crucial nature of cognitive function.

Cognition underlies all our behaviour including survival behaviour. Yet, when life is threatened, cognitive function becomes impaired. This article examines current research into the role of working memory and executive function in survival situations and attempts to shed light on why so many people in survival situations perish unnecessarily. It also seeks to remove the term ‘will-to-live’ as an outdated concept that hampers our further understanding of human behaviour in extremis.

Tales of human survival in extremis have always held a public fascination: think of climber Joe Simpson, frostbitten and starving, dragging his broken leg for four days to reach his mountain camp in Touching the Void (Simpson, 1988). Or the Uruguayan rugby team who survived an airliner crash in the Andean mountains by eating the flesh of their dead friends before a small team left to seek help in Alive. Add to these the numerous accounts of survivorship in brutal prisoner-of-war and concentration camps as well as more contemporary accounts of escape from sinking ships, crashed aircraft and collapsing buildings.

There exists a natural admiration, a mix of respect and incredulity, for people who have endured life-threatening duress; who have faced death and come through alive whilst others around them have perished. We tend to view such survivors as possessing a quality above the ordinary; a strength of character, a purposefulness or drive to overcome the crushing physical and psychological duress they encounter: a so-called, ‘will-to-live’. Indeed, in 1945 the Admiralty established a committee under Rear-Admiral A.G. Talbot to study naval lifesaving. One of its findings was that, ‘Evidence indicated that it was essential for survivors to have the will-to-live’ (Talbot, 1946).

Attempts have been made to pinpoint this ‘will-to-live’ by identifying a survivor personality. These approaches have tended to be either popular (Siebert, 2001), psychiatric (Bennet, 1983) or autobiographical (e.g. Richards & McEwan, 1989). Yet personality constructs have proven inadequate, and I would argue that this is because we have been asking the wrong question. The tractable research question is not, Why did this person survive when all around perished? Instead, we should ask why so many people die when there is no need. In other words, it is not the ‘will-to-live’, but the ‘won’t-to-live’ that matters.

Consider this example. In 1994 a light aircraft crashed in the Sierra Nevada. Of the three people on board one passenger was trapped in the wreckage, another had no more than superficial bruising, whilst the pilot had apparent injuries to his arm, ankle and ribs. To obtain help the pilot walked for 11 days through the snow-covered mountains before reaching a road and flagging down a passing car. The alerted rescue services located the crash site. Both the pilot’s companions were dead (NTSB, 1995).

Media attention was given to the feat of endurance of the injured pilot in travelling for 11 days over snow-covered mountains to seek help. His two dead companions warranted no more than a passing sentence in the press. Yet, one of these men had no more than superficial bruising following the crash. So why did he die? Material was there for shelter; fire could be made, water was available and he would not have starved in 11 days. This is the crux of survival psychology.

One view holds that people die because they become depressed and simply give up. This giving up behaviour is commonly reported amongst victims in life rafts and captives in prison camps. In World War II the Japanese called it bura-bura or ‘do-nothing-sickness’, whilst the Americans called it ‘give-up-itis’ from their PoW experiences in Korean and Vietnamese camps. A mental tipping point is reached: living is hard, dying is easy. The professional yachtman Nick Moloney described in an interview the time when he was swept overboard and became entangled in his harness: ‘I was so tired and in so much pain, there wasn’t even an adrenaline surge. I died that day I completely gave up the struggle. Mentally...
I’d lost the will-to-live, and that’s a terrible place to be (Scott, 2004). We investigated this apparent depression with members of a University Air Squadron undergoing winter survival training. Measures of clinical depression such as Beck’s Depression Inventory, word frequency and speech rate were recorded over three days, yet we found no clinical indicator of depression despite the clear observation that some participants showed an overly depressed response to their situation.

This ‘giving up’ behaviour has been noticed elsewhere. In his classic book The Jungle is Neutral, Freddy Spencer Chapman relates his experiences of jungle warfare against the Japanese during World War II. He states, ‘I met in the jungle six NCOs and men who had been cut off. A month later they were all dead. Yet there was nothing wrong with them’ (Spencer Chapman, 2003). The view from Chapman was that the jungle had killed them. Similarly, people enter neutral desert areas (including modern, developed parts of America) as well as Arctic regions and mountain ranges and they perish, and they do so quickly. Again, the question is why? After all, there are communities of people who live quite comfortably in all these environments. In 1991 a Canadian military Hercules aircraft with 18 personnel on board crashed near Alert base in the Canadian Arctic. Five died and 13 were stranded for four days before rescue. I was asked to debrief the survivors. Of those who died three did so through injury, but two were uninjured and were wearing cold-weather flying clothing. They were in the same environment in which women routinely give birth and children are raised quite happily.

So what happened to them? Common speech might say they died because they ‘just gave up’, or lost the ‘will-to-live’ etc. My argument is that such statements or descriptions serve only to explain away the observation without seeking to explain it at the scientific level of understanding. Instead, I prefer to talk of psychogenic death: a biological process takes place as in natural death, but it is triggered at a premature stage in the person’s life when they are under duress. Although it is more common than realised, the actual process is still unknown. However, it must be underpinned by cognitive processes, and a key quest in survival psychology research is the hunt for that process. Most of my early work in this area came from shipwreck survivors and their strikingly similar descriptions of the manner in which victims rapidly perished around them. Once its mechanism is understood, we should be able to prevent it happening to the extent that it currently does.

The road to understanding such deaths is being mapped out through experimental work in cognition and neurocognition under duress, and it begins with survival. We are all day-to-day survivors. We are alive today because from childbirth our behaviour has adapted to our own particular environment. The danger arises when we are forced outside of our adapted environment. This suggests that there are two types of survival behaviour: intrinsic and extrinsic. Intrinsic survival is supported by our daily, regular, routine behaviours within our normative environment. Extrinsic survival refers to those new behaviours we need to survive in an environment or situation not previously experienced: from a shipwreck to a kidnapping, from a fire in an office block to an airliner crash in the jungle.

Extrinsic survival clearly requires goal-directed behaviour. However, witness testimonies suggest that such goal-directed behaviour is the first function to fail when under threat. It was this observation that provided a clue to a new research direction: a cognitive approach to survival. With this new direction came a new question: not, Why do people die when they do not need to? but How do people die when they do not need to? It is this search for the underlying mechanism of human survival that is starting to yield answers.

Executive functions
Analysis of disaster incidents show that survival behaviour follows a pattern reflected in the following psychodynamic sequence: pre-impact, impact, recovery, rescue and post-trauma (Leach, 1994). During this sequence, victims will commonly show cognitive paralysis, stereotypical behaviour, perseveration, hyperactivity and hypoactivity. These behaviours vary over the course of a survival incident but are most prevalent during the sudden impact phase and the follow-on recoil phase when reasoning and comprehension return.

Cognitive paralysis, resulting in complete inaction, is too common an occurrence to be ignored, and the case has been presented for the classic ‘fight or...
flight' response to be renamed the 'fight, flight or freeze' response (Leach, 2004). As but one example, the engine fire aboard the Boeing-737 airliner at Manchester airport in 1985 that resulted in 55 deaths found some passengers sitting immobile in their seats until overtaken by smoke and toxic fumes (AAIB, 1998). An empirical study prompted by this incident describes volunteers in an airliner simulator as being 'behaviourally inactive' (Muir et al., 1989).

The other observed behaviours are indicative of impairment in executive function, a view that has received support from recent studies. In one field trial involving RAF aircrew undergoing the environmental duress of an 'aircraft down' survival exercise, measures were taken of selective attention, sustained attention and attentional switching (visual and auditory) (Leach & Ansell, 2008). Significant impairment was found in both selective and sustained attention but not in the other two functions. There are two interesting points about this finding: one theoretical and one practical. The theoretical point relates to work on controlled or executive attention. Engle et al. (1999) have argued that executive attention results from a combination of sustained and selective attention enabling control of working memory capacity in the face of distraction or interference. This suggests that the function underpinning successful survival behaviour is executive in nature.

The practical point is that impairment in selective and sustained attention was fully recoverable within the initial three days of the survival exercise. This is interesting because the psychological recoil period of a disaster is around three days, and it is within the first three days of a survival incident that most psychogenic fatalities seem to occur. If impairment in sustained and selective attention cannot be recovered then major cognitive dysfunction can arise (Sarter et al., 2001), which will cause further difficulties for the survivor. Indeed, a US Coastguard officer has stated, 'Strange as it may seem some people will just die. That's a little hard to believe, but I've seen any number of cases were the person will die in the first five hours and others will last several days.'

A more recent survival study (Porter & Leach, 2010) probed specific subcomponents of executive function. Significant impairment was found in the incongruent condition of the Stroop test, the mean repetition gap, adjacent letter pair components of the random letter generation task, and the planning and action components of the Tower of London task. No impairment was found in dual-task performance, verbal fluency or other measures of random letter generation. This finding suggests impairment occurring in the left dorsolateral prefrontal cortex, which Frith (2000) suggests is responsible for modulation of the attentional scheduler by the supervisory system. The attentional scheduler mediates between environmental stimuli that can trigger routine actions and the selection of behaviours by the supervisory system to achieve a particular goal. Our current findings suggest that the behavioural problems encountered in the initial survival phase are consistent with a normally functioning contention scheduler but one lacking appropriate supervisory control. In other words, the problem may lie with the communication pathways between cognitive modules rather than cognitive processes within modules.

Executive impairment also manifests itself as a lack of initiative. Such behaviour was certainly witnessed during the explosion and collapse of the Piper Alpha oil platform in 1988 where, according to the official inquiry report, 'A large number of people apparently made no attempt to leave the accommodation' (Cullen, 1990). The inquiry found that the death toll was considerably greater than it would have been if initiative had been taken with respect to escaping.

Impairment in attention and supervisory control highlight two areas of difficulty for the survivor: engaging with the new environment (physical and situational) and maintaining survival actions as goal-directed behaviour. The importance of a rapid return to normal cognitive function is reflected in the comment of Bill Garleb, a former prisoner-of-war of the Japanese, that survivors were those who had the ability to reason quickly and accurately and who could attend their minds and attention to taking advantage of targets of opportunity (Townsend, 1983). Garleb describes an incident when hundreds of his fellow servicemen are being herded onto trains leading to the Japanese PoW camps. He describes men pushing and elbowing their way onto the boxcars to grab a space to lie down, which they had previously been denied when travelling in a ship's hold to the mainland.
Garleb quickly noticed that there was no ventilation in the cars except near the entrance. He allowed himself to be pushed aside and fell back, becoming the last man to climb aboard, and found a space next to the guard by the door. Twenty-six men died from suffocation in that boxcar. This example illustrates executive attention in action: Garleb possessed not only the ability to detect such targets of opportunity but was also able to recognize their significance and to plan a strategy to support his goal of survival. Those who fought to clamber aboard first were responding directly to environmental triggers suggesting impairment in executive attention.

**Working memory**

But what of cognitive function during the immediate impact phase of a survival incident—during the first few seconds or minutes? It appears that during a threatening situation working memory does not work; or at least, it does not work as well as one would hope. This is baffling, because working memory lies at the hub of all cognition and behaviour, including survival behaviour. Intuitively, it would be expected that working memory would improve in efficiency whilst under threat or, at least, maintain its normal level of processing efficiency.

Consider the world of parachuting; in 2004 a parachutist with 118 previous jumps died following a malfunction of his main canopy. In 2005 a 31-year-old, with over 2300 recorded jumps, also died following a main canopy failure. In 2006 a 24-year-old parachutist died from impact following his canopy failure. The significance of these examples is not so much the failure of the parachutists’ main canopies but their failure to deploy their reserve parachutes; a situation referred to as a ‘no pull’. Such ‘no pull’ fatalities are not uncommon, accounting for 11 per cent of parachuting fatalities (Griffith & Hart, 2002).

To investigate this problem working memory capacity was measured in both novice and experienced parachutists (Leach & Griffith, 2006). The parachutists were tested on the operation-span task (Turner & Engle, 1989) shortly before their jump, on landing and on a control non-jumping day. Our findings revealed significant impairments in both storage and processing capacities prior to jumping.

Both experienced parachutists and novices showed the same degree of impairment; however, the experienced parachutists showed full recovery in storage capacity on landing, whilst novices continued to show restriction. Processing capacity had recovered in both groups on landing. Clearly, any restriction in working memory will lead to a slowing down in information processing with implications for survival behaviour that is time-dependent, and this may be one cause of ‘no pull’ fatalities.

Research in survival psychology tends to produce findings that are both counter-intuitive and unexpected. That working memory was restricted under threat was counterintuitive. The unexpected finding was that there were no wrong responses at all in the jump condition. During word recall the parachutists produced both correct and incorrect responses in the landing and control conditions. However, in the jump phase not only did both novice and experienced parachutists produce fewer words but they failed to generate any incorrect responses. We have interpreted this finding through the concept of the ‘episodic buffer’ (Baddeley, 2000) which is proposed as a back-up store that integrates information from the phonological loop and visuospatial sketchpad and, through the central executive, retrieves information from long-term memory (LTM). The lack of production of any incorrect words during the jump phase suggests that access to LTM may be disrupted. This is consistent with our finding of possible executive dysfunction arising under threat as the search and retrieval of information from LTM is an executive function, and if the supervisory system becomes inoperable then no words would be transferred into the episodic buffer. The implication here is that one problem with survivability is the difficulty in integrating information from the new survival environment, through multimodal systems, to information stored in long-term memory. Equally, one would expect no information to be transferred into LTM, and this also appears to be the case, as suggested by reports that some parachutists are unable to recall what happened during their first jump (Breivik et al., 1998) and from another study that found poor learning by skydivers of word lists in ‘in-air’ conditions (Thompson et al., 2001).

This difficulty in retrieving information from LTM could be the cause of ‘no pull’ fatalities. The motor action sequence for deploying the reserve parachute would be stored in LTM but is not associated with an environmental (air) trigger that would initiate the emergency procedure through the contention scheduler. Consequently, this sequence would need to be activated through the supervisory system, however, if this is impaired (as our studies suggest) then the emergency deployment routine will remain inactive. This impairment might also suggest a mechanism for the behavioural immobility frequently observed when faced with threat, as witnessed during the 1994 sinking of MV Estonia with the loss of 852 lives. Also, a hostage taken aboard a Boeing 747 airliner recounted his psychological response to the moment of capture:

> ‘In the hand that was on the end of the arm that was around the flight attendant’s neck, [the terrorist] had a pistol... I didn’t duck, or go to help, or shout, or run away, or anything. For what seemed like an age, and was probably about two seconds, I gawped. If anything went through my mind at all, it was the thought, How extraordinary – that man has a gun [...] At first it was numbing. I couldn’t respond, I was so stunned’ (Thexton, 2006).

**Big questions remain**

In conclusion, research into survival psychology began as a natural adjunct to the need for survival training for military personnel and extended into the civilian world of both natural and man-made disasters. The current indications are that victims perish unnecessarily because the threat environment restricts both the storage and processing capacities of working memory coupled with a form of temporary, environmentally induced dysexecutive syndrome. This field of survival psychology is still in its infancy and big questions remain to be answered. Why should working memory be vulnerable to dysfunction under duress? What is the cognitive trigger for psychogenic death? In case you are in any doubt as to the importance of such questions, I will finish with one final quote from a shipwreck survivor who watched four other passengers perish in his life-raft:

> ‘I had no thought people could die so easily. Their heads just fell back, the light just seemed to go from their eyes, and it was all over’.

John Leach
is at FSES(NorDISS), Norway, and at the Center for the Study of Human Cognition, University of Oslo
john.leach@psykologi.uio.no