Eight Survival Strategies in Traumatic Stress

See also
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Post-traumatic stress disorder (PTSD) in its fourth criterion relies on the consequences of fight and flight survival responses. However, this limits understanding of a much wider variety of stress responses from other survival strategies. Information from a variety of disciplines suggests eight survival strategies including fight and flight. The anatomy, physiology, cognitions, emotions and social expressions of these strategies are described in animals, and human infants and adults. A wider variety of survival strategies enriches conceptualization of PTSD and apparent comorbid phenomena.

KEY WORDS: survival strategies; fight and flight; PTSD; physiology.

When post-traumatic stress disorder (PTSD) was introduced into DSM III (AMA, 1980) it was a diagnosis waiting to happen. It filled a void of previously unlabeled suffering of Vietnam veterans and other traumatized groups.

After a quarter of a century of validation, however, some clinicians have felt that the diagnosis does not capture the wide variety of physical, emotional and social post-traumatic manifestations seen commonly in clinical practice. For instance, Lynch (1998) noted that PTSD saw humans as hard-wired only for fight and flight responses, ignoring other strategies, which dealt with say, abandonment, loss and need to save others' lives. Thus PTSD emphasising fight and flight responses in its fourth criterion, may be too restrictive. It may relegate many traumatic stress responses to other diagnoses (possibly comorbid), or to remaining unlabeled. It is possible that survival strategies other than fight or flight are relived and avoided among traumatic stress consequences.

In what follows, I hypothesize eight survival strategies, including fight and flight. I suggest that the reliving and avoidance of their adaptive and maladaptive biological, psychological and social manifestations and their derivatives make sense of the symphonies of traumatic stress responses.

A Case for More Survival Strategies

It makes intuitive sense that human beings evolved more than one or two means of survival for often complex and fluctuating threats. Similarly, the variety of emotions evoked in traumatic stress is likely to be associated with a variety of physiological responses that serve survival. In fact, Darwin (1872/1965) already described four basic means of survival ubiquitous in mammals. They were anger and fear, and competition and cooperation. It was Cannon (1963) who gave Darwin's anger and fear, the names fight and flight and connected them to sympathetic nervous system arousal.

Overlapping with Cannon historically, Selye (1973) described an 'adaptation', 'rolling with the punches' strategy, which he found to be ubiquitous among mammals. He called it the 'general adaptation syndrome. As against sympathetic nervous system arousal, its hallmarks were parasympathetic nervous system activation, alongside increased cortisol levels, and suppression of the immune system.

Next, Bowlby (1971) described attachment as a ubiquitous mammalian means of survival. Here the weak (he concentrated on children, but it can apply to victims), attach themselves to caretakers who promote their survival. Bowlby noted caretaking to be the ubiquitous complementary response to attachment among caretakers and rescuers.

Finally, achievement of vital goals such as food shelter and territory (through hunting work and assertiveness) has pervaded ethological and anthropological literature. What follows is a systematic synthesis and summary of the above what I call survival strategies.

Historically three forces have resisted syntheses like this one of survival strategies. First, Darwin's notion of survival of the fittest was falsely used to justify theories of racial superiority and genocide. Disentangling the false link (Darwin saw cooperation also as fitness that could promote evolution), has freed research on competition and hierarchies. Second, altruism seemed to belie evolutionary survival principles, because the fittest often sacrificed themselves for the weak. This enigma was resolved by realising that evolution favored a breeding community's gene pool, not an individual's genes (Wilson, 1975; Scott, 1989). Hence altruism by a few fit individuals that preserved a greater community gene pool served evolution of the breeding community. This realization meant that altruistic survival strategies could now be included. Lastly, a reductionist trend that has favored PTSD to be a single entity based on a single biological marker (such as inhibition of ACTH and cortisol) restricted views of the rich variety of clinical manifestations and associated physiological responses in traumatic stress.

Even so, a number of workers have recognized a variety of strategies of survival and have made efforts to categorize them. Plutchik (1993) noted eight means of survival, each associated with a specific primary emotion. He described escaping danger associated with fear, with attacking enemies associated with anger, sexual mating with joy, reintegration with sadness, friendship with acceptance, exploration with expectation, and orientation with surprise.

Panksepp (1998) described five executive command systems subserving survival. He called the systems thus: seeking/appetitive, rage and anger, fear and anxiety, love and nurturance, attachment loneliness and sorrow, rough-and-tumble play and joy.

The survival strategies below concur, overlap and differ with these delineations. For instance, I differ with Panksepp, by seeing attachment and grief as separate means of survival, and play and joy as aspects of all survival strategies. However, what is important to see at this stage is that this paper is part of a movement, which is trying to delineate a number of biopsychosocial templates of survival.

In previous publications, I noted that the great variety of fluctuating and often contradictory survival responses stemmed from different survival strategies (Valent, 1983; 1998; 1999). In the current paper I update descriptions and evidence for them, and show how they enrich concepts of PTSD.

Definitions and Method

Two approaches were used to see if the existence of survival strategies could be taken a step further. First, common patterns of survivor responses were clinically abstracted from (1) a video recording of a major jumbo jet disaster exercise, (2) audiotapes and written records from a bushfire, and (3) from many years of *in vivo* observations of traumatic responses in emergency departments, and retrospective accounts and relivings in hospital and private practice.

Concurrently, the literature of various disciplines was researched and similarly perused for ubiquitous means of survival. The disciplines included ethology, animal physiology, sociobiology, anthropology, developmental psychology and traumatology.

Survival strategies had to fulfill the following conditions. Their level of evolutionary organization and functioning had to be above instinctual reflexes, but below complex prefrontal judgments and planning. Each had to have obvious discrete and heuristic survival function and make clinical sense. Each had to have specific anatomical representation in the limbic and paralimbic system, the areas which serve survival and preservation of others (MacLean, 1973). Each had to be associated with specific neurophysiology, psychology, and social behavior. Lastly, each had to have evolutionary equivalents in animals, be present in all cultures, and to mature from infancy to adult forms.

It was understood that this was a qualitative study which even if fertile in concepts, would need empirical validation. It was hoped that the study might point to potentially fruitful areas of research.

Results

Survival strategies had been researched unevenly across disciplines. For instance, animal studies concentrated on what will be described under competition and goal achievement (such as hunting). Developmental psychology concentrated on attachment and caretaking. Traumatology has concentrated on fight and flight.

Nevertheless, eight survival strategies met the required criteria. They were: flight, fight, rescue/ caretaking, attachment, goal achievement/ assertiveness, goal surrender/ adaptation, competition/ struggle, and cooperation/ love. None are unknown to traumatology, or actually to the general population. They all make intuitive survival sense. The references below are some of the more cogent representatives from a massive literature.

Flight

Flight is perhaps the best researched survival strategy in both animals and humans. It is the physiological and clinical reference point in PTSD. It is sometimes wrongly compounded with its opposite fight, because the two share sympathetic nervous system, ergotropic (Gellhorn, 1970) physiological arousal responses. Yet the two survival strategies are associated with opposite emotions and actions (Darwin, 1872/1965) and are actually mutually inhibitory (Panksepp, 1998).

Flight is typically depicted as running in terror. Different circumstances evoke different shades of terror. Encroaching, engulfing danger evokes panic, inescapable danger evokes freezing, sudden danger evokes fright and startle. Threat of danger evokes fear, and hiding and avoidance may be used to elude it. An unclear source of danger can evoke anxiety and more generalized avoidance. Successful escape is associated with a sense of deliverance, being caught with a sense of engulfment and annihilation.

Flight is ubiquitously present in animals and all human cultures. Young infants already move their gazes, heads and limbs away from fearful stimuli and move away bodily as soon as they are mobile.

Flight is associated with the medial preoptic regions, lateral and central nuclei of the amygdala, ventral-anterior and medial hypothalamic areas, strong rostral connections to the bed nucleus of stria terminalis and with descending connections to the centrum mediastinum - parafascicular complex, down to the dorsal part of midbrain periaqueductal grey (Henry, 1986; Panksepp, 1989; 1998).

Flight is associated with activation of the sympathetic nervous system (Cannon, 1963; Southwick, S.M., Morgan, C.A., Bremner, A.D., Grillon, C.G., Krystal, J.H., Nagy, M.L., & Charney, D.S., 1998). Norepinephrine (NE) turnover is heightened in the locus coeruleus, hypothalamus, amygdala and hippocampus.

Van der Kolk & Greenberg (1987) suggested that the clinical marker for PTSD was inescapable shock and its physiological concomitant was NE depletion and subsequent sensitivity to NE stimulation in parts of the brain. Yehuda (1997) claimed its major physiological marker to be negative feedback inhibition of the HPA axis, with marked reduction of ACTH and serum cortisol levels.

Panksepp (1998) noted that potential fear facilitators such as dopaminergic activity, β - endorphin, CRF, α-MSH, cholecystokinin, diazapam binding inhibitor, carbachol and excitatory amino acids such as glutamate, might in different proportions facilitate different types of anxiety and flight behaviour. They could also be modulated. For instance, alcohol, benzodiazapines and GABA ameliorated fear and anxiety (Dixon & Kaeserman, 1987; Panksepp, 1989; 1998).

Hindered escape may be accompanied by intensification of flight responses, and their generalization into normal situations. For instance, Friedman (1991) noted intense elevation of sympathetic nervous system activity in combat veterans with PTSD when exposed to flight evoking combat stimuli, as well as lesser such elevations in basal conditions.

Total inability to escape may evoke raised cortisol secretion, indicating that even a single survival strategy may be associated with different physiological responses in different circumstances. The excessive cortisol secretion may be associated with lower imunocompetence (Knapp, Levy, Giorgi, Black, Fox, & Heeren, 1992) and be a contributor to hippocampal damage in PTSD (Yehuda, 1997).

Fearful flight responses to trigger stimuli and avoidance of such triggers are seen to be characteristic of PTSD.

Flight responses may also contribute to anxiety disorders, phobias, and cardiovascular disorders through excess sympathetic nervous system arousal.

Fight

While flight promotes escape from danger, fight attacks the source of danger. The two strategies may fluctuate, such as in changing combat circumstances.

The anger and aggression of fight is called defensive aggression in ethology, as its purpose is to defend territory and life. It is also called impulsive and hot. This differentiates it from cold, premeditated aggression seen in hunting (see goal achievement) and in inter-male struggles (see competition). Thus survival strategies may be useful in differentiating various types of anger and aggression (Buss & Shacklefold, 1997; Panksepp, 1998). Such differentiation is clear in animal studies, but less so in human ones. I take into account only studies where the differentiation is clear.

Aggression in fight has escalating goals in ridding enemies. Angry vocalizations and threatening body postures may deter attacks by inducing fear and inducing retreat. If attacks have already occurred, revenge leads to equal or greater counterattack, meant to deter further attacks. When it comes to "kill or be killed" situations, hatred and fury spearhead lethal attacks on the enemy. Sometimes danger is sensed to threaten from within. Disgust is akin to anger toward internal vermin and germs, whose poisons must be excreted. Hatred and disgust toward enemies may alternate.

Successful fight is associated with a sense of security, unsuccessful with pent up vigilance.

Defensive aggression is present in most animals and in all cultures. Human infants attack hurting objects by biting, scratching, hitting, spitting and vomiting.

It interweaves with, but is different to that of flight. Thus in fight it is the medial nuclei of the amygdala, and medial areas in the hypothalamus which are activated. As in flight, radiations are present to the stria terminalis, periaqueductal central grey, and to the prefrontal cortex (Panksepp, 1998; Critchley, Simmons, Daly, Russell, van Amelsvoort, Robertson et. al., 2000).

Some of these areas are involved with the sympathetic nervous system, which is very active in fight. E and NE levels are high (Panksepp, 1998; Haller, Makara & Kruk, 1998), though NE/E ratios are relatively more elevated and sustained in fight than in flight (Henry, 1986). As in flight, there is a striking association between catecholamine activation and HPA inhibition (Henry, 1986; 1997).

Parts of the immune system such as natural killer cells may be mobilized during fight arousal (Dopp, Miller, Myers & Fahey, 2000). Serotonin has been consistently found to diminish fight type aggression (e.g., Kavoussi, Armstead & Coccaro, 1997).

Hostility, destructive feelings and suppressed anger contribute to vasoconstriction, high blood pressure, arrhythmias, increased levels of cholesterol, triglycerides and glucose, and endothelial damage in arteries. Thus prolonged fight may contribute to hypertensive and coronary heart disease (e.g., Goldstein & Naiura, 1995; Spieker & Noll, 2003). Hypervigilance and aggression are not uncommon in PTSD, as well as in paranoid and sociopathic personality disorders.

Rescue; Caretaking

Helplessness of infants cues strong protective feelings. Recently, especially in traumatology, we have learned that traumatic helplessness of adults, even of strangers, can cue in the more able imperative desires to save and nurture the weak and needy.

Rescuers feel a need to pick up, hold, secure and take care of the victims. Rescue/caretaking emotions are intense empathy, pity, compassion, care, devotion and responsibility.

Successful outcomes are among the most joyful and purposeful in life. Too great demands can lead to feeling strained, burdened, depleted, to acute anguish and guilt for causing death, and to compassion fatigue and secondary PTSD (Figley, 1995; Valent, 1995).

All social animals and human communities tend to protect and care for their young and their weakened members. In children, rudiments of empathy develop by the age of two. By the age of seven children can even save and protect their parents (Valent, 1994).

Studies of the neurophysiology of rescue are far more sparse and scattered than those of the previous survival strategies. The right ventromedial prefrontal cortex is associated with empathy according to Shamay-Tsoory, Tomer, Berger & Aharon-Peretz, 2003. The thalamocingulate division of the limbic system, especially in the areas which have high receptor sites for estrogen, progesterone, prolactin and oxytocin, are known to activate maternal behavior (Rosenblatt, 1989) including maternal aggression (Troisi, D'Amato, Carnera & Trinca, 1988). Opioid activity and high cortisol levels may also facilitate caregiving behavior (Panksepp, 1998).

Attachment

Attachment is the bond of children and the weak to their rescuers and caretakers. Attachment and caretaking are complementary strategies (Bowlby, 1971), akin to fight and flight. The ethological, developmental, clinical and neurophysiological features of this survival strategy have become well documented in the last three decades.

Searching for attachment figures is accompanied by yearning, craving, calling, reaching, searching, and holding on. Failure to find an attachment figure leads to separation anxiety, helplessness, aloneness and a sense of being abandoned and cast out.

Attachment and separation calls evolved about 180 million years ago and are present in all mammals and birds (Scott, 1989). In humans, attachment develops most strongly between six and eighteen months.

The neurobiology of the attachment bond is served by the midbrain PAG and thalamocingulate division of the limbic system. Separation calls are associated with the cingulate gyrus, in areas rich in opioid receptors (MacLean, 1985). Oxytocin, prolactin but especially opioids facilitate attachment (Schore, 1994; Panksepp, 1998). Morphine and endogenous opioids sharply reduce separation cries, while their antagonist naloxone increases them. Opiates withdrawal may be associated with the perception of aloneness isolation (Panksepp, 1989).

Separation distress is facilitated by CRF and glutamate (Panksepp, 1998), and the sympathetic nervous system is also activated. In the later detached/'depressed' phase of the separation response, heart rate and temperature are decreased, ACTH and adrenal cortical secretions are elevated and the immune system is depressed (Panksepp, Siviy, & Normansell, 1985). The control system of attachment is situated in the orbitofrontal part of the right hemisphere of the brain (Schore, 1994; 2000).

Because mothers are important instruments in setting points for physiological functions and normal integrated development (e.g., Schore, 1994), early separations may adversely affect biopsychosocial attunements such as immune system settings. This in turn may contribute to a variety of later disorders especially under stress, such as infections and cancers (Panksepp et al, 1985; Schore, 1994).

Poor psychobiological self-regulation may contribute to dependent and borderline personality disorders, and addictive behaviors.

Goal Achievement; Assertiveness

Hunting, work and combat are means to achieve survival goals such as food, shelter and territory. The associated aggression is cold and calculating, accompanied by a sense of will, strength, control and potency. Failure leads to frustration, burn-out, exhaustion, a sense of loss of control and impotence, and powerlessness. Animal studies of this survival strategy concentrate on hunting and foraging. Human studies concentrate on work. Studies of combat tend to not distinguish goal achievement and fight. Only studies where the distinction is clear are drawn on in this paper.

Food, shelter and territory are survival concerns in all species and cultures. Controlling the breast may be the first human means of achieving food, territory and security, but skills and roles develop over the life cycle. In modern society, goal achievement is often channelled into work, as it provides money, which then buys food, shelter and territory.

Predatory aggression is associated with the lateral perifornical hypothalamus, ventral periaqueductal grey, and ventral and lateral tegmental areas (Shaikh, Brutus, Siegel & Siegel, 1985).

Effort is associated with activation of the sympathetic nervous system. As in fight, this is associated with increased levels of E, NE, glucose, cholesterol and fatty acids, and decrease in blood coagulation time. Associated elevated endogenous opioids may facilitate motivational behavior and suppress pain (Smith, 1991). A decrease in 17-OHCS and cortisol levels occurs as in flight and fight (Bourne, Rose & Mason, 1968; Hoch, Werle & Weicker, 1988). Though hunting and combat are associated with maleness, unlike in competition, they are not associated with elevated male hormones (Worthman & Konner, 1987).

Repeated arousal may lead to toughness, such as enhanced immune system competence. However, sympathetic hyperactivity may lead to hypertension and coronary heart disease (Friedman, 1991; Goldstein & Niaura, 1995).

Goal Surrender; Adaptation

Goal surrender is the reciprocal survival strategy to goal achievement. It demands delaying or surrendering goals, grieving losses, and adaptation to new circumstances.

Grief and mourning seem to be newly evolved capacities, shared only with birds, elephants, and primates. Grief and mourning occur in all cultures. Grief and weeping appear in infants at six months. After the second year of life the grieving process resembles ever more that of adults.

The clinical stages of grief are well established. Acute grief is accompanied by sadness, sorrow, sobs and crying, which are sometimes confused with acute stages of separation in attachment. Over time, the mourning process allows emergence of new hope and rebuilding of a new life. Inability to adapt may lead to unresolved grief, hopelessness, depression, despair and giving up.

Normal grief has been researched only recently. However, grief and depression seem to be associated with the cingulate gyrus, hippocampus and septum, basal ganglia, and other centres depending on the type of mentation involved (Panksepp, 1986; Brody, Barson, Bota & Saxena, 2001; Gundel, O'Connor, Littrell, Fort & Lane, 2003). Feelings of sadness and depression sensitively activate the parasympathetic nervous system, the HPA axis (with increased cortisol secretion), and suppress parts of the immune system

(Selye, 1973; Calabrese, Kling & Gold, 1987). Just recalling sadness can suppress mitogenic lymphocyte activity (Knapp, et al., 1992).

Immune system deficiencies may contribute to infections, autoimmune diseases and cancers. Changes in platelet function can lead to prothrombotic states that may help to explain increased cardiovascular risk in patients with depression (Spieker & Noll, 2003).

Competition; Struggle

Struggling of all against all (the supposed law of the jungle), is rare in social species. This is because social species establish hierarchies (pecking orders) to ensure peace. Even though the dominants appropriate more resources, they ensure that sufficient trickles down for all to survive. Internal struggles occur only when hierarchies break down. Then struggles such as for exits, shelter, food and money can occur (Valent, 1984).

Competition is a ubiquitous survival strategy across the animal kingdom. In humans, it is present by the age of two.

Studies of this survival strategy concentrate in both animal and human literature on inter-male hierarchical contests for power. (Envy, greed and jealousy are rarely studied, and not yet physiologically.) Winners in human hierarchical contests experience triumph, power, and a sense of dominance. Losers experience a sense of defeat, submission and being crushed. Such feelings are often confused with depression.

Drive for power is associated with the medial preoptic and medial anterior hypothalamic sites, which also take up testosterone selectively. Defeat and subordination are associated with the hippocampus, septum and paraventricular and supraoptic nuclei of the hypothalamus (Henry, 1986; Kollack-Walker, Don Watson & Akil, 1999).

A consistent and robust finding across species, including humans, is a very sensitive parallel between hierarchical dominance and testosterone levels. Even imagining success or failure in a mental dominance contest is sensitively reflected in high and low testosterone levels respectively (Schultheiss, Campbell & McClelland, 1999). Such levels in turn influence attitudes to winning or losing and hierarchical status in subsequent contests (Mazur & Booth, 1998; Schultheiss & Rohde, 2002).

Defeat, submission and subordinate status are sensitively reflected in low levels of testosterone, and high levels of cortisol with dexamethasone resistance in proportion to subordinate status (Sapolsky, Alberts & Altman, 1997). Defeat in males also leads to marked increases in the female luteinizing and follicle stimulating hormones as well as oxytocin (e.g., Ebner, Wotjak, Landgraf & Engelmann, 2000), though the same hormones may increase female status. Nevertheless, female competitiveness is also enhanced by testosterone (Dabbs & Hargrove, 1997).

As well as testosterone, catecholamines such as norepinephrine and dopamine seem to be necessary to maintain dominant status (Serova & Naumenko, 1996). Finally, testosterone levels in early life may influence later testosterone levels and hierarchical status.

Victory enhances immunocompetence while defeat compromises it (Fleshner, Laudenslager, Simons, & Maier, 1989). As a result, defeated animals may die of infections, while injecting them with testosterone can lead to recovery (Wilson, 1975). Low socioeconomic status has been known to be associated with generally poorer health in humans (Wilkinson, 1999).

Prolonged hierarchical struggles such as at work may lead to raised blood pressure, ventricular arrhythmia and atherosclerosis (e.g., Sgoifo, Koolhaas, Musso & De Boer, 1999).

Cooperation; Love

Non-sexual bonding among equals is possibly the least researched survival strategy, though cooperation is acknowledged widely as a human trait that ensured species survival.

Cooperation is the opposite survival strategy to competition. In cooperation people bond and pool their diverse resources without hierarchies, and give and take to fill each other's needs. Such reciprocal altruism (Trivers, 1971) has evolved even for strangers, as long as their 'image' is that of potential friends (Nowak & Sigmund, 1998). The high morale cohesiveness typical of this survival strategy was seen in the London blitz, and the 9/11 tragedy.

Cooperation is accompanied by trust, love, generosity and mutuality. Combined with high energy, they are conducive to inventiveness in managing hardship, and to creativity. Distortions and perversions of this strategy occur when one party betrays the trust of the other by cheating, robbing, exploitation and abuse.

Animals from insects on are known to help each other. In mammals, affectional bonds intensify such reciprocity, while reciprocal giving and trading act as social glues in human societies. Giving and taking develops in the first two years of life in humans.

Animal and human studies have indicated that oxytocin is the most potent affiliative hormone (Insel, 1992). Oxytocin, vasopressin and opioids, in conjunction with serotonin (Marazziti & Cassano (2003) act between the hypothalamus and the medullary source nuclei of the visceral vagus (Porges, 1998). Vagal activation leads to decrease in pulse, blood pressure, E and NE levels (Henry, 1986), and cholesterol, triglycerides and glucose levels (Catipovic-Veselica, Buric, Mercep, Skrinjuric-Cincar & Catipovic, 1995). Social love bonds may thus protect against cardiovascular disease.

Absence of affiliative love bonds, felt as social alienation, is associated with the cingulate gyrus, decreased opiate levels (Panksepp et al, 1985), and increased HPA activity and cortisol levels (Carter, 1998). Socialization reverses these findings.

Sexuality is a specific type of affiliative cooperation. It is served by the amygdala, temporal pole and orbital frontal cortex. They also have the highest concentration for mu-like opiate receptors, and opiates. Opiates can be seen to enhance different types of social comfort, and mutual affectionate bonding (Kimball, 1987). We have already seen that the opioid antagonist naloxone intensifies attachment needs. It also intensifies social need, grooming and sexual activity. Sex hormones also promote social bonding, as well as sexual desire in both sexes (Panksepp, 1993).

Loving relationships and social networks may protect not only against cardiovascular disorders but also against a variety of traumatic stress and other disorders. Negative relationships and isolation may increase vulnerability to them. Abuse of love bonds, especially in children, can have long term debilitating effects.

Thus far, survival strategies have been described sequentially. Table 1 indicates that it may be possible to tabulate their characteristics and display their qualitative differences. Such tabulation may also indicate directions for empirical research. Table 1 presents the functions, and physiological and psychological highlights of survival strategies in traumatic situations.

Table 1. Physiological and Clinical Highlights of Survival Strategies

Survival Strategy	Function	Physiology	Clinical trauma
Flight	Safety	↓ACTH, cortisol	Engulfment
Fight	Rid danger	↑E & NE	Murder innocents
Rescue; Caretaking	Preservation	↑ female sex hormones	Abandon to die
Attachment	Be preserved	↓ opioids	Abandoned to die; helplessness
Goal achievement; Assertiveness	Achieve life goals	↑E & NE & opioids	Failure; powerlessness
Goal surrender; Adaptation	Adapt to new circumstances	↑ ACTH, cortisol ↓ immune system	Despair; giving up
Competition; Struggle	Win scarce resources	↓ testosterone ↑ cortisol	Defeat; elimination
Cooperation; Love	Inventiveness; creativity	↓ opioids &oxytocin ↑ cortisol	Stasis; disintegration

Discussion

Survival strategies expand the usual scope for making sense of, and classifying the variety of traumatic stress manifestations. For instance, we can now place union and abandonment, triumph and defeat, mutuality and betrayal, in a conceptual framework that includes associated neurophysiological responses.

The validity of survival strategies rest (1) on intuitive logic: we know that to survive we need to avoid or confront danger, help others or be helped, strive or adapt, struggle or cooperate; (2) on consistent, even if scattered descriptions in various disciplines of the survival strategies described, and (3) on the differential anatomy, physiology and psychology of survival strategies. However, we saw that others may delineate survival strategies a little differently (Plutchik, 1993; Panksepp, 1998). Ultimately empirical research, with concurrent utilization of psychology, neuroimagery and physiology will help to hone survival strategies. Such research may test the associations in Table 1.

Specificity of survival strategies must take into account that nature uses the same building blocks in different proportions for different purposes. For instance, active survival strategies may share ergotropic (including sympathetic nervous system) physiological components (Gellhorn, 1970), including raised catecholamine and decreased cortisol levels, and passive survival strategies may share trophotropic (including parasympathetic nervous systems) physiological components, including decreased catecholamine and increased cortisol levels (Henry, 1986; 1997; Panksepp, 1998). Within these major divisions, it is likely that neurological circuits and physiological components are applied in more refined ways as survival strategies are applied in particular ways. Thus E and NE may be used in different proportions in fight, flight, competition and rescuing. Opioids may be used in different survival strategies in different proportions to enhance different bonds or numb pain. Increasingly complex neurophysiological fine tuning is likely as nuances of emotions and meanings derive from survival strategies. This opens a vast field for research.

Conclusion

Eight survival strategies described above provide expanded means to make sense of, and classify the great variety of biological, psychological and social traumatic stress responses. They enrich the clinical scope of PTSD and of understanding comorbid diagnoses. They have the potential to describe and classify trauma and fulfillment ripples at different social and spiritual levels (Valent, 1998; 1999). They indicate new areas for clinical research.

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