Hope Against Fear

The motivational tapestry of trauma and recovery in ecological context

Andrew R Harvey

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This work may be cited as "Harvey, A. R. (2026). Hope Against Fear: The motivational tapestry of trauma and recovery in ecological context. Complex Trauma Institute, UK, **www.complextraumainstitute.org**".

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The motivational tapestry of trauma and recovery in ecological context

First published in the UK in 2026 by the Complex Trauma Institute
www.complextraumainstitute.org

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ISBN: 978-1-9194964-0-5

Preface

What do chronic pain and other syndromes of persisting physical distress have in common with syndromes of emotional distress such as depression, anxiety, PTSD, and grief? This book finds answers by exploring the biology of embodied trauma. It will guide you through the common ground they share, showing how foundations often laid through childhood adversity and built through physical, psychological, and socioeconomic stress in adult life create vulnerability to this full spectrum of conditions.

There are three key elements they all share. **The first element is distress.** We all understand intuitively what distress is, but its precise nature is not so easy to nail down. It can be defined as the unpleasant-ness of an experience which arouses our senses, warns of danger and prompts and guides necessary behaviour change, and may range from a sense of unease through to unbearable pain or intolerable fear. **The second element is that in all these conditions distress does not switch off after the threat of danger has passed.** It is no longer adaptive (guiding safety behaviour) but is part of an ongoing cycle of persisting symptoms leading to avoidance of those actions which could break the cycle – it is maladaptive. **And the third shared element is fear**, which may derail an adaptive healing response in a vulnerable individual into a syndrome of persisting maladaptive distress whether the primary symptoms are "physical" or "mental" (or mixed, as they often are).

Let me explain first why it was important for me to understand maladaptive distress. I am a physician, a rheumatologist by specialist training, and early in my career I began to ask why injury and painful illness sometimes continue to give pain after the tissue damage or inflammation has fully healed? Working with people with maladaptive pain (termed nociplastic pain in this work) raised another question – why does this type of pain always bring mental distress? Pain has to be distressing to protect us, but **the nature of the distress in severe nociplastic pain seemed different, more mental than physical**, altering someone's whole demeanour. It was somehow embodied within the individual rather than an irritant which could be faced up to and worked around.

The questions crystallised into a broader theme – **what is the common ground shared by maladaptive physical illness on the one hand** (for example nociplastic pain (NP), irritable bowel syndrome (IBS), chronic fatigue syndrome(CFS)), **and maladaptive mental illness on the other hand** (for example major depressive disorder (MDD), generalised anxiety disorder (GAD), post-traumatic stress disorder (PTSD), complicated grief (CG)). **Has something happened in all affected individuals which increases sensitivity to distress?** If so, **why does that distress so profoundly dominate an individual's decisions and behaviours?** And this is where fear comes in – it is a pervasive thread within the motivational tapestry this work brings together.

This book seeks to translate and distil understanding from recent exponential growth in scientific knowledge relevant to trauma and recovery into a text that can be applied at the

coalface. It analyses research around five main themes: **body-mind integrity; the shared neurobiology of physical and mental distress; the body's contribution to mental life; foundations of vulnerability and resilience**, particularly early childhood and adolescent experience; and **complexity in biopsychosocial systems.**

Before exploring the themes in more detail through the rest of the book, I would like to comment on use of terminology. Because information is integrated from many different fields, **I have included a number of scientific terms which may not be familiar to many readers**, such as affordances, allostasis, anhedonia, dyshomeostasis, emergent phenomena, interoception, nociplastic pain, and proprioception. Don't worry if these terms sound technical when you first come across them - I believe they are all important foundations for understanding trauma and recovery. **I introduce them gradually, I have defined them all in the glossary at the beginning of the text**, and I hope it will work for you to check their meaning there until you get used to them. I believe the illustrative examples and case narratives will help familiarise them, allowing the book's arguments to develop smoothly.

So, who am I hoping will read this book? **My first audience is the large and diverse group of therapists, social care providers, nurses, physicians and many others who work at the front line of health and social care with individuals whose lives have been derailed by trauma in all its forms.** These would have been the colleagues with whom I worked in teams of various shapes and sizes and individually, from whom I learnt how to see the complexity of need, and through whom I understood how to build empathy into therapy for change. But I have another key audience. **The threads of knowledge from which I have woven this tapestry have largely come from scientific territory outside my areas of trained expertise, and understanding that science has been challenging. So this book is also addressed to their academic authors, partly to validate my interpretations of their work but perhaps more importantly to offer additional insight into the questions clinical and social care teams and their patients and clients might wish to ask.** Clear understanding will only build when there is open fertile communication between scientists, practitioners, and their patients and clients. I ask for patience from both audiences with any awkwardness in writing style resulting from my wish for this work to bridge between these two audiences.

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Introduction

The ecology of recovery.
Trauma always affects mind and body together. Sometimes it presents mainly with emotional distress like post-traumatic stress disorder (PTSD) or complicated grief (CG), and sometimes with physical distress like fibromyalgia (FM) or irritable bowel syndrome (IBS). But symptoms are typically mixed - emotional distress almost always comes with physical symptoms and physical distress carries emotional pain within it. These shared symptoms point to complexity in the development of many trauma outcomes, and the ecological perspective always looks at an individual within his or her social and physical context. It sees that context as an ecological niche in which the individual's development, health, and wellbeing is determined by their social connections and available physical resources as well as any traumatic challenges encountered. When you "can't see the wood for the trees", systems thinking helps - how an individual responds to threat, illness, or injury depends on feedback loops which develop between the body (including the immune system), the brain, and the environment. Inputs from the environment may be social (things other people say and do) or physical (diet, air pollution, time spent in natural surroundings). This work explores how traumatic experience may become embodied when sensitivities from childhood, adolescence, and adulthood leave an individual vulnerable to subsequent trauma, feeding into these complex systems. Such feedback loops may wind each other up - negative influence may build distress which persists after the original trigger has passed, so simple treatments which should work may be ineffective. But at the same time, positive past experiences linked into hopes for the future will introduce resilience.

To see the bigger picture it helps to recognise that threat has always predicted injury, illness, and social alienation. Throughout evolution, our ancestors' experience has crafted their genes (which we have now inherited) so our bodies and minds anticipate all eventualities. Not only does the body respond to fear by activating the autonomic nervous system's fight or flight arousal, it also primes an inflammatory response within the immune system so if injury follows, tissue healing can be up and running quickly (that is the ecological explanation for neuroinflammation that this work proposes). This bigger picture sees adaptive recovery from trauma following a motivational sequence. It starts with pulling back from threat for safety, and resting after injury for recuperation, described in this work as ecological disengagement. The body's nervous and immune systems, primed by threat and sensitised by injury or illness, together build the "mind-body" feelings and emotions which demand rest and promote reflection – fear, pain, fatigue, and anhedonia (loss of pleasure – its role in recovery from trauma is discussed in detail later). But re-engagement within the ecological space is essential for nurturing, support,

and development and as healing progresses, wellbeing, vitality, and hope gradually take over to guide, pace, and motivate active recovery (see chapter 1, fig. 1). But an adaptive pathway can be derailed onto a maladaptive pathway at any stage along this continuum as vulnerability embodied following previous adversity fearfully evokes past distress in a remembered traumatic context.

Body-mind integrity is fundamental.

Despite major progress in scientific understanding – for example of the cellular biology of pain and the neuroanatomy of mental health and illness – there have been no recent breakthroughs dramatically improving quality of life in syndromes of maladaptive physical and mental distress, or slowing the relentless increase in their prevalence. This work argues that a key barrier to better progress is the implicit cultural paradigm which continues to separate the workings of mind and body through the heritage of Cartesian dualism. The line that has traditionally been drawn between the mental influence of feelings and the physical workings of the body is not as clear as we intuitively think. Feelings which guide behaviour during threat and illness arise in the body, not the mind. Emotions which motivate behaviour change during daily life – and following threat, injury, and illness – are put together seamlessly by the body's neural and immune systems through engagement with the individual's ecological space, and only then presented to the mind to translate into the experiences which we have learned to recognise as emotions (which we intuitively think of as mental). These same neural-with-immune processes have been working intimately together through millennia, successfully defending bodies and motivating behaviours long before our evolutionary ancestors had anything resembling the minds which contemporary Western thought esteems so highly.

This book builds on eight key ideas — hypotheses which can be tested — to help explore how body and mind respond to threat and injury together and why the responses sometimes get derailed. You don't need to remember these hypotheses in detail as they will all be revisited and analysed with help from the stories and other illustrations. Here is the ground we will cover:

- **Mental and physical distress develop ("emerge") together within a fully integrated neuroimmune motivational repertoire (hypothesis 1)** - what we call mental and physical pain are "made of the same stuff".

- **Throughout evolution, threat has predicted injury and alienation. The evolved neuroimmune continuum responding to threat and alienation anticipates injury, illness, and food insecurity (hypothesis 2).** The work will explore how body-mind prepares for the best or the worst depending on past experience - allostasis in action. In maladaptive distress syndromes, the worst predictions have the upper hand.

- All disturbed bodily feelings can be misinterpreted as illness under the influence of

a general sense of threat. In scientific terms **all dyshomeostatic interoception can become salient (nociceptive) through fearful ruminative attention (hypothesis 3).**

- **Cross-domain (mental-physical) sensitisation may build reinforcing feedback in both directions between social distress and physical health and wellbeing (hypothesis 4).** Social stress and mental illness (anxiety and depression) may undermine physical health, shortening lifespan. Physical illness not only adds to mental distress but can undermine life's activities through fatigue, and also through anhedonia which downregulates reward responses in the brain.

- Self-image - our unique sense of who we are - is built from archived knowledge of the body's health and physical activity through a lifetime's engagement with our social and physical environment. In scientific terms **self-image is dynamically curated from interoceptive and proprioceptive surveillance of the body's engagement with its ecological niche (hypothesis 5).** It is refined by feedback from the niche through exteroceptive surveillance, particularly from other people.

- Loss of pleasure, a key feature of depression, has its roots in the body's survival responses during illness and after injury. In scientific terms **anhedonia first evolved as a primeval response to physical injury and illness - its recruitment in depression is recent in evolutionary terms (hypothesis 6).**

- How we move and actively use our bodies shapes emotion, guiding and supporting adaptive recovery after trauma. In scientific terms **surveillance of body movement (proprioception) influences mood and motivates ongoing physical activity (hypothesis 7).**

- Attitudes and skills are a mix of thoughts and behaviours – someone who loves nature goes out exploring, and plants a garden; someone who enjoys risk goes rock-climbing, and takes chances with new friendships. Although mind and body are in reality fully integrated, it may help to think of them working together as a very close team, looking out for each other, sharing what they learn for the benefit of the self. As a result of this intimate integration, **cross-domain neuroimmune learning translates from physically risky childhood play to social confidence in adolescence and adulthood (hypothesis 8)**, a foundation for trauma resilience.

Although the relevance of some of these concepts to recovery from trauma may not appear obvious at first reading, I hope to clarify their importance within the motivational tapestry of evidence-based trauma therapies by the end of this work.

A number of illness narratives are introduced to help translate the developing scientific knowledge into practice (and I would emphasise that all these narratives are fictional).

For example, in the second chapter a story illustrating an emotionally traumatic event is compared with one illustrating a physically traumatic one to highlight how they share both perceptual and behavioural response repertoires. That analysis shows how it is beliefs held in the virtual but powerful world of the imagination which determine the difference between an adaptive and a maladaptive outcome in either domain. Different stories also explore the concept and processes of cross-domain (physical-mental) influence – archived psychosocial stress may sensitise future physical arousal and distress, as well as physical injury or illness embodying vulnerability to future emotional arousal and distress. Cross-domain sensitisation is potentially a key foundation for self-reinforcing persistence in the complex generation of maladaptive distress.

Recovery is a battleground between fear and hope.
As it adopts an ecological perspective to map the developing science onto evidence-based therapy, the work shows how fear and hope operate self-reinforcing but opposing repertoires during recovery (see chapter 10, fig. 16). Fear initially leads to disengagement for rest and recuperation, but healing then allows hope to build, motivating re-engagement and flourishing. Hope and fear operate within the imagination to guide and motivate behaviour choice, and the work explores how the virtual world of the imagination holds and operates the neurochemical battleground in which recovery from maladaptive distress is played out. This virtual world is open to influence, and challenging maladaptive beliefs through education is another key early requirement in trauma recovery. In a delayed and complex recovery, a propaganda war between fear (from a traumatic allostatic archive) and hope (for a healed self in an imagined welcoming future) may operate within an individual's traumatised self-narrative. Family and therapists may contribute to the propaganda by deliberately sharing positive emotion and encouragement, or sometimes carelessly reinforcing negative beliefs. Positive emotion introduced in therapy is a key adaptive influence during recovery, facilitating psychological and behavioural flexibility. Overall, this work seeks to offer a clearer, more practical understanding of the body-mind connections, distilling and translating recent scientific progress so that the underlying biology of trauma's devastating outcomes is less mysterious, and the pathways towards recovery become clearer.

The work concludes by analysing the sequence of recovery motivation under the headings **healing** (resolving dyshomeostasis), **early re-engagement** (as wellbeing liberates innate curiosity-led exploration), **ongoing re-engagement** (capitalising on the evolved self-reinforcing adaptive repertoire), and **affordances** (inviting escalating engagement, rewarding with positive emotion, offering developmental opportunities). It also offers suggestions for future lines of research which may improve understanding and application of the developing science of body-mind trauma.

1
Trauma, the body, and the ecological perspective

Trauma is of the body

This work seeks to get "under the skin" of trauma to understand how its biology explains why distress may persist maladaptively when threat has subsided. It explores why some people are more vulnerable and others more resilient, and why maladaptive persistence typically generates both physical and mental symptoms. It analyses contemporary shifts in understanding how the body influences conscious experience and motivates behaviour. Through that analysis it brings interoceptive and proprioceptive surveillance (of the workings of the body's organs and tissues, and the active movement of its musculoskeletal system) into the foreground, showing how they influence mood to adapt behaviour through the feelings and emotions they generate.

Interoception, homeostasis, and trauma memory.

It is through interoception that the human under stress is aware of threat. This work analyses stress in terms of homeostasis - mechanisms the body has evolved to identify and monitor changes in the internal and external environment, adapting metabolism and motivating change in behaviour to keep its systems, and its ecological relationships, in balance. The work details the processes of interoception (immune and neural surveillance of the body), showing how homeostasis has evolved from monitoring and guiding a primitive organism's metabolic physiology to a highly complex system of body surveillance capable of monitoring external events (such as social interaction) through the body's responses to them. It describes how the nervous and immune systems co-operate in all the body's physical and mental operations, archiving salient experience for future reference. The archive of adversity introduces vulnerability, and the concept of allostatic load (ongoing sensitivities resulting from archived stress responses) is described. This allostatic archive works in such a way that it continually pushes forward salient highlights from prior experience when ongoing contexts trigger familiar "memories" in order to guide ongoing engagement.

The ecological perspective – persisting trauma develops within complex contexts

The science of ecology describes how organisms' development, wellbeing, and flourishing depend on their interactions with each other and with their physical environment. Although this work focuses on the contribution of social alienation to trauma, alienation from our natural physical environment represents a fundamental vulnerability for mental and physical illness for us all ((Richardson 2023) section 1 'The need for reconnection with nature'). This work's ecological perspective has two key elements. Firstly, it emphasises the fundamental importance of our ecological relationships, within both our physical and social environments, to our responses to threat and trauma – there is always relevant history and a relevant context. Secondly, it acknowledges that the bodily responses that guide and motivate contemporary daily life were forged into our genetic heritage by our evolutionary ancestors in challenging environments very different from those in which we now live. The ecological niches in which our ancestors crafted those responses operated as complex systems, with many factors interacting in the emergence of adaptive outcomes. However, traumatic events within contemporary lifestyles may trigger responses which could not have been anticipated when our genetic legacy was created. The many differences between our niches and those of our ancestors will trigger dyshomeostasis, the system may not find easy ways to overcome the mismatches, and maladaptive distress may build.

Throughout evolutionary time threat has predicted injury, illness, and alienation (**hypothesis 2**). This hypothesis argues that the evolved neuroimmune repertoire that follows threat anticipates these dyshomeostatic states, sensitising pain as well as fear and priming neuroinflammatory, endothelial, and metabolic responses to be "ahead of the game" should any resulting trauma require tissue repair and healing, or demand energy adjustment through alienation-induced nutritional instability. All conditions discussed in this review share maladaptive derailment of this motivational continuum related to allostatic vulnerability.

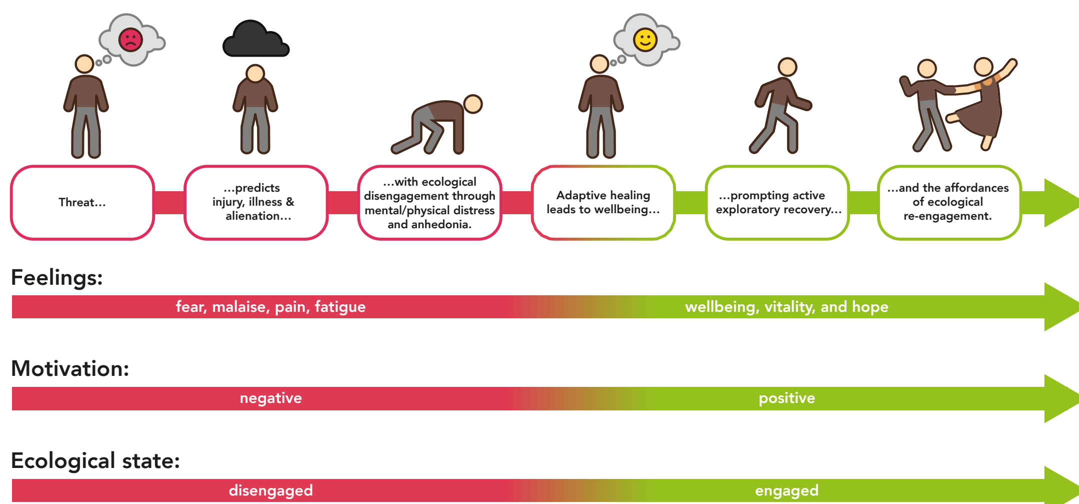

Fig. 1. The ecological perspective recognises co-operation between mental and physical components during any trauma response (after (Harvey 2023)).

Threat without injury initiates this repertoire, driving ecological disengagement through fear to provide safety and rest and facilitate reflection, recruiting pain and fatigue if injury or illness result. When complicated recovery demands longer disengagement it may add anhedonia, attenuating the rewards of ecological engagement, thereby enhancing survival by reducing activity and energy demand. The evolved repertoire may go further. Through the prioritisation of social affiliation during primate-human evolution, threat came to predict social alienation and food insecurity. Childhood adversity promotes ongoing altered lipid and carbohydrate metabolism and the development of obesity (Lam et al. 2025) (Kyler et al. 2021), adaptations which are also associated with mood disturbance (Penninx and Lange 2018) (Chourpiliadis et al. 2024). This work hypothesises that these metabolic changes evolved to improve survival following social alienation by managing energy availability (Pistis et al. 2025). However, when resources are plentiful, this propensity introduces metabolic and inflammatory risk, evidenced in the current obesity and non-communicable disease (NCD) pandemic (Biswas et al. 2022).

Analysing stress and trauma - complex contexts may lead to maladaptive derailment

Ruth's story begins to explore the common ground of mental and physical distress and introduces themes discussed within the scientific analysis through the rest of this work (based on Martha's story (Harvey 2023)).

> Ruth and her husband were involved in a catastrophic car accident, colliding head-on with an articulated lorry. Her husband was killed instantly but Ruth escaped with a simple injury of her spine. Following admission to hospital she was shown to have an uncomplicated single lumbar vertebral compression fracture, had no neurological risk and was able to walk but with pain. She was discharged after 3 nights in hospital. Her children Lauren (age 5) and Mark (age 9) had been taken to Ruth's parents' home after the accident (they live in the same town), staying off school while Ruth's father took time off work to be with them. When Ruth came home from hospital she was extremely withdrawn, barely able to respond to any communication. She felt overwhelmingly tired and had pain in her low back so severe despite painkillers that she stayed in bed. Although she knew Lauren and Mark needed her love and support, she felt emotionally empty - she found it very difficult to hug and cuddle them because of pain but also because of her own emotional distress. Lauren and Mark came back home when their mother left hospital. They felt very sad themselves but also uncertain and confused about what they should do and how they should behave. Ruth's mother moved in

to look after the household. Ruth was unable to make any decisions, and her parents took responsibility for the funeral and for Lauren and Mark returning to school. Over the next six weeks Ruth's pain became worse to the point that she would cry out in pain when trying to move and was sometimes unable to get out of bed to use the toilet. Sometimes at night Lauren would hear her crying, but if she went to her, she was unable to comfort her. Ruth's mother went back to her own home after a few weeks but continued her support, mainly making sure Mark and Lauren were safe to and from school and helping them prepare the evening meal. They found themselves doing many of the chores around the house, often helping Ruth with standing, walking and dressing.

Ruth's relationship with her husband had not been easy, but he had provided well for her and their children. She had stopped working as a typist when they married - she had previously felt constantly stressed by her employers' demands and was glad to leave it behind. She felt that her husband made a lot of the big decisions around their home and family and often took her presence for granted, but she did not feel confident to challenge him or to consider training for a different job. After her husband's death, her main emotion was fear - about the future, about whether she would recover, about how she would look after and support their children into and through their teens, about how she would cope with all the jobs around the house that her husband had always done.

As weeks went by Ruth's pain did not improve as the fracture healed although her specialist had predicted it would. She was offered further investigations which briefly gave her hope that something had been missed that could be treated, but they confirmed the normal healing process, leaving her more despondent and tearful. She found she was becoming generally sensitive, not only to touch but to bright light and loud noise, and her pain seemed to affect her whole body. Her hands were often mottled and purple and felt like they were swollen. She became increasingly irritable with the children, and when she reported to her family doctor that she never felt refreshed after sleeping, he diagnosed her as having fibromyalgia (a generalised form of nociplastic pain).

Their life at home settled into a pattern in which Mark and Lauren would help themselves to breakfast and then, before going out to school, help their mother to get up, use the toilet, wash and dress, although on many days she would stay in her nightclothes and sometimes stayed in bed all day. The atmosphere was sad - Ruth experienced pain with almost any movement, would often cry out in pain as they helped her prepare for the day and was often tearful. She felt constantly guilty about being so dependent on her children and mother, about not feeling able to give Lauren and Mark the love

> she knew they needed, about not managing her home. And she continued to feel afraid. In the evenings, the children enjoyed the time with their grandmother, and sometimes went out with both grandparents, but it upset them to leave their mother behind.

We will return throughout this work to Ruth's and Lauren's stories to explore how they may help to understand the body-mind neuroimmune biology of trauma, comparing and contrasting with other stories, including Colin's below. I hope themes arising from the narratives will help to map the body-mind science onto familiar experience through this work's ecological analysis.

Key learning points

A. Ecology describes how organisms' development, wellbeing, and flourishing depends on their interactions with each other and with their physical environment.

B. Homeostasis evolved to identify and respond to changes in the environment to keep all systems in balance. Trauma symptoms are driven by dyshomeostasis.

C. Healing is reduction in physical and social dyshomeostasis, allowing the positive motivational state of wellbeing to re-emerge

D. Surveillance of the body (interoception and proprioception) influences mood and motivates behaviour throughout any trauma response.

E. Maladaptive trauma responses are never simple. Self-within-ecological-context follows a strategic agenda reflecting archived past and imagined future.

2
Trauma, allostasis, and complexity: do we need a new paradigm?

Challenging the dualistic paradigm: the motivational ground shared between maladaptive physical and mental distress

A key pillar of such a new paradigm is that the same evidence-based therapies benefit people across the full spectrum of maladaptive mental-physical distress (NP, PPS, CG, MDD). Examples include cognitive behavioural therapies such as acceptance and commitment therapy, and therapeutic approaches which facilitate social affiliation and physical exercise. In chapters 10 to 12, this work will address why education, imaginative reflection, repair of self-image, optimistic goal setting, peer support and encouragement, and above all physically active re-engagement may all contribute to the sometimes long and confusing battle for recovery following all types of trauma. Although many of these steps would be considered "mental" within the traditional paradigm, they are all equally important for recovery when symptoms are primarily physical. The following two fictional narratives, Charlie's illustrating a mental injury as seen through the traditional paradigm, and Bernie's a physical one, open up analysis of the shared neuroimmune biology motivating mental and physical trauma responses.

> **Charlie's story.** Charlie has been fighting with her partner; she is emotionally traumatised, feeling frightened, anxious, and almost unbearably sad. She vividly recalls the moments of the conflict as she works through what happened and tries to plan what to do next. Her memory plays an important role, recalling good times positively as support for reconciliation, or overwhelming her with anger making the possibility of healing seem distant. Her imagination emphasises memory's affective-motivational content, triggering encouraging or discouraging feelings varying from moment to moment as recollections of past events and thoughts about future possibilities flash through her mind. Initially it is too difficult to imagine a positive future

relationship because the emotional pain is so great, but subconsciously and consciously her optimistic personality pushes the positive images forward. Her cognitive-behavioural self ruminates about the insults, considering their validity and reviewing her self-understanding in relation to the accusations made. A close friend challenges her perception of the severity of the "injury", paving the way for conversations with her partner. The beginnings of reconciliation immediately lessen the pain of sadness and loss and start to bring pleasure back into her life. This is a key turning point as emotional warmth and recovering physical and sexual contact lead to self-reinforcing recovery in which positive emotion lessens the pain, reduces the fear, and allows more comfortable reconsolidation of the traumatic memories in line with her hopeful imagined future. But the imprint is not erased, archived for the time being barely below conscious access. Implicit components of these memories will influence her apprehension in any future context similar to the triggering scenario, giving immediate sensitivity and arousal, and influencing - adaptively or maladaptively - how she perceives, communicates, and behaves in a future confrontation.

Bernie's story. This is the third time that Bernie's knee has "gone", a minor twisting injury getting off the bus giving sharp pain and difficulty walking. The first time it happened, now nearly a year ago, he was playing in a local hockey league - following an awkward side-step he immediately developed severe pain on the inside of his knee and had to be carried off the pitch. Despite intensive physiotherapy he couldn't return to work for over five weeks, and he clearly remembers his boss's warning that his temporary contract was at risk. It is five days since the start of this new episode – his knee seems more swollen, the pain is sometimes severe, and he is struggling at work. As he ruminates about the injury, memories of the first episode intrude, recalling his sense of despair facing the loss of his job and triggering fear of disability and unemployment. He encourages himself by recalling healthy times positively but sometimes it is hard to imagine a normally active future. How he feels varies from day to day as different recollections from previous episodes are weighed with his current experience, triggering encouraging or discouraging feelings depending on his overall interpretation (an affective-motivational process). Today the physiotherapist is explaining what has happened, showing him what he needs to do to improve his mobility and keep his leg strong for the long term. She has challenged his judgement about how severe the injury might be, beginning to shift his health beliefs - cognitive-behavioural reflection integrates this new information, bringing a more optimistic and active approach to recovery. He begins to reclaim previously enjoyed recreation, allowing pleasure back into his life at home and at work, lessening his pain and pessimism. This is a key turning point - he becomes less irritable with his partner and children; emotional warmth returns to their relationships through recovering social engagement with his children's lives and sexual

responsiveness to his partner. The pain from the injury imprint gradually recedes as this recurrence continues to heal. However, the imprint is not erased. Its associated distress is archived for the time being barely below conscious perception, and the implicit predictive components of this neural learning will influence apprehension and arousal in any future context similar to the triggering scenarios, adaptively or maladaptively driving future injury behaviours.

How can we recognise the common ground shared by physical and emotional distress? An ecological perspective.

Placing these two stories side-by-side raises important questions about how similar Charlie's emotional injury and Bernie's physical injury are. What the science shows is that maladaptive processing of physical and mental trauma is shared in several ways: their foundations in prior social and/or physical adversity are embodied as shared allostatic vulnerability; fearful threat (of social alienation or physical distress and disability) is central to early evaluation and progression; and the brain networks in which the trauma imprint establishes distressing central sensitisation are shared (see chapter 5, fig. 7). The affective-motivational and cognitive-behavioural domains of physical and mental trauma not only share central brain processing but operate using common rules according to a single overarching strategy for defending and nurturing the self through motivational influence - they can be compared through these two stories as follows:

i. Both Charlie and Bernie are ecologically disengaged by their trauma.

ii. Memory recall introduces affective-motivational arousal, strongly influencing cognitive-behavioural planning and decision-making in both individuals. There is oscillation in mood determined by the balance of fear and hope (compare with grief processing (Stroebe and Schut 1999)).

iii. Social influence (from a friend in Charlie's case and from a professional advisor in Bernie's) shifts perception of the threat, facilitating re-engagement.

iv. Re-engagement introduces two key evolved mechanisms building self-reinforcing recovery which operate in tandem:
   - physical activity itself modulates pain and fear and activates neuroimmune plasticity needed to overwrite the trauma imprint (see chapter 6, 'Movement, mood and motivation' and chapter 12, 'Ongoing purposeful (future-oriented engagement')).
   - engagement with affordances positively shifts emotion, biasing prediction and interpretation of exteroceptive and interoceptive sensory flow (see chapter 12, 'Engaging with affordances in the social and physical environment').

Fig. 2. Key components of the journey through distressing disengagement to adaptive recovery shared by mental and physical trauma.

Maladaptive distress operates in the virtual world of the imagination.

At this point a counterargument might run 'But aren't you forgetting something? Bernie has a cartilage injury, a torn medial meniscus. Charlie may have felt her heart was breaking but has no physical damage - the two "injuries" are fundamentally different'. But Bernie's body will heal his cartilage tear, as his ancestors' bodies were doing a thousand - even a hundred thousand - years ago (Thorlund et al. 2025). What these stories explore is how maladaptive persisting distress following trauma initially deviates from adaptive recovery only in the virtual world of memory and imagination, whether the trauma is primarily physical or mental. Adaptive recovery fundamentally depends on the hope of a welcoming and engaged future. In the absence of hope, maladaptive persistence may occur when experience is interpreted through the lens of archived adversity, and perception is negatively biased by current mood, irrespective of the nature of the trauma.

Each response could still go the other way.

In both narratives wellbeing is fragile. We see in fig. 3, chapter 3 and fig. 16, chapter 10 how fear may drive reversal of flow in the repertoire, derailing recovery through arousal predicted by the allostatic archive. Bernie has powerful memories of his times in hospital for correction of a foot deformity as a child and may not be able to lose his fear of disability despite his physiotherapist's good prognosis. By avoiding activity his thigh muscles will weaken, risking further cartilage irritation. He may not get back to work, may lose his job, relationships at home may deteriorate, and pain and disability may progressively self-reinforce. Or Charlie may not be reassured by her friend – she has handled conflict poorly since viscerally experiencing her parents fighting before they separated. She may not let her resentment go, may not be optimistic enough to imagine a future without anger. For either of them the perceived risk may be too great and there may be no turning point into exploratory re-engagement - sadness and loss may overwhelm emotional warmth and pleasure, and irritability (physical and mental) and defensiveness may continue to prevent reconciliation and recovery. Although I have described this shared imaginative domain as virtual, it reflects neurochemically induced sensitivities and is structured in synaptic connectivity (Reddan et al. 2018). The same synapses and sensitivities in the same central neural networks may well be involved in both Charlie's and Bernie's distress.

Key learning points

A. Homeostasis manages an organism's adaptive responses to stress. Allostasis describes how salient surveillance data is archived to predict and anticipate what will happen next, preparing body and mind in readiness.

B. The allostatic archive is the data source for a sense of self, self-image, and self-efficacy. It incorporates the foundations of resilience and vulnerability.

C. Adaptive recovery from trauma is a process of ecological re-engagement depending on hope in a welcoming future. In the absence of hope, both Charlie's and Bernie's stories could derail onto maladaptive pathways.

D. Maladaptive distress initially deviates from adaptive recovery only in the virtual world of memory and imagination.

8
Self, self-image, and self-organisation

Self within ecological context

Self-image is dynamically curated from interoceptive and proprioceptive surveillance of the body's engagement with its ecological niche (hypothesis 5). Its post-traumatic reconstruction is central to recovery.
The body's health and its competence in ecologically valued activity is judged and archived from interoceptive and proprioceptive surveillance. This book hypothesises that self-image is built from this body surveillance - healthy and actively engaged, or unhealthy (dyshomeostatic) and disengaged. Its representation in an individual's unique allostatic narrative is thereby dynamic (Conway 2005) (Delafield-Butt and Trevarthen 2015) (Oakley and Halligan 2017). Note that exteroceptive feedback from ecological engagement will refine it, and social influence from peers may bias its interpretation (see (Lieberman 2013) pages 189-92).

The allostatic archive from childhood and adolescence influences trauma responses for life. Adversity may anticipate vulnerability, predicting the worst, priming anticipatory physiological responses and building fearful emotion, as in Colin's and Ruth's stories. But the archive from a childhood of positive ecological engagement in a resource-rich niche builds resilience, enabling flexible selection from the full menu of gene-based repertoires and predicting the best (see Rachael's story, chapter 11). It will anticipate and prepare for welcoming contexts leading to positive future developmental experiences, and resilience will accumulate through iterative adaptive success. Environmental quality (the richness of its resources) is thereby important in developing resilience, explaining the pervasive negative influence of social, economic, and environmental poverty on mental and physical health (Marmot et al. 2020) (Xiao et al. 2023) (Beery et al. 2023).

Memory science - implications for adaptive (and maladaptive) post-trauma re-engagement

Contemporary memory science shows how the allostatic self-narrative is malleable, allowing therapeutic interventions to influence self-image, improving its fit with a welcoming imagined future (May et al. 2015) (Monfils and Holmes 2018). However, although (re)-building self-image is often considered a mental process, and the virtual world of the imagination is influential in motivating engagement/disengagement, the substance of self-image is largely reconstructed separately from the psychotherapeutic encounter through physically active ecological re-engagement – putting the learning into practice. It is when individuals challenge their inhibitory post-trauma neural imprint through action, successfully undertaking risky behaviours motivated by hope, that the dynamic multi-domain archive of self-image will be updated to build back self-efficacy (Felton et al. 2017) (Craske et al. 2018).

A "rumination glitch" in the processes of memory recall developed through primate-human evolution (developed more fully in the complete manuscript).

Rumination refers to repeated recall of past experience in the imagination. Whereas positive rumination may help build optimism by recalling successes, the term is more commonly applied to the negative process in which prior trauma is repeatedly revisited. The process of imaginative rumination contributes positively to post-traumatic recovery (Allen et al. 2022) but in an ambient fearful context, negative rumination leading to somatic with emotional arousal can enhance the salience of memory's aversive predictions which subsequent re-consolidation may iteratively and maladaptively reinforce (Moulds et al. 2020) (Egan et al. 2024).

Fig. 13. How rumination may bias and enhance memory's impact. Recalling an experience (from the allostatic "library") allows its imprint to be modified through the influence of current emotional arousal. Ongoing fear may lead to it being remembered more pessimistically, whereas hope may reconstruct it more optimistically. Whichever way rumination leans, emotive arousal may enhance the reconsolidated memory's impact.

Our evolutionary ancestors' lives were challenging with little opportunity for rumination – indeed, significant trauma or alienation would compromise survival. Our typical contemporary lifestyle is different - surviving trauma and alienation is the rule, social support

provides food and safety, and time may be plentiful for ruminating, re-experiencing, and fearfully imagining an unwelcoming future.

Key learning points

A. Allostasis holds the biological values, neuroimmune sensitivities, and neural connectivities learned through adaptive ecological engagement - its archive provides an individual's self-narrative within which self-image is dynamically generated.

B. Self-image determines self-efficacy when an individual positively imagines him/herself engaging in a challenging future as a source of recovery motivation.

C. An allostatic archive from a childhood of positive ecological engagement in a resource-rich niche builds flexible resilience – a childhood experiencing physical and socioeconomic inequality may carry vulnerability into maladaptive recovery.

D. Adaptive repair of self-image (self-reorganisation) must creatively incorporate lasting impacts from trauma into the individual's ongoing narrative.

E. As recalled trauma triggers distressing arousal, fear may reinforce its aversive impact through the rumination glitch. This is a recent human problem - survival in our hunter-gatherer ancestors' challenging environment left little time for rumination.

F. Cognition is not restricted to the brain but emerges through the body's interaction with the brain and with the ecological context.

G. Homeostasis is cognition, harnessing the body's "biological intelligence" learned from our own and our ancestors' ecological engagement (allostasis and genes).

12
An ecological context for evidence-based recovery: the same therapies work across the full spectrum of maladaptive distress, fulfilling a common body-mind agenda

Analysing evidence-based trauma therapies: four phases of motivational influence during recovery

We focus below on recovery from persisting maladaptive trauma responses, examining the motivational influences from healing, return of wellbeing, and re-engagement, identifying four phases of recovery. This work does not attempt to provide a comprehensive review of therapies, or to prescribe elements of an ideal therapy programme, but to link evidence-based therapies which work for both mental and physical symptoms to the scientific foundations it has integrated and presented.

Healing - resolution of physical and social dyshomeostasis. Reduction in negative feelings of fear, pain, fatigue, and anhedonia can be anticipated through this stage. The broader ecological perspective sees healing of social networks as fundamental to resilient recovery from complex trauma. From this stage onward, supported positive self-reflection on the impacts of trauma (Allen et al. 2022) may allow hope to colour in a welcoming future (Fredrickson 2004).

Early re-engagement. Healing allows the positive motivational state of physiological and social wellbeing to re-emerge, liberating an innate curiosity-led exploratory appetite. Introducing novelty into the recovery environment feeds that appetite, triggering neurochemical reward (Poli et al. 2024). Stressful but successful risk-taking (against

threat rather than for pleasure) inherently reinforces wellbeing, downregulates anxiety, and contributes to resilience through endorphin and oxytocin release. It continues the process of self-reorganisation, building self-image.

Ongoing future-oriented re-engagement builds within a self-reinforcing motivational repertoire. Neuroimmune surveillance of active engagement introduces its own rewards (Fuchs and Koch 2014) facilitating adaptive overwriting of the complex trauma imprint at all levels within the neural hierarchy through neural and immune plasticity (see chapter 6, 'Movement, mood and motivation'). As old skills are reclaimed and new ones learned, self-image is (re)-built, increasing perceived self-efficacy. Motivational valence progressively shifts positively from fear of alienation to hope of affiliation. Anticipation of affordances builds positive emotion.

Affordances in the social and physical environment provide ongoing reward, inviting escalating engagement and offering developmental opportunities. As skills develop for a valued imagined future, competent engagement is predicted, further reframing traumatised self-image. Social activities with synchronised group involvement (walking, singing, dancing), and those in natural surroundings, offer additional deep evolved opportunities for flourishing (Launay et al. 2016) (Barton et al. 2016).

Is recovery from trauma self-reinforcing?

Recovery may start with "unlearning" fearful embodied avoidance, but losing the burden of trauma memories is only the beginning. When a traumatised individual shifts from a maladaptive to an adaptive pathway, engagement with a welcoming ecological context resembling the niches in which our ancestors forged our genetic inheritance can be self-sustaining (fig. 19). Remember from chapter 8 how Dr Knox's work on self-agency argued that the processes of self-reorganisation after trauma can flow with the same self-reinforcing neurobiology as a newborn infant's developmental self-organisation within a nurturing niche context ((Knox 2011) page 44).

This chapter offers some detail of the ways our evolved neuroimmune repertoires can together support recovery. Psychological therapy (CBT, education) may allow a more hopeful imagined future to support the risk-taking involved in critical early steps. Ongoing engagement within the social and physical environment rewards with affordances (Gallagher 2018) (Toro and Martiny 2020) motivating continued engagement with the risky contexts. Gene-based responses forged by evolution within the ecological niche are then primed by the context to welcome, nurture, and develop the traumatised individual towards flourishing. Maslow's theory of motivation (Maslow 1943) (McLeod 2025) with its hierarchy of five fundamental needs may guide the early emphases in recovery support. From the bottom up these are physiological (including health and nutrition); safety; love and attachment; esteem (including self-esteem); and self-fulfilment - needs lower in the hierarchy may need to be fulfilled before the higher ones can be contemplated.

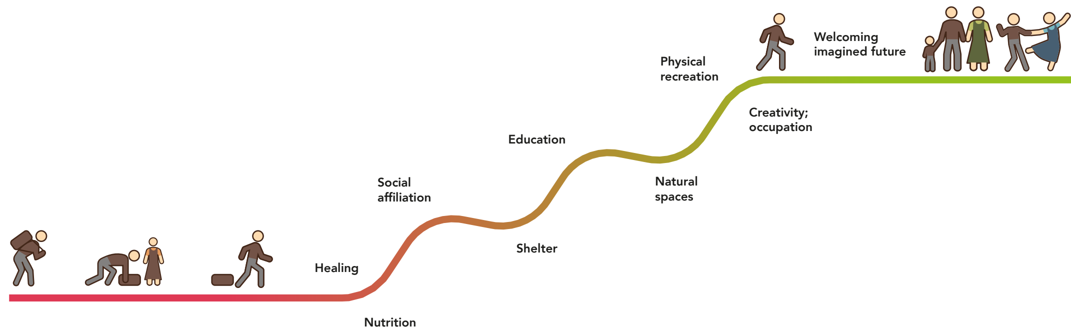

Fig. 19. Self-reinforcing recovery from complex trauma is possible. Whatever form of successful therapeutic encounter reduces the allostatic burden of fear, socially and physically active engagement with the "rich landscape of affordances" (Rietveld and Kiverstein 2014) (Krueger and Colombetti 2018) (Dings 2020) will capitalise on that lightness. Such ecological engagement guides, motivates, and develops the recovering self within his or her unique niche – self-reorganisation (see also (Zavlis et al. 2025)). Remember that an individual's allostatic backstory will include unique components of resilience as well as vulnerability.

Key learning points

A. Early exploratory re-engagement is motivated, and its neural learning enhanced, by curiosity, novelty, and risk-taking; curiosity and risk-taking can probably be learned.

B. Wellbeing and hope positively bias ongoing sensory prediction/interpretation; hopeful communication builds resilience, but careless communication may add to vulnerability.

C. Guided mental imagery virtually simulating a welcoming future can recreate its positive motivation and facilitate new learning. Any empathic therapeutic context unconditionally valuing the individual may contribute.

D. Mindfulness increases access to and awareness of emotion's building blocks; more fluent emotional expression supports recovery from all maladaptive distress.

E. The proprioceptive foundations of relevant skills embed flexible trauma recovery (resilience) within the allostatic archive.

F. Affordances invite and sustain ecological engagement through wellbeing, health, and developmental opportunities.

G. Trauma may undermine the influence of affordances; an individual's allostatic back-story may help target their therapeutic introduction

13
Conclusions, and implications for further research

This project set as its objective to expose and explore the common ground underlying persisting mental and physical distress. It has integrated recent research from a wide range of academic disciplines to understand this sometimes profoundly difficult area of maladaptive distress and disengagement. In recognising ecological alienation (from the social and physical environment) as pre-eminent within the foundations of such persisting symptoms and behaviours rather than innate (genetic) predisposition, its evolutionary perspective seeks to destigmatise. This project has not attempted a systematic review of specific trauma-related conditions and their recommended therapies, seeking rather to present principles from contemporary research as a guide for those working at the front line to adapt to their own models of care and support. Fig. 20 offers a broad framework summarising its emphases.

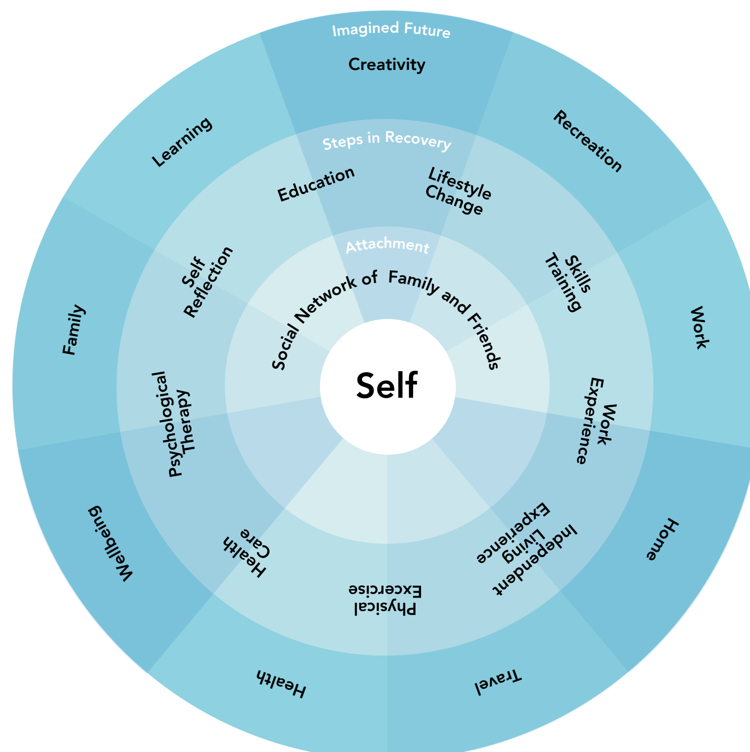

Fig. 20. Steps in recovery.

Evolving through the project has been a wish to promote debate around the need for a deeper way of conceptualising body-mind interaction for clinical and social care practice. An updated paradigm would have two key objectives. Firstly, to build professional and lay understanding of the developing science in ways that help communication in front-line clinical and social care practice - an outline framework for such a paradigm appears in chapter 9, and a checklist of potential components of multidisciplinary support programmes appears in the first section below. Secondly, to prompt further academic exploration to clarify the many remaining areas of uncertainty - suggested research directions have been outlined in the second section below.

A checklist for support during recovery

A key aim of this project has been to make the new science available to individuals and teams working at the sharp end of care for individual's dealing with complex trauma. The following checklist may be integrated within existing trauma therapy work (for example, approaches following Herman's phased recovery model) as it demonstrates how physiological, psychological, and ecological recovery processes overlap. Description of an approach for prolonged grief disorder presented by Professors Naomi Simon and Katherine Shear integrating recent research-based evidence in this way can be read here (Simon and Shear 2024). Different parts of this work may link to specific aspects of established models - for example, checklist items a, c, and g (linking with hypotheses 5, 7, and 8) emphasise self-image and the value of introducing meaningful activity into re-engagement, complementing stage 3 in Herman's model. Clinicians might also use this list as a personal practice reflection tool as they navigate any internal (body–mind) and external (relational and occupational) aspects of their engagement in therapy work.

A. **Self-image**: early assessment gauging self-esteem and self-efficacy; offer open affiliative engagement and respectful support in identifying recovery goals.

B. **Personal relationships**: facilitate supportive personal friendships and family connections; identify a key worker/mentor, developing mutual trust and respect; accompany risk-taking as appropriate.

C. **Future orientation**: support development of a positive imagined future; facilitate relevant short- and medium-term goals; anticipate future occupation and recreation.

D. **Personal healthcare, physical and mental**: optimise diet; optimise medication, reducing where appropriate; avoid substance misuse.

E. **Health beliefs**: early emphasis on symptom understanding; identify and target incorrect health beliefs.

F. **Psychological therapy**: support in re-evaluating maladaptive beliefs and behaviours with a focus on active social re-engagement.

G. **Physical and occupational therapy**: encourage and facilitate risky engagement with feared contexts; collaboratively develop creative future-oriented valued activities (learning and practicing useful skills), identifying relevant contextual affordances; include skills for independent living and working.

H. **Offer a time-limited supportive therapeutic relationship**: facilitate ongoing risk-taking; jointly plan withdrawal as engagement leads towards self-reliance.

Areas of knowledge justifying further research

In line with the 8 hypotheses around which the literature review has been structured, the following areas of research may fill in gaps as this tapestry of knowledge continues to take shape. After each hypothesis, a statement is introduced emphasising its significance in clinical practice before posing research questions, and at the end of each set of proposals, a suggestion for clinical reflection seeks to guide their integration into therapeutic practice. The research proposals below may appear barely relevant, even intimidating, to many non-academic practitioners, but please approach them with an open mind, asking how developing knowledge in this area might help with complex situations that challenge you in your work. The hypotheses can be read both as scientific propositions and as principles for integrated trauma support - they explore body-mind integrity, interoceptive awareness, and ecological re-engagement as central processes within recovery. One hope that has motivated me in this project is that it might act both as a bridge to carry information between researchers and practitioners, and as a prompt for both groups of experts to share their questions with each other in building better understanding to improve clinical outcomes.

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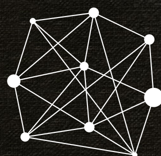

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