6

An introduction to evolutionary reasoning: diets, discs, fevers and the placebo

LOUIS GIFFORD

Foundations

In the ground-breaking book *Evolution and Healing. The new Science of Darwinian Medicine*, Randloph Nesse and George Williams (1994) make a passionate plea for the integration of evolutionary reasoning into the practice of everyday medicine. This is a stance that is argued for here, in particular for use by physiotherapists working with patients in pain.

While evolutionary reasoning may raise as many questions as it answers, what it does best is to promote a paradigm of thinking that is at once open-minded, uncluttered, quite logical and, above all, easy to follow. The opinion here is that it will first, be beneficial for our patients in the long run, and secondly, provide an alternative broad reaching and open-minded umbrella approach to reasoning that will aid clinical management and also be very helpful for framing more productive research questions.

In order to be able to reflect and reason from an evolutionary perspective we need to accept and appreciate a number of propositions. The first is that man, like all other animals and plants is the product of an evolutionary process—and as such is, just like all of them (from bacteria, to brambles, to bullfrogs and bristlecone pines), a successful and remarkable 'replicating machine.' We just happen to be here, we're very new to the scene, and it's been very much a chance thing that we exist.

Further, while producing what often appears to be an exquisite design, evolution also produces frailties and flaws that make all organisms vulnerable to dysfunction and disease. As Nesse and Williams put it, our bodies are a 'bundle of careful compromises'—they work well enough to allow our

continued survival and successful reproduction, but along the way many of us may suffer as a result of this vulnerability. For evolution, and for those who have not succumbed to extinction, an organism's success is self evident, these careful compromises have worked, and it's just tough on a given individual if they suffer!

Of course, all organisms are vulnerable. Perhaps the least vulnerable, smartest and best adapted, are those that have been around the longest. Thus respect is due to organisms like bacteria and to sharks, examples of creatures that evolved so successfully that they have changed very little over an incredibly long time and have witnessed a great many environmental changes and challenges.

We live today in conditions that are very different from those of our 'hunter-gatherer' ancestors. Or as Charlton (1996) has expressed it, 'Humans have been designed for a historical situation, not for contemporary society.' In other words, evolutionary forces operated to produce advantages for life and survival in those conditions—not in the very recent modern day ones. In order to better understand the way we are, and the way we act and react, it is often informative to think in terms of a hunter-gatherer type of existence, and the likely implications of, or consequences from, those times for the issues we are contemplating.

Ponder the following question, for example: Why is it that we crave the very foods that are bad for us (fats, salt and sugars), but have less desire for pure grains and vegetables? Could it be simply because the tastes and food preferences we have today evolved long ago when fat, sugars and salt were always in short supply? In the words of Nesse and Williams (1994): 'Almost everyone, most of the time, would have been better off with more of these substances, and it was consistently advantageous to want more and to try and get it. Today most of us can afford to eat more fat, sugar and salt than is biologically adaptive, more than would ever have been available to our ancestors of a few thousand years ago.' It seems that conditions in the past never required the evolution an effective biological 'stop button' that prevents our over-indulgence and self destruction.

Nesse and Williams (1994) warn their reader to be wary of romantic concepts of life being better back then. While modern life has its disadvantages, it also has advantages—for example, lower mortality rates in early life. Fewer people die from smallpox, appendicitis, childbirth complications and hunting accidents, and therefore many of us in Western style civilisations live a lot longer. But, as a result, we suffer the consequences of ageing, and vulnerability to age-related afflictions such as heart disease and cancer. 'The price of not being eaten by a lion at age ten or thirty may be a heart attack at eighty' (Nesse & Williams 1994). One contemporary problem is that many are unwilling to accept this notion, resulting in strong, arguably unreasonable, pressures on the governments of the day to provide cures for these diseases, or to take responsibility to prevent them happening. In part, if we understand our background, we can be better informed to be able to tackle and prevent these afflictions in ourselves.

Nesse and Williams (1994) provide a powerful example:

> Cancer rates are increased substantially by high-fat diets. Much diabetes results from the obesity caused by excess fat consumption. Forty percent of the calories in the average American diet come from fat, while the figure for the average hunter-gatherer is less than 20 percent. Some of our ancestors ate lots of meat, but the fat content of wild game is only about 15 percent. The single thing most people can do to most improve their health is to cut the fat content of their diets.

They go on…

> One of us once met with three others early one morning to travel to a hearing on claims that agricultural uses of pesticides were endangering the health of nearby suburban residents. A stop at a diner for breakfast yielded a vivid memory. One of the eaters lamented the likelihood that the wheat and eggs in his pancakes were no doubt contaminated with unnatural pesticides and antibiotics that might give him cancer ten or twenty years later. Perhaps so, but these toxins were a minor danger to his future health compared to the grossly unnatural fat content of his sausage and buttery pancakes, and the enormous caloric value of the syrup in which everything was bathed. The cumulative effect of that kind of eating is surely more likely to cause future health problems than are the traces of exotic chemicals.

(As an aside, the above is an excellent example of a reasoning error based on insufficient evidence or failing to take all the available evidence into account in an unbiased way. We need to reflect that very often, our reasoning, and that of our patients too, is ill-informed and sometimes shockingly 'un'-reasonable!)

We need also to appreciate that successful evolution/survival requires variation and variability. For guaranteed species success in the future, we all need to be slightly different while at the same time having stable 'core' attributes for everyday existence and successful reproduction. Some of us are tall, some short, some thin, some big, some athletic some lethargic, some witty, some fiery and so forth. Attributes vary—and in some environmental conditions some of us are at an advantage. I'm thin and wiry, I can move about quickly, have good balance and can pull myself up with my arms with ease—I have a sure advantage over my overweight, slothful friend when out hunting or when fleeing a rival tribe or threatening beast. However, in times of scarce food resources, he has it over me by far. When times get tough, the one with the best attributes for the prevailing conditions will be the one whose genes are preserved for the next generation.

Variation applies to every attribute any investigator cares to examine—from the physical to the psychological and behavioural. For example, relevant to pain, it is now well established that different varieties of rat respond differently to identical experimentally produced nerve lesions. Researchers term the pain behaviour observed in animals *autotomy*—a condition where

the rat self mutilates the limb affected by a nerve lesion, and thought to represent a reaction to neuropathic pain following denervation (see Devor & Seltzer 1999). 'Lewis' strains of rat appear quite oblivious to the injury, showing no or very little pain behaviour. In contrast to 'Lewis' rats, 'Sabra' rat strains show marked autotomy behaviour. The underlying reason for this variation is likely a single recessive gene (Devor 1990, see also Mogil 1999, Mogil et al 1999, Mogil et al 1999a, Lariviere et al 2002).

Astonishingly, some genes seem to be preserved through evolution even though they confer apparent disadvantages, like this susceptibility to chronic neuropathic pain and hypersensitivity. Appreciate, however, that genes that are found responsible for apparently negative effects are likely to confer some benefit in other ways elsewhere. Those who have studied genetics know that a single gene can have more than one effect (pleiotropy). Thus, the gene responsible for autotomy behaviour following nerve injury may well confer advantages that are yet to be revealed. Evolutionary reasoning dictates that traits tend to remain because their advantages on balance will always outweigh any disadvantages. The sickle cell trait (see Allison 1997) is probably the best known example—here, individuals with the trait (herterozygous for the sickle cell gene) suffer from malaria less often and less severely than those without the trait. The sickle cell gene is thus vital for survival in regions where malaria is rife; the unfortunate cost, though, is sickle cell disease (those who are homozygous for the gene).

Let us return to diet. As already noted, there is a huge variation in our fatness and thinness, and some of us are more prone to the effects of dietary overdosing than others. Some of us can eat and eat and change little, while others only have to look at food to put on weight!

In their attempts to relieve chronic malnutrition of the Pima Indians of Arizona, researchers inadvertently caused an epidemic of obesity and diabetes (see Nesse & Williams 1994, p. 129). The researchers concluded that the affected individuals had what they called a 'thrifty phenotype'—a genetically derived attribute that provided the ability to store food energy as fat with great efficiency. Thus, what to us would be considered a reasonably normal and modest diet gets quickly stored away as fat in these Indians, leading to obesity and detrimental consequences like diabetes. From an evolutionary perspective this food storage efficiency can be applauded. What better way to survive conditions where famine is commonplace? Evolution has endowed the Pima Indians, and many of us, with highly efficient food to fat metabolism—we put on weight rapidly in times when food is in good supply, and then we lose it very slowly in more pressing times. Clever stuff, but we pay the price now. No wonder it is so easy to put on weight, yet so difficult and slow to lose it. Famine-adapted individuals unfortunately get fatter and fatter in conditions where food shortages never occur and where low physical activity and low energy expenditure is the norm.

Finally, evolution endows us with an innate laziness. The biological rule is that for best survival, use the least amount of energy possible and don't waste it. Always take the easy, most efficient route and hence preserve precious resources at all costs. For many, it takes a great deal of will power

to do something physical in a way that uses more energy than is necessary. This thinking may well be applied to the pointless, boring, dull and frequently unrewarding exercises that physiotherapist often prescribe!

From an evolutionary perspective all behaviours can be narrowed down to two fundamental purposes. First, behaviours that can be classified as preventing death and which promote staying alive—fighting, fleeing and feeding etc., and secondly, behaviours orientated to passing genes on successfully to the next generation—finding a partner, having sex and nurturing offspring until they can exist independently. You cannot have the second without the first. Ultimately, the forces of nature that lead to an organism's success rely on selfishness (try reading Watson 1995).

Two types of reasoning

Good reasoning when applied to the understanding of any presenting observation, or condition involves two perspectives: An evolutionary perspective asks the simple question 'Why?' and a more traditionally scientific perspective asks the questions 'What?' or 'How?' about structure and mechanisms. The 'what' and 'how' reasoning perspective is termed a *proximal, or near* explanation of cause for a given observation. In medicine, proximal explanations address how a body works and why some people get a disease and others don't. Evolutionary or *ultimate* explanations show why humans, in general, are susceptible to some diseases and not to others (Nesse & Williams 1994).

An amusing general example is given by Jared Diamond in his excellent book *The Rise and Fall of the Third Chimpanzee* (Diamond 1991). In it, he asks, 'Why to skunks smell bad?'

A chemist or molecular biologist might answer:

> It's because skunks secrete chemical compounds with certain particular molecular structures. Due to the principles of quantum mechanics, those structures result in bad smells. Those particular chemicals would smell bad no matter what the biological function of their bad smell was. (Diamond 1991)

An evolutionary biologist would reason:

> It's because skunks would be easy victims for predators if they didn't defend themselves with bad smells. Natural selection made skunks evolve to secrete bad-smelling chemicals; those skunks with the worst smells survived to produce the most baby skunks. The molecular structure of those chemicals is a mere incidental detail; any other bad smelling chemicals would suit skunks equally well. (Diamond 1991)

From the pain perspective our question might be: 'Why does tissue injury cause pain?'

A **proximal** explanation might run along the following lines. Injury produces physical and chemical stimulation of sensory nerve endings that relay messages into the central nervous system. The spinal cord and brain,

via complex electrochemical processing mechanisms, then reacts to the incoming messages, which may then give rise to pain.

An **evolutionary** explanation might provide another answer. Because pain generates behavioural and physiological responses that are compatible with best recovery of the tissue injured, overall function of the organism, and ultimately improves the injured organisms survival chances.

We all know this, but do we act on it in clinical practice? The following section looks at a very common pain problem—back and leg pain.

Back and leg pain

When physiotherapists observe patients we seek answers to what we observe. We most often use a proximal style of reasoning whose very nature is wedded to a biomedical, mechanistic view. We don't often use evolutionary thinking, and even less often act on an evolutionary reasoned management strategy. For example, why does a patient with back and left leg pain of one week duration so often flex and side-shift to the right? How should the presentation be managed?

Proximal reasoning

Many might offer the following 'proximal' style of explaining the patient's problems: 'Because she probably has a disc problem and the disc problem has lead to irritation of the sciatic nerve.' Proximal reasoning with regard management might go: 'Reduce disc problem, manipulate its structure in some way, overcome the problem which has mechanical origins and hence relieve patient of the pain.' Or similar thinking involving a different pathway: 'Correct the abnormal posture, get normal movements back, again, fix problem.'

Evolutionary reasoning

An evolutionary perspective might consider the following issues before formulating an answer:

- The pain and resultant physical tension produced help her to avoid doing something that might be injurious or slow adequate healing. In another sense, pain can be seen to promote behaviours that provide the best conditions for healing and recovery.
- Her posture and movements warn other community members to avoid her and be very careful when approaching her.
- The posture and the behaviours generated by pain help her to gain favourable attention and receive protection.
- Having pain can be associated with rewards.
- Postures, gestures, words and actions that indicate suffering foster acts of kindness within the social group.

Symptoms help speed healing and prevent further damage

The pain and resultant physical tension produced help her to avoid doing something that might be injurious or slow adequate healing, as well as help speed healing. Tension and pain are useful for early physical recovery. Pain demands cautious movements. Pain may 'request' inactivity and stiff fixed postures. But, if you think about it, pain may also demand, quite the opposite, regular *activity* of the injured part, too; patients are frequently physically restless, often shifting, wriggling and moving with their pain.

Pain helps generate self-care, vigilance and the feeling of vulnerability. The implicit message might run: 'I'd rather not go out gathering food today if you don't mind, and I'm not at all keen on having sex.' Pain also generates a need state (see also Ch. 1 and Introductory Essay this volume) that requires help and protection (see placebo section of this chapter later). Pain often generates a quick temper—anyone who gets a bit too close or appears to be clumsy or in the least bit threatening gets bawled at.

Posture may send protective warning signals

Her posture and movements warn other community members to avoid her and be very careful when approaching her—again helping to provide best healing conditions by not disturbing vulnerable recovering tissues with sudden movements. The fact that an animal that is moving awkwardly or abnormally in some way labels them as weak and hence an easy meal is dealt with in the placebo section later. Thus, the buffalo that limps is soon picked out and killed by hunting lions, wild dogs or hyenas. In some circumstances, pain and the behaviours and postures it can produce are worth concealing.

Pain postures generate sympathetic attention

The posture and the behaviours generated by pain help her to gain favourable attention and receive protection from those who know her, are close to her and value her. Feeling protected and cared for may be important for best healing (see placebo section below).

Pain can be associated with rewards

Having pain can be associated with rewards, more especially if you have some status in the group in which you live. If you are deemed to be important by your peers, you get a lot of attention and protection; you get out of working and doing chores that you dislike doing, you are given more time to heal, which may be a good deal more than that given to others of lower ranking. High ranking individuals in a hunter-gatherer community may have vital knowledge and skills in relation to things like security and well being of the group. Without that skilled and/or knowledgeable individual, the community is potentially more vulnerable (see Diamond

1991). Evolution (continued species survival) often demands cruel efficiency and thus endows some higher social mammals with behaviours and emotions that say, effectively. 'Look after those who are valuable, take less time and care with those who are not or who are a burden.' Think about it, and it becomes quite obvious that even though we try to suppress them, these deep-rooted sentiments and prejudices still persist today. They are not necessarily nice, but they are acts of evolutionary wisdom that must be applauded because they have contributed to our being here today. In the reality of our day to day clinical practice, one has to be a very strong willed therapist not to give 101% of our skills and time to a client who is a celebrity of some kind.

Visible signs of suffering foster kindness

Postures, gestures, words and actions that indicate suffering foster acts of kindness within the social group. If you are in a hunter-gatherer community you may get a few days off from hunting and gathering. In modern society you can get paid by the social services and have drinks bought for you by sympathetic friends down at the pub (recall the innate laziness rule discussed earlier.) The fact that having more than a few days off is now being shown to be detrimental to recovery seems hardly surprising. What use are you if you are unproductive? No wonder our sympathy for those in our midst who are unwell, don't 'get going in a reasonable time', or are disabled soon wears thin.

Perhaps these are uncomfortable thoughts, but if you're thinking from an evolutionary perspective it starts to help explain and make sense of a great many issues that can often 'leave a lot to be desired' when viewed from more cultural, civilised, and social perspectives. Our animal instincts were valuable; if we appreciate them and accept them we are more likely to bear judgement on them with greater insight and understanding.

Before addressing management and bearing the above points in mind, the next important part of reasoning like this is to ask if the presentation (the pain, the postures and the observed behaviour in its context) can be considered to be useful or 'adaptive'—and therefore to be respected—or of no use whatsoever and, hence, 'maladaptive'. Or, finally, is the observation some kind of imperfection or defect?

We tend to think that we are in a healing profession and the pressure is on us to provide a cure. Evolutionary reasoning invites a shift of thinking to consider that this flexed and deviated posture in the patient example, might be a very adaptive response and one not to be meddled with? Would you ever consider saying to a patient: 'Don't worry about your flexed and shifted posture, it's very useful and protective at the present time—it will get better as your problem gets better, and at the appropriate time I will help you to gradually overcome it. If we attempt to correct the way you stand and move too quickly, we may actually prolong your problem.'

In other words, if the pain and posture are adaptive, what right do we have to get rid of them? If we do deem such a posture and pain to be adaptive,

evolutionary reasoning would predict that too early a resolution of the pain, or too rapid a correction of the posture might not be a good thing, may prolong recovery and lead to more episodes later on. This is a very useful type of research question that is challenging to several physiotherapy methods—and which needs answering.

Clearly, whenever we examine a patient it is important to reason whether what we observe can be viewed as adaptive, maladaptive, or an imperfection/defect. On the one hand we need to consider millions of years of success, yet on the other, we ought to consider that the phenomenon we are observing, and deeming 'abnormal' in some way, may not have been at all obstructive to success. The pain and posture adopted by our patient are of little consequence to the passage of genes from one generation to the next. Eventually, especially if you are ignored, with or without a spinal shift, pain or no pain, you have to get on with life, fend for yourself and your community, or you get (adaptively) ignored and may die!

The opinion here is that not all acute pain is necessarily useful pain in the sense that it is adaptive and should therefore command respect. An example is the early severe pain that is often the result of minor nerve injury (Gifford 2001). The pain is often out of all proportion to the injury sustained. While the pain level can be incredibly high, continuous, extremely distressing and debilitating, the actual injury to a nerve may be minimal with the nerve's ability to conduct normally hardly affected, if at all. It could be argued then, that most neurogenic or neuropathic pain is maladaptive pain, or an imperfection/defect related pain, even in its acute stages, and hence should be subdued as quickly and efficiently as possible without ill effect later on.

Pain and deformity may be an unfortunate by-product of the healing chemistry or related to genetic factors as already discussed. The fact that there are many people who suffer nerve injury, or who have squashed, compressed or fibrotic nerves without ever getting any pain is in part, testament to this 'maladaptive' imperfection/defect perspective for neurogenic pain. An alternative reasoning perspective is proposed in the next section however.

A major problem for patients *and clinicians* is that high levels of pain are often interpreted in terms of seriousness, which then generates understandable fear—leading to inappropriate inactivity/rest and/or inappropriate medicalisation. A high level of pain, or at least the witnessed distress and suffering, is scary to clinicians—but remember, high intensity pain is *not* a 'red flag'(for red flags, see Waddell 1998, Roberts 2000).

There is a dire need for research to inform us as to whether common severe acute nerve pains like acute sciatica and brachialgia are adaptive or maladaptive in nature. If indeed, the pain is maladaptive from the beginning, it will surely help reduce clinicians' fears, which are so often implicitly or explicitly passed on to patients to their detriment.

When clinicians ask themselves whether a problem is adaptive or maladaptive it is important to think beyond just the physical dimension. Consideration as to whether psychological, behavioural, social, work, and cultural responses are adaptive or maladaptive needs reasoning, too.

Whatever we decide, whether adaptive or maladaptive, evolutionary perspectives should also be accompanied by thoughts about 'costs'. This balances the reasoning process but, unfortunately for those who like clear-cut black and white answers, leads to frustration! In terms of our patient with back and leg pain we need to address the question**: '**If the patient maintains this posture for some protective or other reason—what are the costs?' There are a number of possibilities:

- It might cause more discomfort and pain by straining other structures—which might lead to secondary problems there. Ongoing poor movement and postural habits may be being set up or 'conditioned' into the organism as normal when they needn't be (see Gifford 1998).
- If they keep going round like this, it's pretty obvious they're injured—they'd be an easy target for any predator! If you look vulnerable, you are easy prey. Thankfully nature has endowed us with responses that can extinguish pain and deformity in an instant (see placebo section below).
- The sufferer might be unable to fend properly for themselves, or their family—they are unable to work effectively, they may suffer financially, they may feel very frustrated and upset and lose their self esteem, they may feel very embarrassed or distressed by it and so forth. The long term consequences of pain and disability are well described. (See chapters in this and other volumes in this series. Also, Waddell 1998, Main & Spanswick 2000.)
- They are likely to be poor at chasing the opposite sex (usually relevant to males) or keeping them off (usually relevant to females!) and hence there are unsatisfactory reproductive consequences. 'She' may end up being saddled with a child she can ill afford to bring up, and 'he' just wallows in the misery of an unfulfilled sex drive and, to a lesser extent, reproductive failure. Or, because they move awkwardly and look weak and unpleasant (hence poor stock or poor parental capabilities) they may receive little attention from the opposite sex, or may only get it from others similarly afflicted.

Having dissected our 'disc' and nerve problem by raising a few issues on either side of the evolutionary adaptive/maladaptive argument, the reader may well be left thinking, 'What should I do with the next problem I see like this—should I tell the patient it's OK to be in pain and be awkwardly immobile, or should I try to correct the problem and lead them back to normal function?' The stance advocated here is to provide a balance of both—meaning, avoid the 'fix it/correct it now' style of approach, engender a graded recovery period similar to that for other strains and sprains but with awareness that the added nerve dimension may take a bit longer, and reassure the patient that what they are experiencing is normal and common to all, though annoying, but will lessen given some time and an appropriate recovery programme. Also provide and explain that early and effective pain relief is a great advantage for best outcome and the prevention of ongoing incapacity (see Linton 1997, Watson 2000). This means that just as drugs should work, so should physiotherapy treatments aimed at reducing pain.

If it works do it, if it doesn't work, for goodness sake, keep trying different things until you find something that is effective! A good message here for the patient is that pain relief may actually speed up healing and recovery—rather than the common belief of 'dull the pain…lose the protection and hence promote further injury', which is how most react to the suggestion of using pain killers.

So far, questions have been raised about the value of the back and leg pain and the resultant deformity. Evolutionary reasoning on the one hand suggests that since this pain and posture are common occurrences, they are likely to have evolved for very good reasons. The other side of the coin is that what we see and what the individual feels represents an unfortunate quirk, suffered as a consequence of imperfections that have been of no major consequence to successful survival.

But, why does the disc bother to hurt?

Previously we made an assumption that a disc injury is a possible precipitating cause of the patient's problem. If it is a disc—what *proximal* explanation might be used? We know a disc has an innervation (albeit a poor one), we know it is a collagenous structure and that, when injured, collagenous structures mount a healing response that begins with inflammation. Inflammation can lead to pain. Disc extrusions and protrusions can physically and chemically irritate nearby sensitive structures to produce pain too.

But, why should the disc itself bother to hurt in terms of its own health or that of the organism? Pain created by injury usually provides a background for behaviour that promotes best healing and recovery—usually guarded movement and opportunistic rest for an appropriate time. This reasoning is problematic since the disc is a metabolically sluggish structure, for example, biological turnover rate of the glycosaminoglycan in discs of dogs is said to be about 500 days and collagen is even longer than this (Adams & Hutton 1983). Collagen in a disc may not change itself for nearly two years! Very little biological activity seems to go on inside a disc and the healing potential is known to be very poor. One perspective based on the work of Osti and colleagues (Osti et al 1990) actually shows that, once injured, discs tend to 'fall apart'—*whether they are immobilised or not*. Pain and subsequent immobility appear to provide little help and may well be yet another example of maladaptive pain and the potential for prolonged maladaptive immobility.

The findings provided by Osti and colleagues (Osti et al 1990) are worthy of some scrutiny. These researchers investigated the effects of surgically producing a 5mm long and 5mm deep cut in the anterolateral aspect of young and otherwise normal lumbar discs of sheep. They lesioned 3 discs in each of 21 sheep and culled and examined them at different times after producing the experimental wound. They found:

- The lesion lead to a progressive failure of the inner annulus which occurred between the 4th and 12th month in the majority of animals.

- As early as the first 1–2 months there was evidence of nuclear degeneration, nuclear displacement, the presence of clefts, and the early loss of definition between outer nucleus and inner annulus in several of the discs. These features were present in all discs examined at 12 months.
- Narrowing of the disc space was observable in most discs by 8 months and was moderate or marked in all discs by 18 months.
- Osteophytes were apparent in some after 4 months and in all discs by 8 months.
- Marked changes over the whole length of the end plates were also observed.
- The actual incised area of the annulus did show healing capability, however. By 1–2 months the outer one-third of the cut area was filled with granulation tissue and this tissue was markedly vascularised.
- The deeper regions of the cut were never bridged by healing tissues.
- By 8–12 months collagenised scar tissue bridged the thin outer region of the defect and this tissue remained modestly vascularised in many of the discs.
- Some remodelling of collagen lamellae in the healed outer annulus was observed.

The research group went on to reason that degeneration following the artificial annular tear may be a result of continued movement in the vicinity of the lesion and that plate fixation may prevent such dramatic changes. They therefore repeated the experiments but included plate fixation across some of the injured discs to prevent movement. Interestingly, their work showed that the plate fixation had no effect on the degenerative process (Moore et al 1994).

The conclusion is that the disc barely seems to heal, it takes ages to change and immobilising it seems to have little effect on the end result. Since pain usually prevents movement it seems unhelpful here. From the 'selfish' perspective of the disc tissue, producing pain for a healing defence seems utterly pointless.

The message from this line of reasoning is that since the pain is useless, get rid of it and get on with life as soon as you possibly can. Symptomatic treatment and restoration of range and posture as quickly as possible seem justified. The pain is a quirk related to disc innervation and really has little value in creating best outcome, it may even, according to mounting current evidence, have quite a negative impact on us modern day humans and the societies we live in.

But, flexed and shifted, so often away from the painful side, and with movements towards the painful side being far more limited than those that are away from it, are such a common presentation. Why are there such stereotyped responses? Surely they wouldn't have evolved without good reason.

Consider the relationship of the disc to the nervous system (reviewed in Gifford 1997). In the radicular canal and intervertebral foramen the lumbosacral nerve roots lie in close proximity to the disc. Any change in

disc size or in the local environment will potentially threaten the nerve's integrity and put it at risk. I have discussed the effect of movement and posture on the nerve roots in detail elsewhere (see Gifford 1997, Gifford 2001 for discussion and further literature). For the purposes of the arguments here, it is enough to state that spinal flexion plus deviation towards the contralateral side tends to increase the size of the spinal and radicular canals, and movement towards the opposite direction, i.e. extension plus ipsilateral deviation/rotation side flexion, tends to reduce their size. It would be a wise action for an individual with a disc bulge or extrusion (or even the potential for one), or oedema/swelling in the area adjacent to a nerve root, to adopt a posture that puts the least pressure or strain on the nerve—i.e. flexion and deviation away from the affected side. Any threat to the nervous system is a potential disaster for the future efficiency of those afflicted. Far better, and more efficient to, whenever possible, adapt to a new posture that protects the nervous system, than to injure the nerve and suffer the consequences of neuropathy. A weak calf muscle, or a numb foot is likely to be a serious impairment for an active hunter-gatherer.

The observations that follow support the 'adaptive' nature of the early flexed shifted posture for the health of adjacent emerging nerve roots.

In my clinical experience it is common to see patients who have developed sciatica and often some neurological deficit following spinal manipulation or regimes of management that encourage repeated extension for simple acute low back pain. This observation is pure anecdote: while it may have happened anyway, it is something well worth researching; it is quite reasonable, it is commonly agreed upon by other clinicians, and has to have some explanation. What is noticeable in these patients is that there is often a delay of anything from several hours to 2–3 days or longer after the treatment or exercise is performed and before the problem worsens. Research showing prolonged delays of onset for hyperexcitability following experimental nerve injury supports this clinical observation (see Devor & Seltzer 1999).

Knowledge like this highlights *the dangers of accepting an immediate change in pain response to a movement procedure as an indicator of helpfulness*. It also adds weight to an approach to management that requires graduated progress rather than instant success or instant change. 'I walked in bent double and walked out straight' may not be such a good thing after all.

An evolutionary style of reasoning, based on the proposals above might predict the following (all potentially valuable research questions):

- Disc injury that does little to threaten nerve roots is likely to hurt less or not hurt at all. Discs do not need pain because immobility is of no advantage to any recovery. There may be literature that refutes this, if so, it needs to be presented to balance the argument.
- A disc (or any tissue) that is in a vulnerable state, and which has the potential to injure or irritate the nervous system may provide some helpful pain. This may be long lasting and lead to permanent changes in flexibility and posture, or it may be very brief and very intense with particular movements or postures.

- Nociceptive innervation density should be higher in parts of the disc adjacent to the nervous system. Logically, dura and root epineurium most likely to be affected by disc material should have a more dense innervation too. Certainly the dural innervation anteriorly is far more profound than posteriorly, where there is virtually no innervation (Groen et al 1988).
- Some prolonged pains, altered movement patterns, muscle imbalances, disc degeneration, osteophytes and motion segment stiffening associated with the consequences of disc injury, are very adaptive processes in that they may well be nervous system and vertebral column protective. Medically these findings are viewed as 'pathological' when they may well be highly adaptive biologically. Could we be inadvertently over-treating and putting too much emphasis on some of these impairments we skillfully observe and try so hard to change? Could it be that it may be appropriate to teach patients to adopt antalgic movement patterns and postures in order to for them to remain active and productive?

As already argued, our eagerness and our obligation to overcome pain, correct deformity and restore range of motion as quickly as possible, may actually be prolonging recovery. Clinical anecdote sometimes supports this—for example, many patients having been on treatment for long periods, go on holiday, stop their exercises, stop treatment, and feel a great deal better. The patients put it down to the weather, the doctors to rest or relief from stress, and physios to the daily swimming. This may be so, but we ought to realise that stopping what we have given them to do, or what we have been doing to them, are also factors to consider.

Fever for an infection—an evolutionary masterpiece!

The reader may find this section interesting, considering it an interlude before the final section perhaps, but what it really spells out is how important evolutionary thinking can be in our clinical reasoning.

A patient has a streptococcal infection; symptoms include headache, painful throat, fever, anaemia, and the impaired speech of laryngitis. Should any of these be considered good symptoms? The answer is yes, all of them, except the speech impairment.

- The headache makes you want to relax and avoid stress, a good strategy to hasten recovery from an illness.
- The sore throat means you will not try to shout or talk too much, and will be careful about what you swallow.
- The fever and anaemia are things *you are doing to the bacteria*, not what they are doing to you. The high temperature hastens and facilitates immunological responses, and the anaemia deprives the bacteria of a needed nutrient (iron) as the body hides its iron in the liver.

According to Nesse and Williams (1994), if we get an infection the body releases a chemical called leukocyte endogenous mediator (LEM) which both

raises the temperature and greatly reduces the availability of iron in the blood. Iron absorption by the gut is also decreased during infection. Even our food preferences change. In the midst of a bout of influenza, such iron-rich foods as ham and eggs suddenly seem disgusting; we prefer tea and toast. Remember that blood letting—perhaps not so daft—reduced iron levels! Iron supplements may harm patients who have infections (only 11% of doctors and 6% of pharmacists know this).

Fever is an adaptive 'host' response to infection that has persisted throughout the animal kingdom for hundreds of millions of years. For example, even lizards benefit from fever; when infected they actively seek places that will warm their bodies by 2°C. Blocking fever in animals increases their likelihood of dying (Nesse & Williams 1994).

What about costs and benefits?

Considering fever—if a higher temperature prevents infections having their way, why isn't our body temperature 40°C all the time? A moderate fever has costs: it depletes nutrient reserves 20% faster, and it causes temporary male sterility. And a higher fever causes delirium, possible seizures and lasting tissue damage.

When considering any observation a balanced approach is necessary. We should always think about the potential costs and benefits of interventions. For example, reducing an 'adaptive' temperature or ameliorating the process and symptoms of infection may be detrimental to recovery. Children with chicken pox who were given paracetamol took on average about a day longer to recover than those who took placebo. Recovery from cold infections is slowed in those given aspirin as compared to those given a placebo, and the placebo group had a significantly higher antibody response.

The placebo—why would it have evolved?

'Placebo' is often used to pour scorn, but as a phenomenon it is quite remarkable. It is a word used by medical science and medicine to describe an awkward, puzzling and sometimes embarrassing phenomenon (for definitions and discussions of all the evidence see Chs 1–4). The placebo is consistently observed and is found when patients respond positively to an intervention that is known to be physiologically 'inactive' for the condition under scrutiny. However, as the reader will have already found in earlier chapters, it is also a consistent partner in 'active' treatments too. As a phenomenon, the placebo is unlikely to go away, and as a word it is frequently used in a derogatory and insulting way because it challenges the very foundations of medical intervention.

Even today, with the knowledge we have about the placebo, spontaneous recovery, regression to the mean and related phenomena, many doctors and Consultants regard physiotherapy as 'mere placebo'—something to keep the

patient amused while they recover naturally, and something to prescribe to keep difficult patients out of their consulting rooms. In their view, the placebo is worthless and its presence provides evidence in support of an inorganic 'cause' of the patient's problem and that 'real' treatment is unnecessary and wasteful. Thankfully, such sentiments are being challenged seriously in favour of far more productive multidimensional models that embrace multidisciplinary co-operation and mutual respect (see earlier chapters and Gifford 2000).

As already argued by Pat Roche, Nigel Lawes, Mitch Noon and Richard Shortall (Chs 1–4), part of feeling comfortable with what we do as clinicians is feeling comfortable with the placebo. The word and the negative connotations that are associated with it are now wrong for clinical medicine and management, but the things that account for it are right. In particular I like the notion of the 'psychosocial' placebo (see Ch. 4) and the impact of the 'therapeutic alliance' (see Ch. 3) as better ways of taking this phenomenon on. It seems quite clear that the reassuring, activating, confidence-giving environment that good therapists can create has a very positive multidimensional impact. This includes positive biological responses. If positive interactions have consistent positive outcomes it is reasonable and useful to ask what their evolutionary underpinnings might be.

From an evolutionary perspective, it is proposed here that the observed placebo phenomena may be related to responses associated with:

1. The need to put healing on hold.
2. The need for help, safety, reassurance and satisfaction.
3. The need for pain variation.
4. The need for pain relief.

All four explanations will be discussed before tying the proposed reasoning together in a way that can be clinically useful.

The need to put healing on hold

Injury is a part of life; sometimes it causes death, but quite often the organism survives. All organisms have evolved some form of repair/healing physiology as well as a repair/healing reaction or behaviour. For the higher social mammals, this condition can be linked to altered moods and emotions, too (see Thayer 1996).

Healing/repair requires energy and nutrition and from an evolutionary/survival perspective has to be seen as a potentially expensive item. Organisms have evolved to conserve energy at all costs (recall the 'innate laziness' rule discussed earlier.) If an animal is in extreme environmental conditions, is in danger of losing its life for some reason, or perhaps has very meager energy stores—any available nutrients it does have need to be used in ways that are most likely to preserve its life. It makes sense for living things to have evolved very efficient systems that control the use of nutrients and energy efficiently, diverting resources to fuel only the most vital processes and actions. Putting lengthy and costly healing and repair processes 'on hold' while an animal

escapes or is busy foraging for food makes sound 'evolutionary' survival sense.

In keeping with this line of reasoning, we know that stress inhibits vegetative (anabolic) functions (like growth and repair) powerfully, while at the same time promoting efficient nutrient delivery and energy provision for the appropriate threat/survival action response required.

In the evolutionary environment threat is commonplace; to stay alive requires hard work, and any energy or nutrient-preserving behaviour, reaction, or physiology is likely to be favourably selected from one generation to the next. From the perspective of the carer and the production of a placebo response (which promotes healing/recovery), turning this potent stress related energy conserving healing inhibitory mechanism off, by providing an environment that is safe and 'stress-less', may be an important governing feature for its occurrence.

The need for help, safety, reassurance and satisfaction

Humans, are societal; in a similar way to lions, hyenas, most monkeys, elephants, dolphins, termites and bees, we have evolved behaviours that in large part are community oriented. For us, and other social animals to survive requires co-operation in, for example, obtaining food, in nurturing, and in defence against predators and attackers. Such co-operation requires the exchange of information between individuals, and it is in social species that we find the most complex and sophisticated forms of animal communication. Think how capable and how necessary it is that we are expert at interpreting the mood states, friendliness and trustworthiness of others by vision alone.

In most successful communities there is the giving and taking of help. Issues involving social hierarchy and advantages were touched on earlier in this chapter, and the nature and evolution of altruism, an evolutionary paradox, can be investigated elsewhere (Wright 1994, Watson 1995). Clearly, for a community to maintain a successful working network individuals must help each other. Helping and needing help is part of our nature, a reason for our success, and logically must have biological underpinnings.

It makes sense that if we are injured, a requirement of the weakened injured tissues is some modification of behaviour that affords a degree of protection. If an injured tissue is vulnerable, so is the organism it belongs to. Why else would pain have evolved, but to provide a powerful background feeling that is so distressing it demands a change in attitude, thinking and behaviour? Surely this is the primary purpose of pain—to change behaviour?

One way of reasoning here is to consider the brain/CNS (the 'scrutinising' centre—see Gifford 1998) as receiving competing sensory inputs, each demanding some action or response. Thus, the brain/CNS might receive a massive sensory nociceptive barrage from injured tissues. Metaphorically the tissues are selfishly screaming, 'Me, me, me, look after me…forget all else, it's me you need to organise a response for, I'm the most important.' In this way, the first injury provision is for the tissues to selfishly try to get help—that is, to ask for, and selfishly try to get, a change in the behaviour of

'their' organism for their advantage. However, the brain/CNS may be busy elsewhere, tackling a marauding tribesman perhaps, or fleeing an attacking buffalo. The message back might be, 'Sorry bud, I might get back to you later, I'm busy right now, you'll just have to suffer. Tough. Bye.' (The pain gates, quite rightly, slam shut while the muffled nociception glumly continues). Later on, when life calms down a little, the tissue screaming may start to penetrate. The pain gate inhibitory currents gradually lift and our friend starts to suffer as the incoming messages reach consciousness. He feels pain in his badly twisted ankle, he starts limping, he orientates his attention towards the injured area, and he starts moaning and feeling very concerned (see Pat Wall's Introductory Essay in this volume). It doesn't look nice and it doesn't feel nice either. His instinctive reaction is to seek help or to find safety as soon as possible. He is weak, he hurts, he doesn't feel confident about looking after himself, he feels highly vulnerable, he is worried and he is only just coping. He is verging on feeling helpless (see Fig. 6.1). He needs help from others, or he needs to find a safe place to hide and rest up. Despite the intense pain he searches for help and safety. Pain now drives a very powerful 'help'/safety-seeking need state that, if satisfied, may enhance the chances of survival considerably.

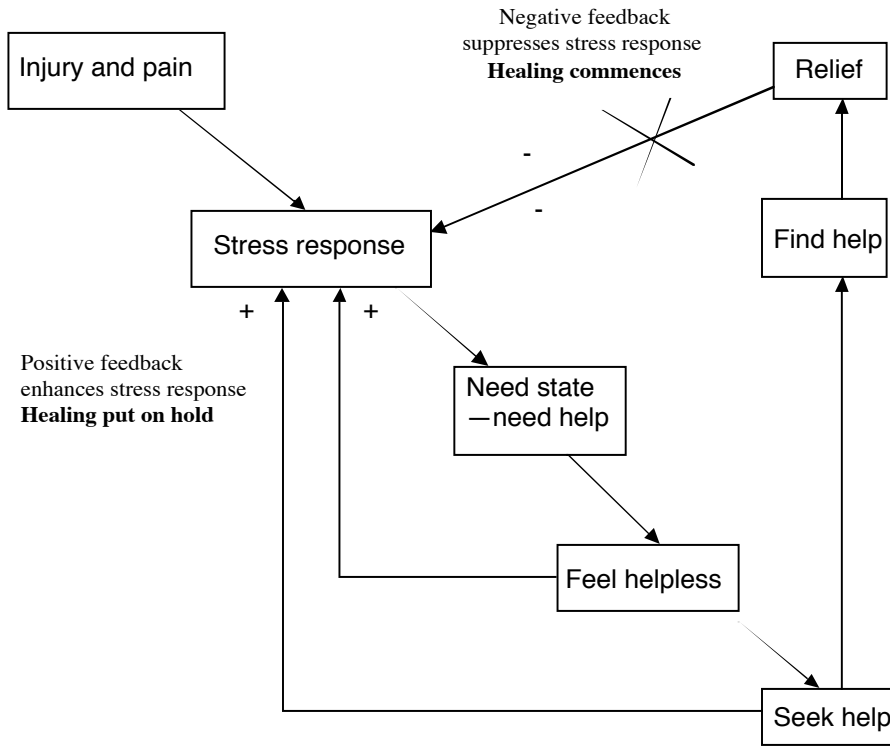

Fig. 6.1 Injury, pain and the stress response

Getting help and feeling safe reduces stress and consequently releases the powerful inhibitory controls on recovery/vegetative physiology. Recall that if we *perceive* that we are under threat (even though we may not be) our bodies mount a stress response that can instantly dampen down systems like those concerned with healing and repair. 'Maladaptive' perception of a situation may lead to unhelpful physiological responses. Feeling safe and feeling reassured may have powerful positive biological consequences in that it allows energy to be spent on the healing response.

The stress response has evolved so that it is switched on very rapidly—note the abruptness with which you become tense or your heart rate increases when you are uneasy or excited. Yet even though a *sense* of relief can be profound, it still can take a long time to fully calm-down afterwards. Clearly, evolution has preserved those who get worked up fastest and remain vigilant for a good while after. The doctor who frowns at a patient's X-ray and sighs at what he sees takes just a few seconds to wind up a prolonged stress response. Quelling the stress response, as all good therapists who deal with patients whom this has happened to know, can take a lot of words, a lot of reassurance, and a great deal of time. Careless talk can carry a high cost (see Ch. 5 this volume), but careful talk pays a good dividend.

The message here is that getting help, finding safety and feeling reassured on the one hand, allows the stress response to wind down and switch off, while on the other, the more vegetative functions like growth and repair to resume activity. Part of what happens when we get the help *we feel we need* might account for part of the placebo observation. Even if it is not, the arguments here provide some good reasons for providing actions and responses that help the patient feel reassured.

The need for pain variation

Pain varies all the time; it has to. Sadly, the inconsistent pain report and pain behaviour noted in many patients, especially in those with more chronic and difficult problems, is commonly/frequently used to challenge the authenticity of the pain and the patient. Sadly, too, if an observation doesn't fit with the pattern we perceive, rather than seek an explanation via thinking and research, we tend to blame the most obvious, though at times quite erroneous, factor we can think of. Time and again, the most obvious cause for an observation has been shown to be wrong (e.g. see Sagan 1997).

Pain needs to vary. As discussed in the previous section, the brain/CNS 'sorts and chooses' sensory information and prioritises its messages to best fit the needs of survival (see also the Introductory Essay to this volume). 'Disallowing' pain to reach consciousness, or dulling its intensity via gate control, is essential in times of need, like times of danger or when we perceive danger, or in times that require a great deal of attention and concentration. Hence, when under threat, or when busily occupied with 'important' tasks like gathering food, or having, or trying to have, sex, gate control may be at its most efficient. Since intense pain may inhibit actions that have survival

(and health) benefits, it cannot always be permitted. Evolution clearly favoured those ancestors with the apparatus to vary the ability of nociception to produce pain and alter behaviour. Good pain can drive safety-seeking behaviour and recuperative actions at times of low threat, or low need, but can be powerfully dulled in times of important goal-seeking action. *Even in the acute situation, pain has evolved to be 'adaptively' inconsistent.* Pain is slippery.

Observe the inconsistency of a child's pain. One moment they are writhing and screaming in agony, the next minute they are running around as if nothing had happened. Call it naıve pain, or manipulating pain, but its major attribute is its *consistent* inconsistency through every culture. Pain can go when it suits just as easily as it can come when it suits. Pain at one level promotes behaviour that is beneficial to the tissues: it orientates us towards looking after the injured hurting part, it makes us go quiet, it promotes rest if rest is an option, it makes us move when the tissues crave movement, and it can make us feel concerned and want to seek help. At other less palatable levels, and let us not kid ourselves, it can also help provide advantages and rewards (remember survival advantages). Pain behaviour has a very smart but devious element. One difficulty is that providing rewards for pain and the accompanying pain behaviour further reinforces them and can amplify them. If crying and squealing very loudly when we hurt gets a sticky bun, then crying and squealing is very likely to be imprinted as a useful strategy in future. That the act is a conscious one can be challenged. Responses once reinforced quickly become learnt. If a pain and pain behaviour are subtly rewarded, their future activity may quickly become a conditioned habit that gets ever more permanently imprinted. Well-established habits require a great deal of effort to overcome.

Since a major part of the placebo effect relates to decreased pain, 'placebo analgesia', it is important to ask how the arguments above relate to this effect. There may be a slightly dangerous paradox, since relieving 'stress' and 'threat' via help and care during treatment may actually *allow* pain to feature more, rather than dull it. However, two forms of stress need to be considered: the first, associated with pure survival at and around the time of injury, which produces 'stress induced analgesia'; and the second, which relates to stress/distress associated with pain and the realisation of injury—which produces the feeling of vulnerability and the 'need for help' behaviour strategy. Our patients with acute pain are in this second category. Here, they are likely to be focused on the pain and the injury and anxious about it and its impact on their future. A good examination (in the patient's eyes), a clear explanation combined with a positive picture of management and the expected outcome are vital components during that first, and most important, therapist-patient session. As individuals, if we are concerned about an injury, or concerned about a pain, we dwell on it. If concern lessens, if the pain is 'normalised' in some way, our concern subsides and our attention and focus on the pain and injury can reduce significantly. Effective reassurance is a pain killer since it downgrades its importance. For reassurance to be effective, it requires patient belief in you and your examinations, your findings, and your

explanations. Effective reassurance has little to do with the treatment offered and everything to do with you and your examination and explanation style.

In summary, on the one hand gate control can be initiated by fear and the need for survival activities, on the other it can be enhanced by changes in attention away from the pain. In the case of patients, shifting attention away from pain can occur with good quality reassurance in tandem with confidence building function and focused activity. Thus, a significant step in therapy occurs if attention can be directed away from the pain or the part that hurts and even further if it then includes some form of task fulfillment. If interactions with patients provide such things, then changes in pain, that may be termed a positive 'placebo' response in a trial setting, are likely to occur.

The need for pain relief

As argued so far, pain drives valuable safety-seeking behaviour. Pain orientates us to the site of damage and makes us investigate it and try to derive a meaning in order to formulate appropriate action. Since pain is so unpleasant, it also drives us towards behaviours that bring relief from it. If I get stung by a stinging nettle, I might immediately look around for a dock-leaf to press on the area (a dock-leaf feels very cool and distracts from the stinging). If I burn myself I look for the quickest way of cooling the part burnt. Pain drives behaviours to satisfy pain relief. Pain relief is what we all want. As Patrick Wall (Wall 1999 p. 155) has said, pain is 'best seen as a need state, like hunger and thirst, which is terminated by a consummatory act.' Part of the consummation for pain is the seeking and obtaining of a treatment. The importance of patient belief in relation to active and placebo treatments has already been discussed in earlier chapters.

Why would the need for pain relief have evolved? Surely that goes against the general purpose of pain? I would like to invite comments here, but would propose that while high pain early on is necessary to drive help-seeking behaviour, continued high levels are detrimental to best outcome. Once safe, it is paramount that pain is brought down to a manageable level so that life can go on and independence can return. Not only does high pain intensity stop you sleeping, make you moody and unpleasant and distressed, it may also prevent the restoration of normal movement and activity. Lack of normal activity and movement (and sleep too) quickly leads to a loss of fitness and deconditioning—which ultimately increases vulnerability and threatens survival capacity.

Activating the placebo response

Previous chapters in this section of the book show that placebo effects have two components: one that influences pain perception, and one that has measurable physiological effects. A clear message is that therapists should be looking to understand the placebo, appreciate its importance and integrate

aspects of therapy that relate to its effects. Problems have always arisen with the idea that if you use placebos you are deceiving the patient. Hopefully the chapters in this section of the book are helping to lay this perspective to rest. In fact, talking to your patients about the meaning of the placebo is an empowering thing for them. It is well worth reading what Norman Cousins said about the 'mysterious placebo' in his best-selling classic, A*natomy of an Illness as Perceived by the Patient* (Cousins 1979).

In order to bring the material discussed together I would like to analyse some of the key components of a mother dealing with and comforting her young child who has just hurt himself. Although there is much subtle variability, most young children and their mothers react to injury and pain in stereotyped, and therefore arguably, in 'evolved' ways. Note that all the features discussed below occur very soon after the injuring incident and the onset of pain.

Seek help from someone trustworthy. When hurt in some way, most young children instinctively want their mother and their mother instinctively wants them. A mother is the one they trust and it takes a strong willed mother to let anyone else deal with their child. In hunter-gatherer times, and still in many regions and districts of the world, if you are hurt and vulnerable, it might be a very dangerous option to seek help from someone who is unknown. As a therapist, it helps if you are well known and have a good record in your local community. Successfully treated patients and positive referring doctors help here. Most people tend to stick with someone they trust and who has been effective in the past. People relax when they feel comfortable with someone trustworthy.

Attention and diagnosis. The mother attends to the area that is hurt—she shows concern, she finds out where it is, she looks and examines it, *she diagnoses the problem*. We all know how ineffective this part can be if the child feels the attention is inadequate—the mother who is too busy to be interested or take the time often gets an auditory savaging from the frustrated child. Therapists need to care, to show interest, to give adequate attention, and to take care to listen, question and do a high quality physical examination. Doctors would be advised to do the same. In the current culture, we all need more time.

Reassurance. The mother then reassures *herself* and then the *child* that the problem is not major. We need to do the same—the Red Flag guidelines that we now have are useful here (see Volume 2 of this series). As mentioned, the examination must be extensive enough to provide reassurance. This is an individual thing. Whether child or not, some people require a lot more time and a lot more reassurance than do others. If we do not give it, or it does not come across as convincing, it may not be sufficient. This involves listening, attention and the appropriate use of voice and touch.

Treatment. Thereafter, the mother's major concern is to quell the child's distress, attend to the pain, and get them active once more. She may rub the area, rub the child's back or 'kiss it better'; she may get a plaster or even give some medication. Throughout it all, touch is used very powerfully—the

cuddles provide a feeling of protection, safety or distraction, the rubs and more precise touch may provide a comforting input and further reassurance. All combine to relieve anxiety and relieve the pain. Beneficial 'inputs' originate simultaneously from tissues as well as via the mind—'bottom-up' and 'top-down' inputs. Witness how social animals use touch when they care for their sick and vulnerable, elephants, many social monkeys, the whales and dolphins, for instance. Touch is a constant reminder to the nervous system and the organism that they are safe, that someone is there to protect. Early on and with high levels of disabling pain, this type of reasoning would predict that touch and closeness may need to be continuous and prolonged! Bedside vigils for the very sick—regular touch, gentle words, the application of soothing compresses may be fundamental to a recovery environment. Reactions like these seem instinctive with our children but as we mature they seem to be lost and forgotten. Is our current overly objective and cold mechanistic approach to illness with its 'no time for care' style, a problem to be addressed?

Distraction and reactivation. Once the tears and crying start to subside a mother might hold and play with a cuddly toy to further distract the infant's attention from the hurt. Reactivation and independent play soon follow. It seems likely that smiles and cuddles, laughter and fun (and the likely physiological effects) may represent many of the best attributes of good therapists and good therapy! Skilled parents can quickly turn terrible tears into chuckles and giggles. Pain gates slam shut and healing proceeds! Arguably, the goal of trying to get back to normal tasks and activities in a carefree way as soon as reasonably possible is paramount.

Having time to think about how we are going to perform our daily movements seems a ridiculous luxury when viewed from an evolutionary perspective. Re-education of *thoughtless, fearless movements* that are task and goal orientated needs to be taken more seriously by professions involved in treatment of pain conditions relating to musculoskeletal injury and dysfunction (Gifford 2001a, 2002). To teach a patient physical confidence and **not** to focus on their body during activity might be anathema to many, but to most normals it could be viewed as one of the most valued currencies of uncluttered survival!

Note that if help isn't immediately available, we have to cope. A child who is playing out of range of their mother may suffer scratches and blows that would normally elicit strong distress but in this instance do not. The child may self diagnose, they rub and squirm and shake the part, they try it and test it and find its OK, the more they move the better they feel and they're soon back playing in the game again. Lone sailors often report remarkable physical acts despite appalling injury and severe pain. When help is unavailable, we have to cope. There may be two extremes. At one end is not enough help—and we die! At the other end, is too much help—and we risk becoming disabled by it. The evidence is suggesting that we are giving and receiving far too much help for far too long for the majority of musculoskeletal problems.

Given the discussion here and that presented in earlier chapters, the overall stance is that specific environmental, psychological and physiological conditions exist that can promote more efficient recovery and normal function, and that there is a huge complex interplay between these conditions. Every individual and their condition is subtly different and therefore requires subtly different conditions. The clinician's role is to help the patient explore and gradually create the best recovery environment, the best psychological state and the best physiological activity. In the clinic I like to think that part of my role is to help set up the individual's system so that it responds best. It's a two way process (between patient and therapist) that attempts to adjust the 'gain' of the system to the most favourable setting for efficient recovery. This is definitely not 'soft' medicine, but powerful, biological and, due to lack of practical understanding, largely untapped. The word placebo, in a rather distorted 'proximal' or mechanistic way, is a poorly chosen word that is representative of some of the observations derived from the remarkable natural healing and recovery processes when they are given the opportunity to happen. Providing this opportunity is a skill that needs to be on offer and not one that is viewed with disdain because of some historical prejudices associated with a word.

Final comments

Evolutionary reasoning is all very well but dangers occur if concepts and reasoning so generated do not consider all possibilities and result in rigid approaches. For example, giving appropriate attention to the pain and injured part was discussed in the context of the child above, however, overindulging a child with attention or a patient with the passive component of therapy may be detrimental in the long run. For example, it can create dependency, passivity and lead to unnecessary physical incapacity. From earlier in the chapter, a therapist who tells all her patients that to be flexed and shifted is not a problem and as a result makes no attempt to improve or restore normal range or full physical potential is just as problematic as a therapist trying to correct the posture instantly.

Evolutionary reasoning in medicine and physiotherapy is a new way of thinking and viewing the situations and presentations of our patients. Pleasingly, its validity is being increasingly tested, while its utility at this stage, seems obvious and points towards interesting and exciting new management and research strategies.

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FURTHER READING—A SELECTION

As well as the literature cited above, many of the following books have impacted on and moulded my thinking on the topic of pain and health and some of the reasoning presented in the chapter. Some are from the 'pop' healing literature, several are written for the general public by respected academics, and some are more conventional science. Mostly, they provide easy and quite often amusing reading on a difficult topic.

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