Ergonomics in a subjective world

By David Brown, B.Sc. M.A.

Introduction

During the Somali-Ethiopian war in 1982, refugee children in Somali camps were dying after drinking contaminated water. An Australian nurse told me of her efforts to explain to their mothers that invisible malicious beings called "germs" lived in the water. Her audience rolled in laughter on the ground in disbelief at her naivety and superstition.

Ten thousand children died in that camp.

As you read this, Australian business owners are similarly shaking their heads. They cannot accept as genuine a person who avoids returning to work after an episode of back pain, or after an exchange of insults in the workplace.

Into this darkness, ergonomists cast no light. They stand up and talk numbers, "proving" mathematically whether or not the job is physically reasonable, and whether or not the person should go back to work without further complaint.

So the ergonomist has been part of the problem. To become part of the solution, ergonomists as a profession need to embrace the subjective world, to explain "germs of the mind" in ways that people can understand.

This paper aims to provide ergonomists with basic navigation around the subjective world, to show how the inner and outer worlds meet. It begins with the occupational overuse problems ("RSI") of the 1980's, and ends with the present-day problems of pain, fear and stress.

"RSI": Where inner and outer worlds meet

Let's picture ourselves in the early 1980's. "RSI" has (apparently) just arrived on the scene, and physiotherapists, doctors, psychologists and other professionals rush to be the first to solve the problem. What is this "new disease", and why is it here? The first idea, as suggested by the name, is:

Low repetition	High repetition
No RSI	RSI

But how much is too much? And how do you account for people who aren't doing much repetition but still "get RSI"? Perhaps you add a chair to the equation:

	Low repetition	High repetition
Good chair	No RSI	Maybe RSI
Bad chair	Maybe RSI	RSI

That adds a new problem - how much chair badness is the equivalent of how many repetitions?

The problem compounds with every new factor added. Soon the problem is caused by work rate, chairs, desks, supervisors, management, troubles at home, being unfit, keyboards that are too light, keyboards that are too heavy.
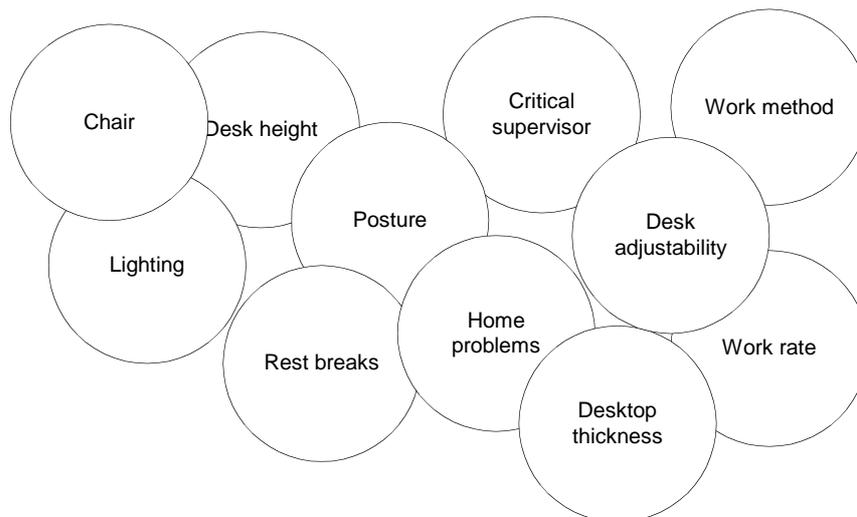
We might represent these theories in Figure 1:

Figure 1. Theories of "RSI" circa 1982.

It makes a good graphic, but there is no practical action that you can take based on Figure 1.

According to Thomas Kuhn (1962), science often has times like this. Theories start simply, then special rules are added to deal with issues that the original theory can't quite cover. In time, theories become so complex that they are unuseable, and they are then overthrown.

In retrospect, although nobody thought of it this way at the time, the revolution was to introduce the subjective, which crept in under the name of "muscle tension".
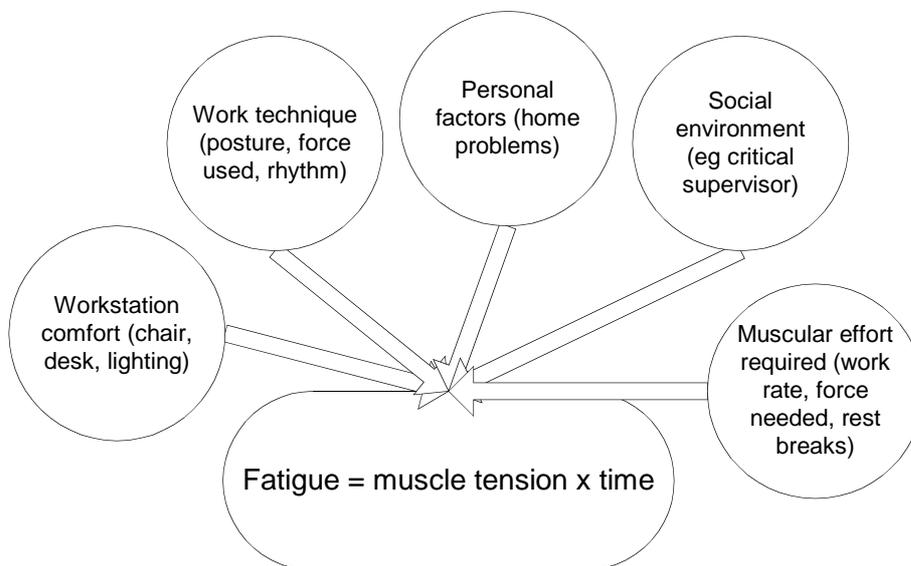

Figure 2. Muscle tension seems to resolve the confusion

So a chair is a problem if and only if it makes you tense. Of course, doubling the tension doesn't really double the discomfort, but the "equation" gives, broadly, the right feel for the topic.

There was no outcome to measure in Figure 1 other than injury rate, but in Figure 2 we can measure muscle tension using electromyography or "EMG" [1]. That EMG biofeedback noise and meter reading makes a very strong impression on the audience, convincing workers of the need to adjust

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[1] The author and Dr Robin Mitchell, stimulated by muscle tension work done by the NSW Division of Occupational Health in the 50s and later work in Scandinavian countries, developed an easy-to-use EMG (electromyography) machine in 1982.

their workstations and to work well, and convincing managers of the need to provide appropriate tools and work / break regimes.

It is, of course, a "con". An effective con-sultant con-vinces people to change, and gives them confidence in the recommendations made. You need theatre, drama, otherwise you won't get behaviour change in workers, and you won't get decisions made by managers. The consultant needs to say confidently "This is important, that is not!" and people need to believe it.

The purely "scientific" ergonomist who hedges their bets and tries to list every possible factor is impotent by comparison.

The muscle tension approach was nothing short of a revolution, and it took a while for people to adapt. An example. The author was taking part in an "RSI intervention" in a government department, training supervisors to help workers to relax as they work. A visitor remarked, "It's so different here. In Melbourne we tense up when the supervisor comes near, because we know we're going to be yelled at about our posture!"

By 1985, the revolution was virtually complete, in Australia at least. After hundreds of conference appearances, along with TV, radio, newspaper and workshop presentations, these once-radical views about muscle tension and "RSI" were being rated as "mainstream"[2]. Although worldwide muscle research continued through the years, and the "acceptable level" of sustained muscle activity reduced from 15% of maximum voluntary contraction down to just a few percent, the central concept (that sustained tension hurts) did not change. So intervention remained targeted at reducing tension, at reducing the time for which tension was held, or at doing a little of each.

The muscle tension approach opened a world of practical applications. We could test a proposed change to a work process in a few hours by measuring its effect on muscle tension with several workers using cross-over designs. This was a much more practical approach than introducing a change to a whole section of workers and waiting a year to count the bodies. We could also work therapeutically with individuals, and have immediate feedback as to the expected outcome.

Using muscle tension as the central idea gave us a vast impetus. But its biggest benefit was unexpected – it opened a door into the emotional realm.

How muscle tension lets us talk about the subjective

When we began to use EMG in occupational settings, we had no detailed information about how EMG had been used by others (apart from electrode locations), so we developed our own protocol. The author, a psychologist, had used EMG for a decade in relaxation training, and that relaxation-focused approach slipped in without anyone realising. It was a lucky accident.

We knew that people expected the solution to be found in workstation adjustment, so we began there. We used EMG to prove the value of raising the chair, then we built on that success - "did you notice that when you do it that way, it makes your shoulders as tense as having your chair at the wrong height? Can you think of a different way to do it?" Next we showed the worker how to take an effective micropause, and practiced it until they could quickly reduce their EMG readings for trapezius and forearm extensor muscles to a very low level. Finally, we asked – "is there anything else about work that makes you feel tense?"

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[2] In post-workshop evaluations of the author's workshop "The Skills of RSI Management", 1984-1986.

Discontinuity - the slippery slope

It's an ergonomics truism that late interventions are more difficult. So years ago, we drew a diagram showing a man at the top of a slippery slope of pain. It was easy to pull him back from the brink, but once on the slope he would probably slide rapidly downhill, and you would have quite a job to get him back up again.

Figure 2 does not show the slippery slope. Perhaps it should have one, like this:
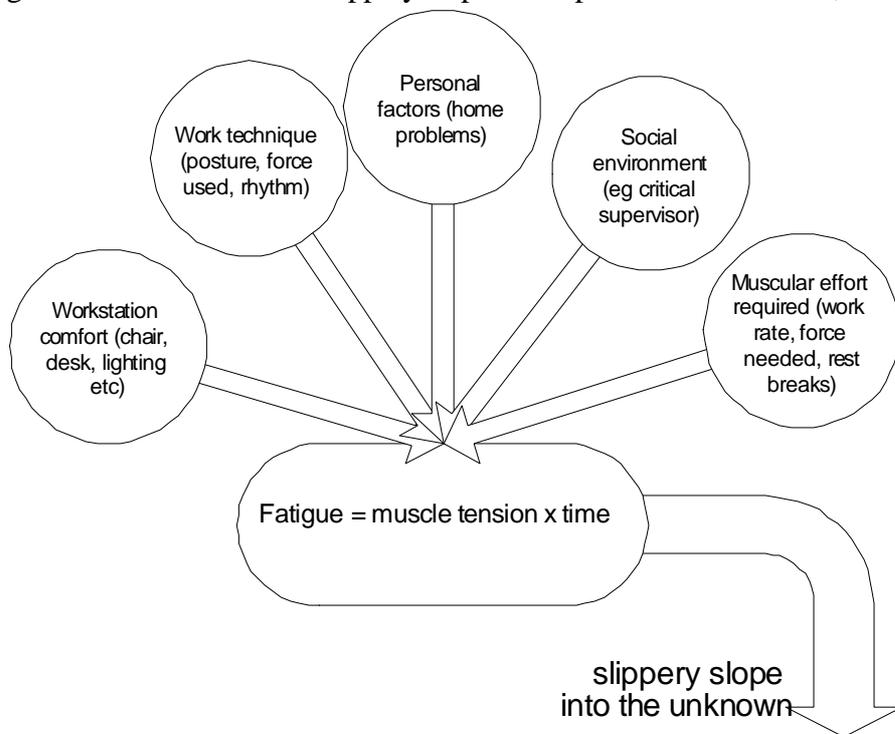

Figure 3. Adding discontinuity to the pain model

Is pain a particle, or a wave?

Now our "RSI" diagram is dual in nature. There is a "mathematical zone" where fatigue is the issue, resulting from tension sustained over time. In that zone, a degree of precision can be achieved with the intervention and the result. But there is also a discontinuous zone, where unpredictability rules; the person slides rapidly downhill and it is not always easy to get them back. We don't even know where they went – is the problem physiological or psychological, or how should we think about it? Fortunately, some progress is now being made with the idea "fear of re-injury" which will be discussed in detail later in this paper.

This same dual-nature approach is needed when discussing occupational stress. Most of the problem is easy, but some of it is extremely difficult!

"Stress": applying the lessons from "RSI"

In 2002, we are in the same position with "stress" as we were in 1982 with "RSI".

- Most articles about stress provide unorganised long lists of contributing factors – work rate, supervisor style, physical stressors, and so on.

- Important and unimportant things appear in the same list.

- The central factor through which the contributing factors operate is either not shown, or it's told as a joke - "you're experiencing the fight or flight reaction, just like a caveman".

- The consequences of stress are expressed in dire physiological terms, for instance the "Alarm – Resistance – Exhaustion" model of stress proposed by Selye (1950).

Figure 4 shows the model of stress that the author has been developing since 1978. Obviously, it is meant to avoid the errors listed above. The central factor follows the pattern "adverse effect = exposure x time". This is a fundamental pattern of occupational health; it appears in the "muscle tension x time" model of muscle pain as shown in Figure 2, in the "noise x time" model of hearing loss, and in the "radiation x time" model of burns and radiation poisoning. Similarly to Figure 2, the multiplication sign is not meant to be taken as literal simple multiplication. The necessary "slippery slope" will be added a little later.
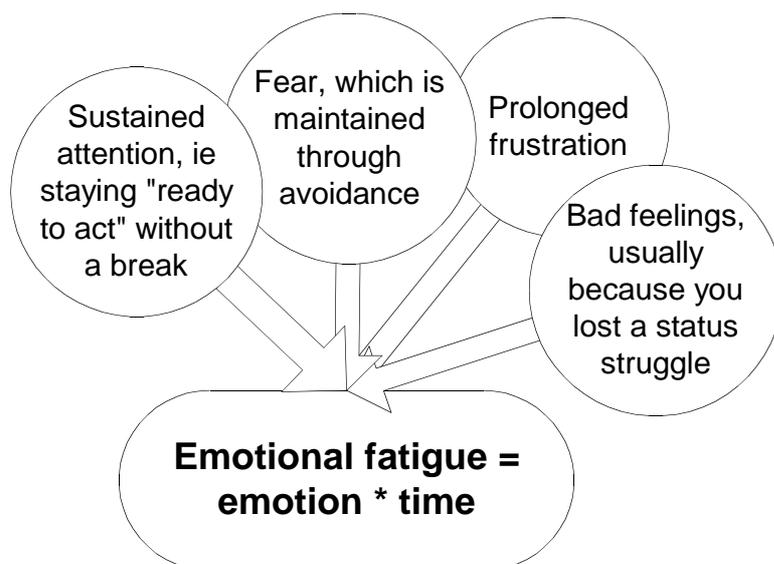

Figure 4. Four causes of stress

This model has a number of sources.

- The "Attention" section is a development the author's Masters degree work (1978). It is partly based on a model of attention presented by Carl Pribram (1975), and partly on a series of relatively unknown experiments carried out on animals by Jay Weiss (1970). Masterfully, Weiss laid out the parameters of a task that led to stress in an "executive animal". The author translated these parameters into descriptions for human tasks (Table 1).

- The section on "Fear" comes from the author's work in "post traumatic stress disorder" (Brown, 2000).

- The "Frustration" section comes from behavioural research on animals, together with the author's observations of people in the workplace.

- The "Bad feelings" section comes from the literature on heart disease and personality, and on the role of status struggles in disease across species.

These four sources of "stress", although subjective, are easily understood. You can feel them, and you can feel the "emotional fatigue" through which they operate. The author has found that most people, including teenagers, can relate to the concept and give examples from their own life.

Compare that to the Karasek and Theorell (1990) model. It is very hard to get a "feel" for their concept of control as "decision latitude". This abstractness problem is common in concepts arrived at through studying large groups; the computer throws out a "factor" and the researcher has to find a way to explain it in words. Whereas the feelings associated with each of the causes in Figure 4 are familiar and recognisable.

Table 1. Attention demand arising from work

Cause of fatigue	The solution is:
Fast pace or short reaction time: Decisions or responses are required rapidly	Reorganise things so you have more time to respond. For instance when driving in traffic, leave a bigger space to the car in front. See Threat avoidant vigilant activity (TAV) - Belkic (1992).
	Take a fixed break (even a few seconds helps) between decisions. For instance if you're answering the phone a lot today, let it ring for 4 rings and not 3, and relax during those few seconds.
	If people are queuing at your door to speak to you, devise a 'pause tactic'. Finish your notes, then close your notebook or put that folder away. Take several deep breaths, get up and stretch as you walk to your filing cabinet.
Duration: Decisions are required one after another without a rest in between, or task goes for a long time	If the job goes for very long periods, try to find natural places to break it. Or invent them! (See 'Lack of completion' later in this table)
	If fast-paced decisions are unavoidable, or if the job doesn't have natural breaks, schedule breaks or rotate jobs so that no one person does the job for too long.
	If you're in charge of staff, ensure that everyone knows when their task is finished.
Lack of clarity: The task is unclear or person is new	Everyone needs to have the same understanding of what the job entails, especially of what the boss means by a 'properly finished job'. It's annoying to finish something and hand it over, only to have it come right back at you! If your boss hasn't done this for you, take responsibility and ask him/her "what do you see as the finish point to this job?" or "can I have some clear guidelines as to what the finished job will look like?"

Cause of fatigue	The solution is:
Lack of completion: The job never really finishes, so we can't relax.	Here I'm talking about the **feeling** of completion, which is just as important as actually finishing. Finishing a task brings spontaneous physical, mental and emotional relaxation only if we **know** that the task is finished. So **clarifying the end point** of a task is very important. You need to be able to feel that you have completed one task before starting another (even if that just means putting the first task away and coming back later, rather than leaving it open on your desk). Reduce interruptions where possible, to allow one task to be finished at a time. If you're always being interrupted, taken off one task and put onto another, or if the end point of the job is unclear, you can't get the satisfaction of completion, and you are more likely to feel frustrated. Talk to your boss.
High complexity: The task is complex and we're not equipped to finish it; or our strategy is wrong and we can't make progress; or we've got too many tasks running at once	Arrange interruption-free periods for complex tasks. Schedule them at times when your mind is clearest. Try to subdivide or otherwise clearly structure complex tasks, so that they can be finished in parts. There are many structuring tools (lists, tables, calendars, flow charts, planner charts etc); spend some time to choose the most appropriate tool for your work. If you're running too many tasks at once, close some of them down (even just putting them in a box and out of sight helps; or ask if someone else can do them). If you can't work out the steps to finishing the task, don't be shy, ask for help!
Lack of control: We can't control what we do or when we finish	If you're doing the job, you need to be able to control it. You at least need access to the on/off button! Too much responsibility doesn't always help – but in most cases, control is healthy. If you can't have control, then you need breaks. For instance ask your boss about breaks and staff rotations. (note: high control is linked with high status, and that also protects against stress if the social rank is stable)
Severe consequences of error:	If a mistake costs a dollar, the job will be much less "stressful" than if it costs a million dollars. So why not reduce the consequences of error?

It is probably obvious that just like the "RSI" model of Figure 2, the "Stress" model of Figure 4 offers straightforward interventions for attention demand –

- Reduce the amount of attention, or

- Reduce the time for which it is held,

and the person will experience less emotional fatigue.

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The second major cause of stress shown in Figure 4 is "Fear, which is maintained through avoidance". This problem occurs commonly after occupational injury, but is rarely diagnosed. Obviously it has similarities with "post traumatic stress disorder", but in the author's view, the standard DSM-IV system for classifying that disorder is faulty (Brown 2001). Instead, the author proposes two key causal paths, shown as A and B in Figure 4 (which is derived from Figure 4):

Causal path A: Fear, vigilance, avoidance - learned in the body, this consists of an emotion (fear) usually linked to an action (avoiding or running away); see arrow A in Figure 5.
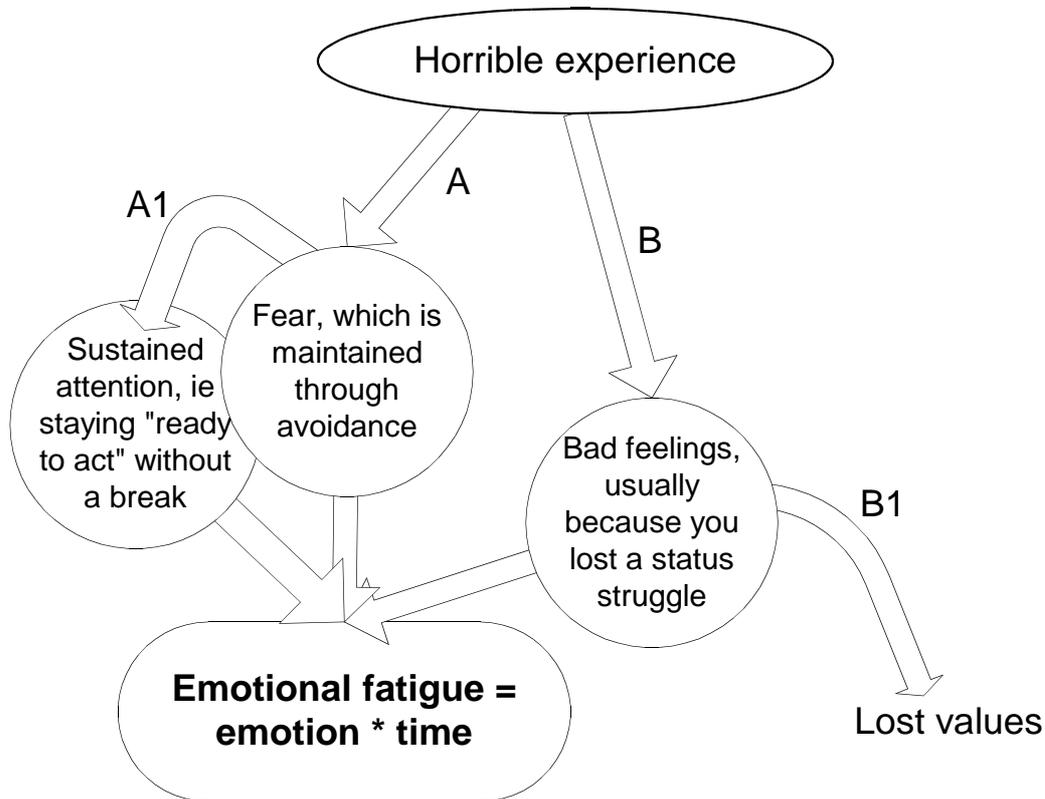

Figure 5. Post traumatic stress

Fear is conditioned and unthinking, its entire purpose is to keep the person safe by running them away from the thing that hurt them. If fear has "generalised" (arrow A1), the person might also be vigilant, because the next threat could come from anywhere.

Treatment is by exposure to the feared thing or place or event, staying there for an hour or more and not running away. Repeat once or twice if necessary. Detailed examples of exposure will be given later in this paper. If the therapist doesn't use exposure, if they simply talk about the problem, the person is unlikely to get better; so a therapist needs to be prepared to get out of their chair and go to the place where the trauma occurred.

A therapist needs to be resilient in order to perform this treatment. It is difficult at times to be with a person who is distressed confronting their fear. You need confidence that the treatment will work! Of course, grade the exposure in tolerable steps.

A therapist also needs to tolerate unusual reports and consider them to be a normal part of treatment. During a recent exposure treatment, a woman looked at a now-empty street where she had been robbed, and told the author that she could "see" her car. This is one type of "flashback". After an hour of exposure, she said that this "ghost car" had now disappeared. Other workers have made

similar comments about seeing things that are not there. It is as if the past is overlaid on the present, but when treatment is complete, the past is laid to rest.

Causal path B: Bruised status and lost values – Feeling put down or diminished; constantly reliving the event, trying to make it come out better (arrow B in Figure 5). I feel that my control over my life has slipped. I might take legal action simply in order to prove that I am a worthwhile person after all.

For most people, bruised status eventually heals. Treatment can make this happen more quickly, particularly if the reaction is being sustained by repetitive thoughts about the event.

The author was held up at gunpoint as a student, and spent a year reliving the event. The "flashback" consisted of the author imagining how he could have overpowered the armed gunman and his two accomplices. In retrospect, any sensible person could have told the author not to be such an idiot! More formally, the technique called "thought stopping" would have brought that type of "flashback" to an end in about three days, compared to their sorry duration of a year.

Repetitive thoughts not only result from trauma, they can result from virtually any event in the workplace. Being overlooked for promotion might be enough. A typical "stress patient", when asked by the author "How often do you have these thoughts?" replied "From the moment I get up in the morning until I go to bed at night I can't stop thinking about how badly I was treated." In an identical expression from a different culture, demonic possession in Haiti is described as "the spirit dances in the head of the possessed person". In each case, thoughts unbidden go round and round, causing bad feelings (Figure 6).
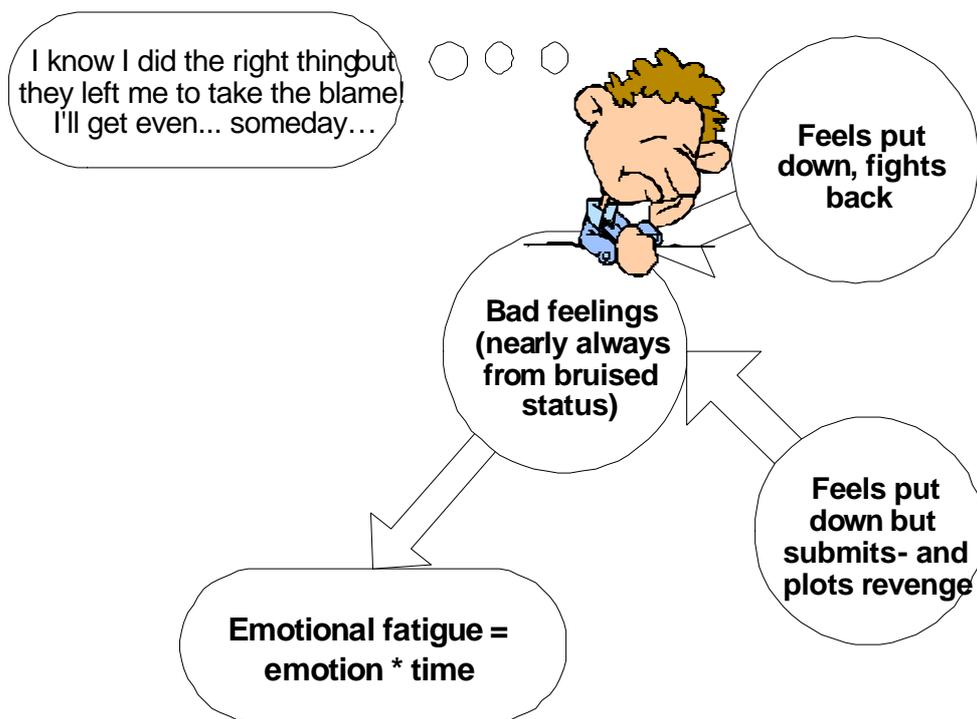

Figure 6. How bad feelings are caused by status reactions

For the past ten years, the literature on heart disease and personality has focused on the role of cynical hostility ("the world is out to get me") and hyper-reactivity in the development of coronary heart disease. Basically, cynically hostile people are always over-reacting in social situations, even though their reactivity in other situations is often normal.

The good news is that a pet dog helps these cynically hostile people, at least while the dog is around (Allen and Blascovich (1996)). The bad news is that cynically hostile people are more likely to disregard parts of a doctor's advice (Christensen et al (1997)), putting them even more at risk of adverse health outcomes. Add the fact that sustained bad feelings have a clear negative health impact (Jonas and Lando (2000)), and these people are in real trouble!

Figure 6 might also explain why the "effort-reward imbalance" stress theory of Siegrist (1996) achieves some positive research results. An effort-reward imbalance sounds like an objective, almost physical thing; it sounds as if person will be stressed if they are not paid enough, or recognised enough, for the work that they do. But the test actually appears to measure the same cynical hostility that is such an issue in heart disease research.

That is, it measures (at least in part) the person's bad reactions to their situation. So the "effort-reward imbalance" theory, which sounds so grand and objective when you first hear it, really means "I feel put down" or "I feel powerless" or "I feel trapped in a dead-end job" – "and I can't stop thinking about it, or feeling that way, I hate you for putting me here".

Personality research suggests that people who readily think that way are different to the more easy-going among us; so the "effort-reward imbalance" test could be a roundabout personality test, and not really a test of workplace stress.

A similar confusion of the internal and external worlds occurs with Karasek and Theorell's concept of "control" as protective against stress. They propose it as a characteristic of the job. The author, however, views it as having two components, one external and one internal – the first being the ability to complete one piece of work before commencing the next, which relates to attention; the second being one's self-perceived place in a social hierarchy, which relates to bad feelings.

In Figure 5, for some people the wound of bad feelings is deep, their place in life (i.e. in the status hierarchy) can't be restored, and the problem becomes "lost values" (arrow B1). The world no longer makes sense, no longer seems "right" or "fair" or "safe". "They shouldn't have done that, it was wrong, nobody should treat anyone else like that." Some people who weren't religious before gain a belief in God, while others who were religious before lose their faith – "how could a loving God let this happen?"

Losing your values is the discontinuity in the stress model, the equivalent of the slippery slope of pain in the "RSI" model. Your old world has turned upside down, it no longer makes sense.

It's rather like flying an aircraft. There is an "envelope" of stability, within which things can be predicted and managed. Go outside the envelope, however, and things will become rough and unpredictable – buffeting, spins, stalls, inversions, all sorts of "irrational" behaviour.

Losing one's values is a developmental challenge that only some people manage to grow through. That is why the B1 arrow takes you right off the map in Figure 5.

For instance, a person who's lost a child in an accident might only heal their fear of cars through exposure to the scene of the accident. They grieve for their child, but perhaps they also grieve for their loss of innocence, for the loss of a stable and predictable world in which everything is fair and right. There has to be someone to blame. Let's find them and sue them. Because few people can cope with the realisation that the world is not a fair and predictable place.

There is another possible outcome of trauma that should not be considered "post traumatic stress disorder" at all. After a trauma some people experience recurrence of earlier, apparently healed psychological problems. Referring them back to their original counsellor is probably the best course of action.

The remaining circle in Figure 4, frustration, is straightforward. Frustration means banging your head against a wall - you're taking the wrong approach to the task, for instance, you're trying to do a complex job on a day when the phone keeps ringing. Silly you.

Why this stress theory uses everyday language

The author's stress model has deliberately been presented in everyday language, without jargon, so as to allow readers to relate it to their own experience. That also allows it to be connected to historical understandings about stress that remain in our culture, and which can be found in folk sayings. Table 2 shows how folk sayings can be related to psychological findings, and then to courses of remedial action:

Table 2. Folk wisdom about stress

Grannie says	Same thing said by a psychologist	What you need to do
All work and no play makes Jack a dull boy.	Sustained attention is unhealthy.	Don't try to do ten things at once - focus instead on completing things.
The job is its own reward.	When we finish something, relaxation comes by itself.	Structure your work into "chunks" that you can finish, e.g. in 1-2 hours per chunk.
Stop banging your head against the wall	Frustration is a useless emotion.	If you're feeling frustrated, stop and take a break. If necessary, attend a coping skills course to recognise and deal with frustration more quickly.
Get back on the horse that threw you.	You can't get over fear by running away - you have to face it.	Confront your fears. Go to the feared place or situation. Stay there for an hour or more and don't let yourself escape. A psychologist can help.
Never let the sun set on an argument.	Reactions that go on and on can harm your health, so make peace as soon as possible.	Meet with the person who offended you. It's usually best to seek the assistance of a peacemaker (mediator, wise person), particularly if the problem is longstanding.

The next section deals with pain, and in particular the question of why a person will not return to work even though their own doctor has said that they are medically capable of doing so. The similarity with stress, and the role of the subjective, will quickly become apparent.

Bad feelings, attention, fear and pain

Many people with nothing diagnosably wrong with their back claim to be permanently crippled, while others with clear spinal problems are coping well. This mystery has annoyed employers, employed investigators, and intrigued researchers for years.

Since 1997 articles have been appearing on the role of attention and fear in pain. This accumulating body of work is beginning to make sense of the disability puzzle. The following is a sample of that work.

How pain disables

Crombez, Eccleston et al. (1998) divided a group of healthy people into "catastrophisers", meaning people who think to themselves "this will be unbearable", and "non-catastrophisers", and gave everyone a task to perform that involved a mild shock. They found that if they warned subjects that a painful shock was coming, the performance of catastrophisers fell even before the shock arrived.

In 1999 they added that pain interrupts more if the person is more afraid of pain in general. You don't have to be afraid of that specific pain – it is your general view of pain that is important.

Crombez, Vervaet et al. (1998) looked at coping styles. They reported that chronic pain sufferers who **avoided** pain reported greater frequency and duration of pain, higher fear of pain and injury, more disability in daily living, and more attention to back sensations, than chronic pain sufferers who **confronted** pain.

Crombez, Hermans et al. (2000) reported that the more pain a person is experiencing, the more their attention tends to be caught by words that are related to pain. This shows that the pain problem is not just at a sensory level; higher levels of the brain are also involved.

Eccleston, Crombez et al. (1997) found higher disruption of performance in those who reported high somatic awareness generally, and high negative affect.

Hadjistavropoulos and LaChapelle (2000) studied patients undergoing medical examinations, and found that catastrophic cognitions, behavioral displays of pain, and somatic sensations measured during examination predicted anxiety experienced during examination. It suggests that if a person stopped their catastrophic thinking and stopped making big displays of pain, they might feel less anxious.

Putting the above findings together suggests that pain experience runs in a loop, in which the more pain a person is experiencing, the more they attend to it, and the more their attention becomes focused on pain issues in general (and not just on the pain they are experiencing at the time). A tendency to catastrophise, fearing or expecting pain, and having bad feelings, makes the whole situation worse. Then just when things get unbearable and you try to escape, ie to avoid pain, you find that you can't, and you're back at the beginning again.

Aldrich, Eccleston et al. (2000) suggest that we think of chronic pain as chronic vigilance to threat of pain. They argue that chronic pain is the result of the entirely normal tactic of problem solving, where the problem is "How can I escape from pain?" Because the problem cannot be solved, the vigilance can never come to an end. (That formulation is rather similar to the author's view of stress; see Figure 5, substituting "Pain" for "Horrible experience".)

Crombez, Vlaeyen et al. (1999) reported a number of studies that concluded that pain-related fear is more disabling than pain itself. Vansteenwegen, Crombez et al. (1998) found in a study of normal subjects that experimentally-induced fear of pain could be extinguished if the pain did not recur, however the person remained alert to the situation that had initially caused their pain.

Consistently, Mannion, Muntener et al. (1999) studied the effectiveness of physiotherapy, muscle training machines, and aerobics as treatments for pain. They concluded that the main therapeutic effects did not come from reversing physical weaknesses, but perhaps worked by reducing fear of pain, and increasing confidence about ability to perform.

This concept "fear of pain" might turn out to be a breakthrough. The author has discussed the idea with many people, and they immediately acknowledge it as something which was never said but was always true.

So there might be two kinds of fear - fear of the place where the injury occurred, and fear of recurrence of pain as explained by Crombez and Vlaeyen. We might expect that in some cases one will predominate, in other cases the other.

How to treat fear of the place where injury occurred

As promised earlier in this paper, this section will give details of the author's approach to treating fear of a thing, place or object - the classic behavioural technique of **graded exposure**.

Successful treatment of fear can only be done if the worker agrees not to escape, and not to avoid, that which they fear. Humane treatment requires that the exposure be conducted in steps which are tolerable to the worker.

If a person is afraid of a place, their fear increases the closer they approach it. This provides an easy way to stage treatment, as well as an objective measure of the person's progress. If they can tolerate looking at the machine from 50 metres away for the first half hour, but for the next half hour they can tolerate being 30 metres from it, you have made measurable progress.

This process is usually very quick, and the author has completed a number of cases in a single one-hour session, even when traumatic injury (such as a shooting) was involved. In the case of a security guard who was shot on duty, we spent 45 minutes sitting on a park bench opposite the bank. When the worker said "I'm starting to feel quite different", we waited another ten minutes, then walked across the road. The worker then described the shooting in entirely matter-of-fact terms; it was clear that the intense emotion that he had been feeling had been largely resolved. It was now just a memory.

When on-site exposure is impossible, use simulation

In a current case the author found that the worker kept looking at the floor during exposure sessions, and not at the machine on which she had been injured. This was effectively avoidance, and would maintain her fear no matter how many sessions were given. It turned out that two fellow workers with whom she had previously had a dispute were standing nearby, smirking. So the author made a 10-minute videotape of the machine, which the worker viewed every workday in a private room without the knowledge of the other workers. Observation of the worker across several sessions showed that she was looking at the TV screen more and more as the days went on. After two weeks the worker reported that she could view the actual machine from a close position with much less anxiety than before.

Treating fear of the task

The author recently conducted exposure treatment on a computer operator who was refusing to touch a keyboard following an injury. Graded exposure away from the workplace included disassembling a keyboard, asking the worker to look at and handle the components, then reassembling it. The worker showed no distress dealing with this keyboard while it was not plugged into the computer. So there was, apparently, no fear of the keyboard itself.

The author then went with the worker to the actual workplace, but the worker insisted that even a dozen keystrokes in a day would injure her. She would not touch the keyboard, and when asked to, she roughly hit at it from a distance. She then refused any further contact with the author.

Reviewing this case in light of the research discussed above, catastrophic thinking was clearly a key factor; the worker had repeatedly spoken of her fear that her previous condition would recur or worsen. High somatic awareness was also a factor; she repeatedly drew attention to the appearance of her arms (in fact they looked normal). She avoided, rather than confronted, pain. But there were many additional complications, including a psychiatric history that the worker refused to discuss.

There was no way to access her inner world, the door remained firmly shut. All that can be done in those cases is to manage "from the outside", for instance:

- Give a clear expectation that return to work is normal even if some pain remains;

- Explain that it is normal to feel reluctant to perform that task again;

- Reassure that the process will be done in tolerable steps;

- Follow the plan, and measure the results in terms of approach to the feared work area, or in terms of time spent on the feared task.

Summary of pain research

A few very important issues emerge from this research:

- Fear is likely to play a key role in return to work difficulties.

- If you expect severe pain from an activity, you'll be more disabled because pain will take more of your attention; if you catastrophise about pain, it makes things even worse; if you express pain, it makes you feel bad.

- Chronic pain might be redefined as "always fearing, avoiding and trying to escape from pain". People with long-term pain do better if they abandon this tactic and confront their pain instead.

- Fear of the place where injury occurred is easy to treat, fear of the task can be harder.

Conclusion

As a rule, ergonomists love measuring things, talking numbers and naming muscles, listing contributing factors and making recommendations. While all this is going on, the essence of the worker is somehow forgotten.

We need to include the subjective world of the worker in our understanding. That subjective world has its complex and unpredictable zones, but it also has places that are easily understood. Hopefully, the ideas presented in this paper about the nature of stress, pain and fear will be a step towards that understanding.

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