Mental Training, the Pre-frontal Cortex, Resilience and Equanimity

Introduction

In many situations, especially when we are under stress, we may find ourselves over-reacting. The ability to stay calm under pressure is a great quality, and is modulated by the pre-frontal cortex (PFC). Such non-reactivity (i.e. not over-reacting to events / feelings / thoughts) has been shown to be a core factor of mindfulness (Baer et al 2006; Siegel 2007 p 209 - 211).

Now during evolution animals developed the ability to protect themselves from danger, and over eons this resulted in what we can call our "Threat and Protect" systems (Gilbert 2009). This activates appropriate behaviours (e.g. flight or fight) when we are under physical threat. However, these systems can also be activated if we are having negative or self-critical thoughts, and this can result in us developing inappropriate / avoidance type behaviours. They can also be activated by our perception of what may actually be an innocent remark / gesture by another person. For example, we may become anxious if our boss frowns at us; this may, however, be nothing to do with us and simply reflect that on that day our boss was, for example, feeling out of sorts or had tummy pains (see also B2).

Figure 1 shows an appropriate activation of our threat and self-protect system, Figure 2 an inappropriate activation of it.

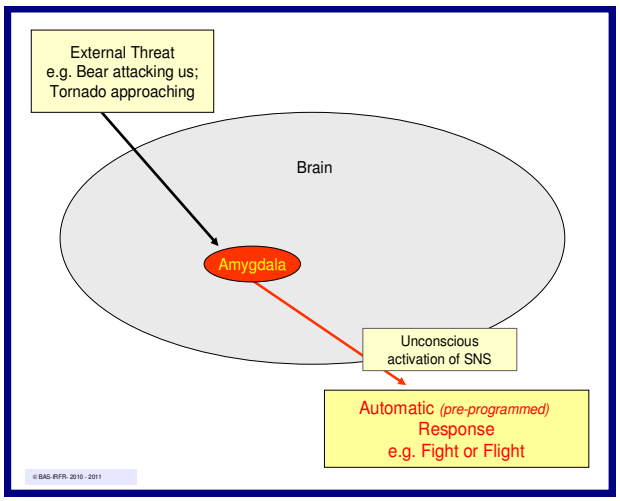


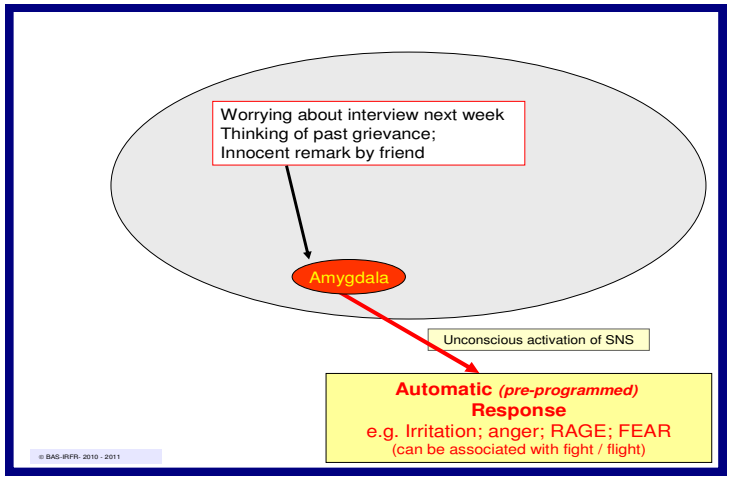
Figure 1

Appropriate activation of the Threat and Self-protect system from an *external source*

Figure 2

Inappropriate activation of the Threat and Self-protect system from an *internal source*[1]

Note:
- This is all mediated at an unconscious level.
- The innocent remark here is perceived as an attack on ourselves.



So how can we appropriately regulate our emotions and feelings? How is emotion regulated in the brain? Emotion is of course central to the way we interact with others. If we are upset, then our interactions

[1] Figures 1 & 2 both show the unconscious activation of the Sympathetic Nervous System (SNS). Actually, this is a short hand for two systems: the SNS system (adrenaline and nor-adrenaline) and the Hypothalamic Pituitary Adrenal system which results in the release of cortisol. These have previously been notated as the Type I and Type II Stress Response respectively (Ross 2010 pp 50- 52). In many ways it is persistent or over-activity of the *Type II* Stress Response that can particularly damage our health.

with others may be upset – and then they too may also become upset. Yet healthy emotions are essential for wholesome human interactions. Phineas Gage was a well respected railway worker in America when in 1848 a metal rod went through his head, damaging the connections between his pre-frontal cortex and his "emotional brain" (the limbic system with the two amygdalae etc). Following this terrible accident, he could still think effectively, yet his personality was greatly changed so that he could no longer do his job or behave appropriately in society (see e.g. Damasio 1994 pp 3 - 19). The idea that we would be more rational beings without emotions is false; reason without positive caring-type emotions can be catastrophic for the individual and society.

So we return to the question, how can we modulate or change inappropriate (and often automatic) behaviours and negative thoughts / feelings? It turns out that the emotional brain if overactive can lead to excessive energy, anxiety, and chaos, with disturbed behaviours. When there is this sort of over-activity, we tend to over-react to situations and / or mis-perceive what others are saying. Note that when our amygdala is activated (e.g. with fear) the two way connections to the neo-cortex and rational thought are "closed down". On the other hand, under-activity of the emotional brain can lead to dullness and depression. So, for balance, we need a middle way between these two extremes that will lead to appropriate and mindful interactions and behaviours with ourselves and others.

Pre-frontal cortex and equanimity

Research has shown that it is the pre-frontal area of the brain that has a monitoring and controlling effect on our limbic system (including the amygdala / emotional brain[2]). And it so happens that meditative-type practices enhance the activity of these crucial pre-frontal cortex areas – and hence facilitate in allowing us to develop several (nine) specific skills for life such as emotional regulation, reduced reactivity (that is, inappropriate reactions), increased attunement with others, and intuition. (For full details of research in this area, see Siegel 2007A pp 337- 345; and for a summary see C2). Some of these dynamics are illustrated in Figure 3.

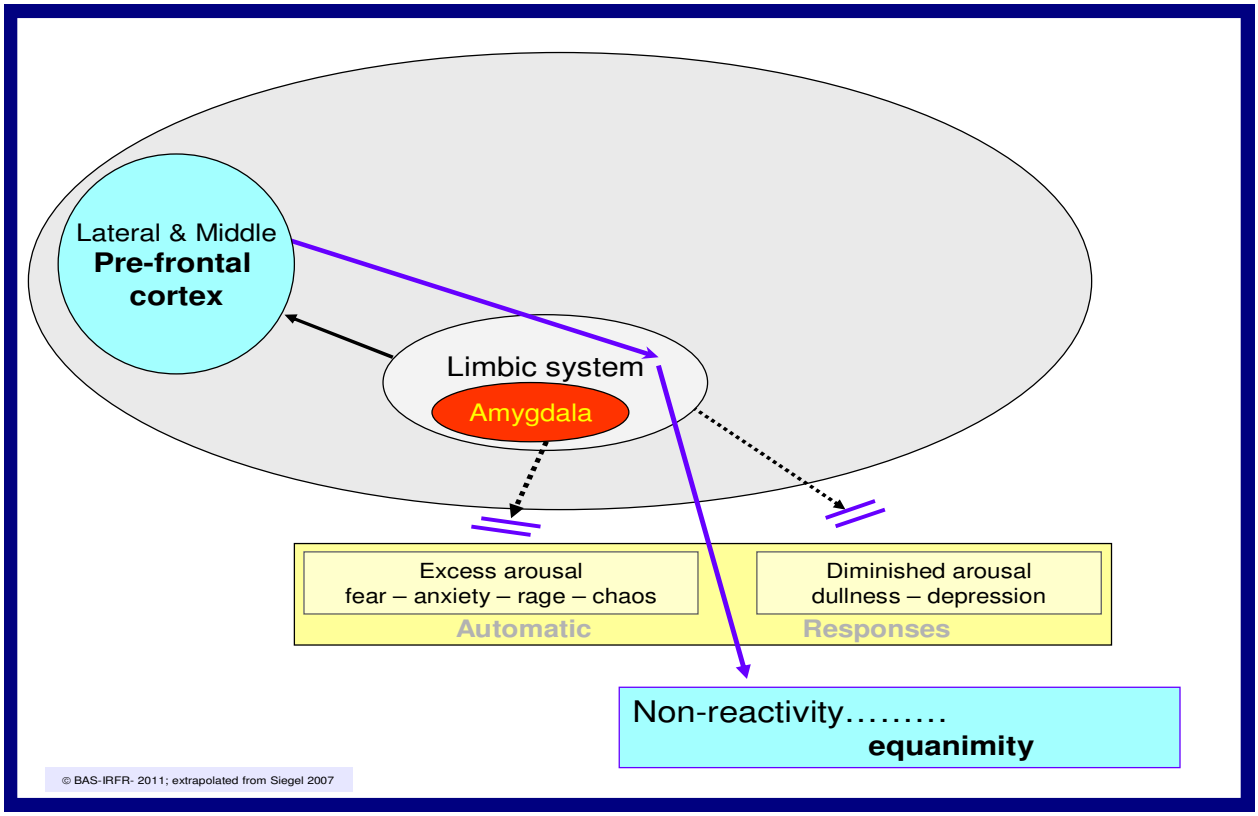


Figure 3
Positive modulating effect of the PFC on our emotions when we are mindful

Comments on Figure 3 /

[2] Sometimes also referred to as the old mammalian brain, in contrast to the neo-cortex.

Comments on Figure 3

i. In health there is a two way communication between the limbic system and the pre-frontal cortex (PFC).
ii. When we are mentally balanced, communication between the PFC and the amygdala has the effect of closing down the automatic responses[3] – such as fear and running away inappropriately from situations.
iii. At the same time, the PFC modulates our mood reducing the chance of feelings of dullness / lethargy (that can be linked with depression).
iv. As we become more mindful, it is not that we do not experience from time to time negative thoughts and negative feelings; but we accept these with a sort of equanimity – and this allows us to bounce back, as it were, more quickly to a positive (or at times neutral) mental state.
v. Also note that meditative type states tend to activate the left pre-frontal region on EEG, and this in itself acts as an anti-dote to negative mind states (see B5).

As we develop our skills in mental training practices such as meditation and / or Autogenic Training, we are appropriately activating the middle pre-frontal cortex – and specifically nine distinct functions that we mentioned above, which also include fear modulation (i.e. reduced anxiety and fear responses), positive bodily regulation (e.g. not becoming flustered and having – say – an increased heart rate), and increased flexibility (in terms of appropriate responses – when formerly we might have simply gone on automatic pilot with inappropriate responses). This means that we can increasingly stay calm under pressure. Note that equanimity is one of the attributes of Mindfulness (see D1). Thus we can begin to sail a route between the extreme emotional responses of chaos / intense anxiety and dullness / depression.

Resilience and facing problems

Resilience is to do with keeping calm under pressure, and being able to bounce back from setbacks. When we have a problem, or when we are feeling low and negative, it is important that we do not run away from the problems / feelings. Rather, we approach and face up to the problem. We can do this by approaching our internal states with Curiosity, Openness, Acceptance and Compassion (Siegel 2007 pp 15, 222). Note that Siegel as a form of shorthand uses the acronym COAL for this – the L being for Love. I prefer the word compassion or understanding here: love embraces understanding[4].

Now what do we mean by all this? If we have a problem, we approach it with curiosity: we can see it as a challenge to be dealt with appropriately and in a wholesome way. Simply by being curious about negative states, we can begin to de-potentiate them. [The concept of curiosity overlaps with the concept of investigating phenomena – one of the Seven Factors of Awakening cited in Buddhist psychology – Hanh 1998 p 216.]

Openness: we are open to the feeling, situation, mood, whatever it is.
Acceptance: we accept whatever it is in a non-judging way.
Compassion: we approach the matter with love and understanding.

In mindfulness, we approach negative thoughts and feelings with curiosity and openness. A skilful approach to such thoughts can be: "A thought is just a thought – it is not necessarily a fact…." We could say that we welcome each emotion with open arms – see Rumi "The Guest House". (http://www.panhala.net/Archive/The_Guest_House.html.)

We need skills to approach matters with COAL. Ruminating silently to ourselves is not a skilful means (C4): it tends to lead us in a downward spiral. On the other hand, labelling the thought / feeling[5] is very helpful (e.g. "negative thought"; "irritation is arising"). Note that facing the emotion, the problem, the situation and writing down what we feel about it, honestly and openly, has been shown to reduce negative affect and boost our immune system (Davidson 2003; Davison 1996; Pennebaker 1986).

Such skilful means, underpinned by regular meditative practices / Autogenic Training, will help us develop resilience to whatever we have to face in life.

Soothing, self-protection, and oxytocin system /

[3] When, however, we are excessively stressed or ruminating negatively, then the positive input from the PFC closes down, so the automatic and inappropriate responses occur without PFC censor: these dynamics tend to be at an unconscious level.
[4] See Hanh 1998 pp 169-173 for a mindful description of love embracing concepts of understanding, compassion, joy and equanimity.
[5] This is called 'Affect labelling' in research literature – See C7.

Soothing, self-protection, and oxytocin system

Mindfulness practices seem to activate our nurturing and caring side (CARE-system – Panksepp 1999 – and see B3); this overlaps with our "soothing and contentment system" (Gilbert 2010). Gilbert's perspective on affect (emotional) regulation embraces three systems: the threat and self-protect system; the incentive and resource-seeking system; and the soothing and contentment system.

These are summarised in Figure 4.

In terms of mother-infant / child attunement, the soothing and contentment system is crucial. That is, the mother's ability to soothe her child when he or she is distressed depends on her (the mother's) attunement to her child. In order to regulate our own emotions, we need to be attuned to our own inner states. This attunement is a function of our pre-frontal cortex.

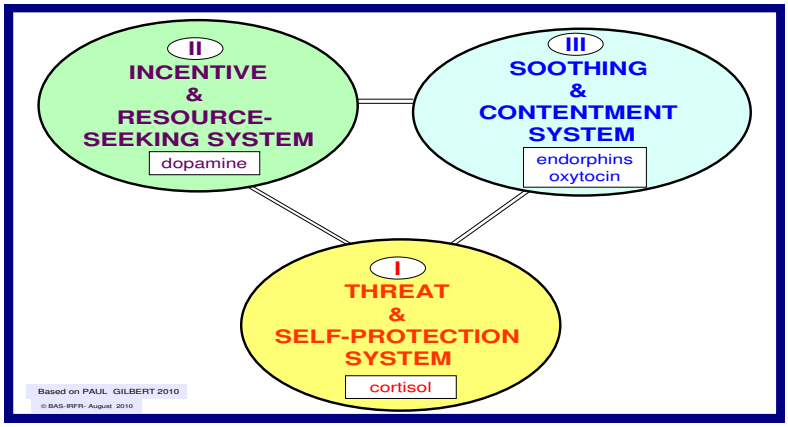


Figure 4
A model of Emotional (Affect) Regulation Systems
(based on Paul Gilbert 2009 p 24)

Note the associated informational substances with each of these systems; in particular, the endorphins and oxytocin of the soothing and contentment system.

Mindful and meditative type practices will be activating the soothing and contentment system via the pre-frontal cortex; thus, with on-going practices such as Autogenic Training, our own (self)-nurturing systems are activated. Siegel reflects on this aspect of self-nurturing in this way: "I am suggesting that we view mindfulness as a form of 'attention and care' focused on oneself" (Siegel 2007 p 215).

Such attention and care enables the middle pre-frontal cortex to develop in an optimal way, with all the benefits of its nine positive functions (C2) – for ourselves, our family, and our community. These are all facets of Mindsight which are explored further in section C.

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Linked themes in this Autogenic Dynamics section;

B1	Bears, Imagination and Well-Being
B2	Reframing, Reappraisal, and Well-Being
B3	Emotional Operating Neuro Circuits – *a brief introduction to Panksepp's model*
B5	Emotions, Frontal Lobe dynamics, and Autogenic Training
C2	Mindsight, *our seventh sense and associated pre-frontal cortex functions*
C4	The Hub of Mindsight
C7	Being in touch with our feelings – Hemispheric Integration (includes the concept of Affect Labelling)
D1	Reflections on foundations for Mindful Living