# The Complete Triangles Model

## Exploring the foundations of Neuromodulation

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# Part 1 – The Neuro-Triangles Model: Derivation

**Advances in our knowledge of the neurological processes supporting consciousness and emotion have led to a proposed new working model of the human brain. Based on the understanding of the extensive interaction of these neurological processes with endocrinology and immunology, the model becomes inclusive of a far wider dynamic of influence. As a result, multiple modalities of intervention deriving from a shared model provide a more comprehensive and effective solution to fundamental neuro-psychological problems.**

## Introduction

Ongoing research in neurophysiology has resulted in the convergence of multiple neurological and neuropsychological concepts into an integrated holistic model. By employing such modalities as fMRI spectroscopic scanning, PET and SPECT scanning as well as electroencephalography we are witnessing significant breakthroughs in the understanding of the core processes of the human brain. Although the observed neurological processes are complex, it is still possible to discern relatively simple functionality supported by defined areas and their connections. In this regard we are now able to identify the neuro-anatomy and neuro-physiology (including neuro-chemistry) of such fundamental functions as memory and recall, emotion and motivation. In this section the relevant neuro-anatomy will be described initially. Thereafter the core components of memory, emotion and motivation will be defined in the context of neuro-anatomy and associated neuro-physiology.

## Overview of the anatomical components and their functions

All neurological activity is based on the function of the neuron. Neuronal integration occurs as a result of the propagation of electro-chemical activity along neuronal processes (axons and dendrites), which then stimulate the adjacent cell or process at the *synapse*. The synapse represents a chemical bridge that connects the activated neuron or process to the next cell. The chemical released into the synaptic cleft is referred to as a *neurotransmitter*. Simplistically, the brain can be regarded as a sphere surrounding a central core of cells or nuclei from which a stem originates. This is illustrated in Figure 1.

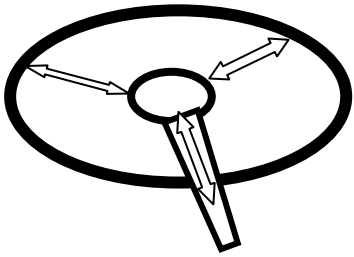

*Figure 1.* Brain topography.

The circumference comprises the cortex. This incorporates all the primary sensory areas, the areas receiving sensory information such as vision, hearing, touch and smell, as well as their related association areas. This is defined in more detail below. All the information represented in these cortical areas is integrated or connected and all project to the very front of the cortex, to the area referred to as the pre-frontal cortex. The pre-frontal cortex is the seat of such functions as concentration, motivation and working memory (Arnsten, 2009). Working memory is an abstract process in which sensory, sensory association and other integrated information is further integrated to a higher level. The processes taking place within the pre-frontal cortex are referred to as executive functions. In this way the pre-frontal cortex may be regarded as the driver of conscious action.

The entire cortex projects to the deep nuclei, specifically to the *thalamus.*This projection is a two-way connection. We are therefore able to define two projection or connection configurations: circumferentially through the cortex (termed the horizontal integration); and from the cortex to the deep structures (termed vertical integration). See Figure 2.

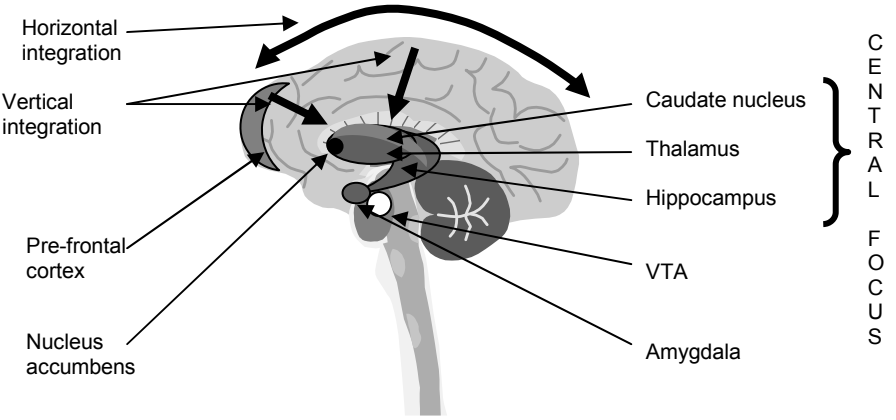


*Figure 2.* Neuro-anatomical structures and integration.

The thalamus also receives connections from the brain stem, which represent sensory fibre connections from the entire body. The thalamus in turn conveys motor connections through the brain stem to the entire body. In this respect we can regard the thalamus as being a major relay station connecting all motor and sensory fibres from the brain to the entire body (Percheron, 2003). But the thalamus is functionally more than just a relay station. It represents the central focus of cortical activity with major representation of the pre-frontal cortex (fronto-thalamic tract). We can, in fact, view the thalamus as the screen of consciousness - the place where our subjective consciousness resides. The thalamus is well connected to the *hippocampus*. The hippocampus supports important short-term memory functions, as well as contextual (spatial) memory. This connection logically promotes the memory and storage of information screened at the thalamus. Without the active input of the hippocampus, screened information at the thalamus would disappear after momentary projection, very much like RAM in a computer – the memory disappears when the computer is switched off.

The thalamus is also connected to emotional centres. The two important areas are the *amygdala*, which supports fear, anxiety, panic and anger and is also associated with emotional memory, and the *nucleus accumbens,* which is the centre supporting pleasure and gratification (Amunts et al., 2005). In fact, as will be discussed below, a significant proportion of the

emotional spectrum is derived from an interplay of these two emotional centres.

Movement co-ordination is supported by other deep nuclei termed the *basal ganglia,* which also connect to the thalamus. In this way, screened information, mainly from the pre-frontal cortex, motivates movement. The neurotransmitter for movement in the basal ganglia is dopamine. This is produced in the *ventral tegmental area* (VTA) of the brainstem and functions as a neurotransmitter in the basal ganglia. When dopamine production diminishes, Parkinson's disease may develop. This is essentially a movement disorder but often has an associated cognitive dysfunction, possibly reflecting a degeneration of connections to the thalamus and pre-frontal cortex. Dopamine originating in the VTA is also conveyed to the nucleus accumbens, where it is the mediator of pleasure and gratification. Dopamine is also the mediator in the hippocampus and in the *caudate nucleus*, another of the deep nuclei that is involved with procedural memory and learning and which has a strong connection to the pre-frontal cortex. Already, at this stage we note the integration of memory, learning, motivation and pleasure/reward through a common neurotransmitter, dopamine (Packard & Knowlton, 2002).

**Horizontal Cortical Integration**

The initial growth configuration of axonal and dendritic processes of the neuron in the embryo reflects genetic influences. With further maturation, environmental factors begin contributing to this hard-wiring phase of neuronal development with a progressively increasing influence. It has been shown, for example, that maternal hormones, notably cortisol, cross the placenta and influence neuronal development. This is discussed in more detail below.

Reviewing the hard-wired configuration at the level of the primary and secondary sensory areas, as well as at the level of association, it becomes apparent that neuronal cells and collections of neuronal cells are stereotypically, spatially arranged for function. The areas most clearly demonstrating this arrangement are the visual and auditory cortices. In effect, the sensory process at the cortical level is characterized by the fragmentation of the incoming signal into its most fundamental components. In the visual cortex, the incoming light signal is fragmented to a level at which first order receptive cells respond only to fixed points of light frequencies or darkness. Thereafter subsequent order cells higher up

in the filtering hierarchy begin synthesizing the sensed information received from the lower order cells through specific receptivity to further qualities of the sensed signal such as static and moving lines in all angles of orientation (Ganong, 1979). The information is further filtered through progressively higher order neurons which are individually responsive to more qualities of the sensed signal and in this way begin to synthesize the perceived information (Felleman & Van Essen, 1991). This process continues until it arrives at a point where the cells at the apex of this filtering and re-synthesizing hierarchy are the representation of the perceived entity. It is postulated that this apical representation is most likely situated in an association area. This sensory-association process may be summarized as follows:

1. First order cells receive the incoming sensory information in a fragmented form.
2. A hierarchy exists such that the sensed information is transferred through successive orders of cells, each being responsive to more of the features of the sensed information than the preceding order.
3. The configuration of all the cells is stereotypically arranged to carry out this required function.
4. The overall configuration of participating cells is triangular (pyramidal or conical in three dimensions) in that the base comprises the greatest numbers of cells, each specific only to very small increments of sensed information, while higher orders comprise progressively fewer cells, each specifically representative of more information. The least amount of cells would be situated at the apex of the configuration – the specific representation of the sensed entity.

This process represents the labeling of individual entities in the environment. Once a foundation of labeled entities is established, the process continues with the integration of associations of labeled entities. In this way awareness evolves into understanding that ultimately contributes to the development of pre-frontal lobe qualities.

**Creativity**

The hard-wired process described above will give rise to an adequate integration, supportive of human consciousness and independent function. This represents a common foundation, stereotypically similar for all individuals. We deduce this from the observation that neuro-anatomy and neuro-physiology are similarly spatially localized in different individuals. At

this point we would need to project further in terms of this integration process to provide a model supportive of individual creativity. In order to explain creativity, we would need to expand the hard-wiring beyond the apices of primary triangular configurations, specifically representative of entities and their associations. In effect, hard-wiring represents an integration of environmental entities and their associations. Creativity, on the other hand, reflects a future-based, abstract integration.

We can assume that many “un-labeled” neurons and processes exist within the milieu of the integration process. These neurons would provide the substrate for further integration. In the event that the apices of two or more representative triangles of configuration are triggered, neighboring neurons and their processes may be recruited and incorporated in the synaptic circuit. In effect, the recruited neurons, termed inter-neurons, would be those caught in the common penumbra of triggered apices. This is illustrated in Figure 3. This process would be more likely to occur if the triggering were repetitive and if there was an element of reward (dopamine-based). As in all neuronal circuit creation, the initial neuro-transmitter mediated connection would evolve into a structurally permanent circuit through protein synthesis and axonal/dendritic growth (Kandel, 2001). The integration of apices elevates neuronal association to a higher order. The expansion of consciousness is therefore a consequence of repeated integration of subsequent apices of representation. The process of recruitment of substrate inter-neurons and the elevation to a higher level of apical representation appears to be co-ordinated in the anterior part of the non-dominant superior temporal gyrus (Jung-Beeman et al., 2004). Activity in this region is associated with the generation of a burst of gamma EEG frequency – the ‘aha’ moment.

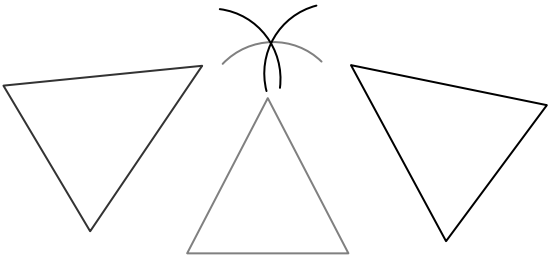

*Figure 3.* Apical integration.

**The Basis of Memory Storage**

Memory refers to the stored information that has resulted from the integration process. The function of memory recall depends on a logical and efficient storage configuration. Two broad categories of memory have been defined: Memory that can be consciously recalled is referred to as declarative memory, while memory associated with complex motor activity (procedural memory), and that related to emotion (emotional memory), cannot be recalled in terms of individual components. This latter memory function is referred to as non-declarative (Davachi & Dobbins, 2008). Declarative memory recall is initiated by the dorso-lateral regions of the left (dominant) pre-frontal cortex while non-declarative emotional memory recall is initiated by the ventro-medial pre-frontal cortex, predominating on the right side. The hippocampus is the structure associated with declarative memory, while the basal ganglia and amygdala support procedural memory and emotional memory respectively.

The key to understanding the process of memory storage is the appreciation of the interplay of genetic expression with activated, stereotyped neuronal cells. It has been shown that primordial neurons differentiate in response to genetically determined induction factors. Of significance in this regard is the finding that neuronal differentiation is dependant upon location within the developing neural tube. Following differentiation, neuronal cell processes migrate to specifically predetermined destinations under the influence of cell-derived guidance factors (Jessell & Sanes, 2000). From these observations it can be extrapolated that neuronal populations are stereotypically configured in terms of their anatomical location to represent specific functions or bytes of information. The initial stimulation of a given neuron occurs therefore as a result of the location of the neuron within an integration, which is genetically determined. The configuration of synaptic connections is also genetically determined. Consequently a given neuron and its connections, when stimulated, immediately represents a pre-programmed byte of information. The genetic transcription of prion-like proteins to establish permanent synaptic connections completes the hard-wiring process (Si et al., 2003). In this way memory storage is a product of precise, stereotyped neuro-anatomical location and the subsequent transcription-driven imprinting and labeling of the neuron when triggered with a byte of information appropriate for that specific neuron within the integration. In other words, a given neuron represents a convergence point for specific representation of information by virtue of its genetically determined,

stereotyped anatomical location and its position within a synaptic integration. In regard to creativity, it is proposed that the inter-neurons which mediate this process, harness genetic substrate and synthesize prion-like proteins appropriate for the integrated configurations.

It follows that the loss of neuronal cells and consequently the bytes of memory incorporated within them, would not necessarily diminish the information stored within the greater configuration. More integrated neurons higher up in the configuration that have been activated and imprinted with information would incorporate the information represented by lower tier cells. Evidence in favor of this postulate is the finding that the removal of the first order visual cells (decortication) in the monkey does not result in an appreciable loss of visual discrimination. Clearly, higher order levels of representation had been imprinted with lower order information (Keating & Horel, 1972).

The horizontally integrated information projects to the thalamus via the vertical cortico-thalamic integration and thereby brings to awareness the information represented by the specific neuronal component of the integration. It is postulated that every cortical apical neuronal representation is represented at the thalamic level. This anatomical arrangement achieves a more rapid and efficient screening of stored information, including newly integrated apices, at the central focus. In effect, appropriate apices of representation are retrieved via both the existing cortical (horizontal) integration, as well as by radial projection to the thalamic central focus. As indicated previously, it is the hippocampus which is required to facilitate memory and recall of information screened at the thalamus. In this context it is postulated that the hippocampus maintains connections to all radial, cortical projections. In order to facilitate its memory and recall function, the hippocampus would need to incorporate a precise spatial-contextual map of representation of the entire cortical neuronal integration. In support of this function has been the finding that taxi drivers in London, who store vast amounts of spatial information, have markedly enlarged hippocampi (Maguire et al., 2000).

**Neuro-electric Field Modulation of Development and Function**

While we accept that the DNA of each cell of the organism codes for the proteins required for the structure and function of life, this template cannot in itself co-ordinate and regulate the differentiation of the organism into its multiple components, from the time of conception through maturation. It becomes obvious therefore that some co-ordinating and regulating influence would need to become operative at the time of conception and thereafter throughout the embryogenesis process until maturation.

Based on the work of Burr (Burr, 1972) and subsequently Becker (Becker & Selden, 1985), there is strong evidence in support of the hypothesis that an electric field provides the template for tissue growth and differentiation. The initial biological electric field is derived from the fusion of the respective fields of the sperm and ovum, which themselves are each products of the parental fields. As the organism matures, the electro-chemical processes of life will further contribute to the primordial electric field template. It becomes apparent therefore that biological processes contribute to the collective electro-chemical field of the body which in turn, affects cellular growth and activity.

When applied to the central nervous system, the electric field template plays a significant role in the co-ordination of function as well as the regulation of growth and development of neurons. It is proposed that the guidance factors of neuronal growth represent *inter alia*, the fundamental neuro-electric field template. The brain has an inherent frequency which is partially measurable as the electroencephalogram (EEG). The frequency at the origin of life would by definition be a representation of the complete neuronal configuration prior to the commencement of *reactive neurological activity*. Reactive neurological activity refers to the process in which sensory structures convey electro-chemical information to the appropriate sensory areas of the brain; sensory areas are then integrated within themselves and with other sensory association areas; higher levels of understanding develop, based on the labeling and recording of associations.

Neurological activity reflects the activation of growing and connecting neuronal processes. Conversely, post-maturation diminishing neuronal activity reflects the involution and loss of neuronal processes and connections. Changes in the volume of cells and connections would result in changes of the intrinsic conductivity of the brain locally and as a whole.

This would then manifest as changes in overall neuro-electric field properties of the organ. It becomes apparent therefore that every new neuronal connection based on sensory labeling and sensory association will change the electric field properties inclusive of frequency, in some minute but discernable way. These micro-electric changes by definition denote the micro-bytes of information represented by the specific neuronal connection and thus the entity coded thereby.

It is therefore proposed that functional memory and subjective awareness do not reflect specific neural chemistry or specific circuit characteristics alone. Rather, memory and subjective awareness result from the influences of the prevailing neuro-electric field which itself is modulated by the changes in the micro-conductance of specific neuronal connections supporting the relevant associations. In this way our primordial electric field dynamic is changed by our subjective neuropsychological experiences. The field becomes our unique signature, our *carrier frequency*. Following on from the observed phenomenon of the influence of electric fields on cellular processes, it can be extrapolated that the collective neuro-electric field contributes to the co-ordination of neurological function. In other words the collective neuro-electric field is both a product of the micro-neuronal processes as well as a source of stimulation and co-ordination at the integrated neuronal level.

**Emotional Centers and Connections**

The two defined emotional centres are the amygdala and the nucleus accumbens. A significant proportion of emotional activity reflects the interplay of these regions. The amygdala supports fear, anxiety, panic and anger and plays a major role in emotional memory (Gorman et al., 2000). When stimulated, it activates its connections to the paraventricular nucleus of the hypothalamus and to the *locus ceruleus,*resulting in the secretion of cortisol and noradrenalin respectively. The secretion of noradrenalin, together with adrenalin, initiates the sympathetic response. The sympathetic response is manifested by a rapid heart rate, increased blood pressure, sweating and an increased respiratory rate. These are all the physiological changes seen in the anxiety or panic state. These changes also occur in response to hypoglycaemia, hypoxia and pain. It is postulated, therefore, that these states in the neonate trigger and integrate the hard-wired amygdala, thus establishing fear and its manifestations. The

raised cortisol levels associated with the activated amygdala have far reaching effects on immune function and general metabolism. Finally, the amygdala projects to the thalamus and thence to the pre-frontal cortex and also directly to the pre-frontal cortex thus integrating the fear or anger emotion with conscious perception.

Reciprocal connections from the pre-frontal cortex, as well as connections from the hippocampus to the amygdala, serve to modulate (stimulate or suppress) the emotions supported by the amygdala. fMRI studies have revealed that the activated right pre-frontal cortex suppresses amygdala activity. In this way it can be appreciated that if amygdala function is modulated by pre-frontal activity, the individual is in a *reflective mode*. If, on the other hand, fight or flight behavior manifests, reflecting unmodulated amygdala activation, the individual is in a *reflexive mode* (Arnsten, 2009).Recent studies have revealed a connection between the nucleus accumbens and the amygdala. Following deep brain stimulation of the nucleus accumbens, significant diminished metabolic activity was noted in the amygdala. Clinically this manifested as antianhedonia with anxiolysis (Bewernick et al., 2010).

Cortisol stimulates amygdala function (Chrousos & Gold, 1998). In this way a positive feedback phenomenon occurs in that cortisol stimulates the amygdala, which in turn increases cortisol secretion (via the paraventricular nucleus of the hypothalamus). Recent studies have shown that high levels of maternal cortisol in a stressed, pregnant woman cross the placenta and sensitize the amygdala of the developing fetus. This appears to promote an excessive fear and /or anxiety component in the new born infant in response to stressors (Van den Bergh et al., 2005). The problem may be compounded if the new born infant is exposed to nurture deprivation (Coplan et al., 1996). Raised levels of cortisol occur in the new born infant in response to stress, but diminish when adequate nurture levels are maintained. If nurture is inadequate or interrupted, levels of cortisol remain high and continue to sensitize the amygdala, thus amplifying fear and anxiety. Studies have also shown that children who were exposed to chronic deprivation such as occurred in orphanage institutionalization have raised cortisol levels in the later part of the day (Tarullo & Gunnar, 2006). A percentage of adults who were maltreated as children were shown to have decreased cortisol levels in response to stress. This finding may be explained by the observation that deprivation states in children are associated with enlarged amygdala's which subsequently atrophy in

adulthood in a significant percentage of individuals (Tottenham & Sheridan, 2010).

Chronically raised levels of cortisol have also been shown to disrupt hippocampal function (McEwen, 1998). Consequently, short term memory, contextual memory and memory recall may be impaired. If raised cortisol levels persist, hippocampal cells may degenerate and die off with resultant hippocampal atrophy. This is observed on MRI scanning. Timely intervention however has been shown to halt and even reverse the process. The converse of this finding has also been noted: Children from enriched environments have been shown to have increased hippocampal volumes (Luby et al., 2012). Finally, chronically raised cortisol levels suppress cell-mediated immunity (natural killer cell activity) which may result in a state of immunosuppression.

Nurture deprivation has more recently been shown to impede the myelination of fibres in the pre-frontal cortex (Makinodan et al., 2012). This resulted in a significant impairment of working memory. Although the mechanism for this damaging process has yet to be elucidated, the possibility exists that the mediator is raised cortisol levels. This is based on the finding that high levels of antenatal cortisol in foetal sheep results in delayed myelination (Huang et al., 2001).

The amygdala is also activated by raised levels of noradrenalin. In this way the activated amygdala both stimulates the production of noradrenalin and is itself further activated by noradrenalin. This situation is similar to the stimulation of cortisol production by an activated amygdala which itself is activated by raised levels of cortisol (Kukolja et al., 2008). As a consequence of these interactions there is a bias towards entrapment in an amygdala driven fight-flight situation until modulation occurs of either the activated amygdala or of the raised cortisol and noradrenalin levels.

The nucleus accumbens is the seat of pleasure and gratification (Zahm, 2000). The mediating neurotransmitter is dopamine. Substantial connections exist between the nucleus accumbens and the pre-frontal cortex. The mediating neurotransmitters in the nucleus accumbens-frontal connection include both dopamine and noradrenalin. The nucleus accumbens is activated when sensory pleasure, reward and achievement are experienced or anticipated. Drugs such as cocaine, amphetamines and opiods stimulate the nucleus accumbens, eliciting subjective pleasure. Physiological activity such as eating, exercise and orgasm are also

associated with raised dopamine levels. The subsequent activation of the pre-frontal connection results in a heightened focus and concentration. The caudate nucleus, a deep nuclear structure close to the thalamus and nucleus accumbens, is an important memory centre with projections to the pre-frontal cortex. It appears to be specifically involved with feedback memory. Neurotransmitter mediation in the caudate nucleus and in the projecting fibres to the pre-frontal cortex is via dopamine. Studies have shown that reward-activated nucleus accumbens activity appears to enhance memory and learning as supported by the caudate nucleus, mediated by dopamine (Olds & Milner, 1954). More recently it has been shown that a sense of curiosity enhances motivation. This is associated with activated mid-brain, nucleus accumbens and hippocampal regions as noted on fMRI studies (Gruber et al., 2014).

The complex interactions between the amygdala, the nucleus accumbens and the prefrontal cortex have been elucidated through several studies. Stimulation of the amygdala in rats resulted in suppressed activity of the dopaminergic system in the nucleus accumbens. This was mediated by suppressive glutaminergic neurons of the pre-frontal cortex (Jackson & Moghaddam, 2001). Raised cortisol levels have been shown to stimulate the outer shell of the nucleus accumbens. This resulted in a heightened motivation for reward gratification (Peciña, Schulkin, & Berridge, 2006). From these studies it becomes apparent that the nucleus accumbens and amygdala function in opposition to each other (mutually antagonistic). Thus while the activated nucleus accumbens gives rise to enhanced subjective gratification, it also suppresses amygdala activity and hence anxiety (Bewernick et al., 2010). The activated amygdala in turn suppresses the dopaminergic activity in the nucleus accumbens and hence the sense of gratification by stimulating pre-frontal inhibitory projections to the nucleus accumbens. The increased cortisol levels resulting from anxiety as supported by the amygdala, stimulate the outer shell of the nucleus accumbens, thereby heightening the motivation for reward and gratification.

**Identifiable emotional configurations and motivation**

In a partial nurture deprivation situation, the following determining factors are presumed to exist: *In utero* maternal cortisol levels are moderately raised. The new born infant has raised cortisol levels with the partial nurture deprivation maintaining the raised cortisol levels. This triggers the amygdala, which manifests a subjective sense of fear. The connection to

the sympathetic nervous system controlling area (locus ceruleus) integrates the physiological manifestation of fear (rapid pulse rate, breathing rate, sweating). The amygdala also stimulates the paraventricular nucleus of the hypothalamus, which ultimately results in a rise in the cortisol level, thus perpetuating the background fear dynamic. (The locus ceruleus has also been shown to stimulate the paraventricular nucleus.) With heightened stimulaton of the amygdala, fear may progress to anger and/or to panic. Both these states are mediated by a sympathetic nervous system raised to a higher level of function.

When the infant's nurture needs are met and gratification is experienced, the nucleus accumbens is triggered and dopamine levels rise. It is the degree of nucleus accumbens activation that drives the infant to seek further gratification of needs when they arise. The needs-fear-gratification dynamic is integrated in the pre-frontal cortex. Also integrated in the pre-frontal cortex is the motor/movement function, which supports the physical effort of approaching closer to the nurture source. Dopamine plays a major part as the primary neurotransmitter in this process, with noradrenalin being a secondary neurochemical mediator. Therefore, from the partial nurture deprivation situation arises an individual prone to fear as well as anger/panic, but highly motivated by reward and gratification of prevailing needs. Reward and gratification has generally been experienced, albeit delayed from time to time.

In a marked nurture deprivation situation, the following dynamic is recognizable: Excessive *in utero* cortisol production occurs. This sensitizes the fetal amygdala. The new born infant has significantly raised cortisol levels, probably due to the excessive amygdala stimulaton and subsequent paraventricular nucleus triggering. This manifests as heightened fear/panic, which triggers the sympathetic nervous physiology. As a result of the poor nurture response, this infant experiences unfulfilled gratification for prevailing needs (which are excessive). The chronic absence of gratification results in diminished activity of the nucleus accumbens, with decreased dopamine secretion. The integration in the pre-frontal cortex is one of futility and despair for unmet needs despite the efforts exercised in this regard. Low gratification also leads to diminished motor activity, resulting in an overall situation of poor motivation. In psychological terms, this syndrome has been described as hopeless-helpless. This refers to individuals who experience a marked absence of meaning and purpose in their lives and who feel that the situation is unchangeable, unmanageable and futile. The latter state incorporates poor self-esteem, which is a further

manifestation of the extreme nurture deprivation and the futility of experiencing gratification of needs. The chronic absence of gratification leads to anhedonia. These individuals have been shown to have lower levels serotonin and dopamine (Raison et al., 2006). Decreased levels of serotonin are associated with depression and anxiety.

In an attempt to experience some gratification, the individual who is a product of severe deprivation may turn to activities that stimulate the nucleus accumbens and dopamine production and thereby provide a degree of pleasure and gratification. This includes excessive exercising, eating and smoking, or the use of such drugs as cocaine, opiods and amphetamines. The tendency to addiction results from the need to chronically stimulate the nucleus accumbens and dopamine production. From a neuropsychological perspective, the mind state that has been shown to be associated with consistently raised dopamine levels is one characterized by purposefulness, a sense of achievement or anticipated achievement and one of autonomy. Raised levels of noradrenalin, together with dopamine within a narrow range, contribute to optimal motivation, concentration, working memory and other pre-frontal cortex executive functions (Arnsten, 2009). However, excessively raised levels of noradrenalin and dopamine disrupt pre-frontal cortex, executive function. The disruption of executive function results in a shift from reflective and insightful pre-frontal activity to the reflexive fight or flight activity of the amygdala.

The configuration of decreased serotonin and dopamine, with raised noradrenalin, is associated with the secretion of raised levels of pro-inflammatory cytokines (interleukin 1, interleukin 6 and tumor necrosing factor α) by the immune system macrophages (Raison et al., 2006). Chronically raised levels of pro-inflammatory cytokines also occur in the presence of chronic infection/inflammation. Pro-inflammatory cytokines circulate back into the brain where they affect several areas of function:

1. They induce sickness behavior – a state characterized by lethargy and poor motivation, anorexia, lack of libido and low grade fever. This situation pre-disposes to a subjective mind state of hopeless-helpless.
2. They increase the levels of cortisol by diminishing the sensitivity of the paraventricular nucleus to circulating cortisol (In the normal situation, high cortisol levels decrease paraventricular nucleus activity thus lowering cortisol levels in a negative feedback loop).

Peripherally (in the body) raised cortisol levels contribute to diminished cell mediated immunity.

3. They further diminish the levels of dopamine and serotonin levels (Miller, 2009).
4. They disrupt hippocampal functioning and thus short term memory. In time, cell loss may occur within the hippocampus with resultant hippocampal atrophy. This situation has been shown to be associated with a higher incidence of developing Alzheimer's disease in later years (Henneman, 2009; Leonard, 2007). More recent research has shown a correlation between chronically raised levels of pro-inflammatory cytokines, intra-cellular free radicals and the development of amyloid protein. Amyloid protein results in the disruption of neurological function as seen in Altzheimer's disease (Marchesi, 2011).
5. Chronically low levels of dopamine appear to predispose an individual to Parkinson's disease, a motor disease characterized by the degeneration of dopamine producing neurons. These individuals also develop poor motivation and, in certain cases, dementia. Dopamine levels have been shown to decrease with advancing age, which further aggravates the effects of chronically raised pro-inflammatory cytokines. A reciprocal relationship exists in regard to levels of dopamine and serotonin. Raising levels of serotonin activity by means of serotonin agonists has been shown to decrease levels of dopamine. This occurs selectively in the nucleus accumbens but not in the nigrostriatal system, the system supporting motor function (Di Giovanni et al., 2000). It has also been shown that increased serotonin activity following the administration of the serotonin agonist *m*-chlorophenylpiperazine leads to increased levels of cortisol (Ghaziuddin et al., 2003).

Three intrinsic physiological mechanisms exist whereby high levels of pro-inflammatory cytokines may be decreased (Johnston & Webster, 2009):

1. Raised levels of cortisol have been shown to effectively decrease high concentrations of pro-inflammatory cytokines. In effect, this represents a feedback loop in that pro-inflammatory cytokines stimulate high levels of cortisol.
2. Pro-inflammatory cytokines stimulate vagus nerve afferents, which reflexively trigger vagal efferents. Stimulated efferents have been shown to decrease high levels of pro-inflammatory cytokines.

3. The hormone oxytocin has been shown to decrease pro-inflammatory cytokines as well as cortisol levels (Szeto el al., 2008). In a neuropsychological context oxytocin secretion is associated with the experience of empathy (both expressed and received), a feeling of gratitude as well as states of belief and trust (Baumgartner et al., 2008). Empathy experienced in the nurture environment has been shown to diminish the secretion of cortisol resulting from states of deprivation (Chen et al., 2011). Oxytocin also inhibits amygdala activity and thereby functions as an anxiolytic. It has also been shown to stimulate the nucleus accumbens giving rise to a subjective feeling of gratification.

   Oxytocin levels have also been shown to increase with parasympathetic stimulation such as direct vagal stimulation, eating, sexual stimulation and nipple stimulation. Presumably, the rise in dopamine seen in response to eating, drinking and sexual stimulation is mediated through the stimulation of the parasympathetic nervous system and the subsequent increase in oxytocin levels. Sexual stimulation without mutual empathy, gratitude and trust would thus stimulate dopamine production alone, while the addition of these emotional states would be associated with oxytocin mediation. Increased oxytocin levels also result from somatic sensory stimulation (Stock & Uvnäs-Moberg, 1988).

Persistently raised levels of pro-inflammatory cytokines resulting from the neuro-chemical configuration described previously render these feedback mechanisms relatively ineffectual. However, direct vagal nerve stimulation with a paced electrode has been shown to be effective in decreasing raised levels of pro-inflammatory cytokines.

Memory, learning, storage and retrieval are influenced by emotional states and their associated levels of motivation. Lesser degrees of deprivation with adequate reward and gratification are characterized by higher levels of motivation. Even if there is a delay in a nurture response to early needs, the fact that an adequate response or reward is eventually forthcoming will justify future efforts directed at eliciting and expecting a response. Conversely higher degrees of deprivation with an inadequate response to needs are associated with lower levels of motivation because of the perceived futility of being rewarded with an adequate response. In the context of the triangular configuration of cortical integration these

relationships can be represented graphically. If the vertical Y-axis represents gratification-driven motivation and the X-axis represents all aspects of labeled sensory information and associated integration, then the process of triangular integration can be depicted by a triangular configuration curve. This follows on from the fact that the higher one ascends in the hierarchy of specific representation in the cortical integration, the more specificity of representation occurs and the fewer the cell numbers. The resulting triangular graph is termed an energy-integration curve. This is illustrated in Figure 4. Three variations of this curve may be identified:

**Type 1: Lesser deprivation, adequate gratification – the Bravo archetype**. This configuration has a high motivation or energy input centred upon a narrow integration base of 'own needs'. In this situation there was a delay in response to nurture needs but ultimately this was forthcoming. A period of anxiety thus evolved during the delay period which focused attention primarily on the need to appease 'own needs' at the expense of a wider integration. This archetype therefore has a pre-occupation with 'own needs' being fulfilled, a fear that these may not be fulfilled, but an awareness that a response will invariably be forthcoming after the period of striving and fear/anxiety. There is a tendency to excessive levels of noradrenalin with an activated amygdala. The high levels of noradrenalin may shift pre-frontal activity towards inefficiency.

**Type 2: Significant deprivation, minimal gratification – the Charlie archetype**. This configuration is again centred upon a narrow base of 'own needs' but due to the poor nurture response, low levels of gratification occur. This gives rise to a perceived futility relating to any effort exerted in the attempt to obtain a meaningful response to nurture needs. Consequently the motivation level is low on the Y-axis. In this situation excessive fear has resulted in a markedly activated amygdala with resultant raised cortisol and noradrenalin. Dopamine and serotonin levels are usually low while pro-inflammatory cytokines are raised.

**Type 3: Minimal deprivation, high levels of gratification – the Alpha archetype**. Here 'own needs' were never an issue and therefore integration is based upon a far more extensive integration. Motivation is driven more by the gratification of ongoing broad-based integration than by the gratification of 'own needs'. In this configuration serotonin and dopamine levels are more than adequate while levels of noradrenalin tend to be low. Personal gratification is the hallmark of this profile. This archetype generally has lower levels of noradrenalin which may impact negatively on motivation.

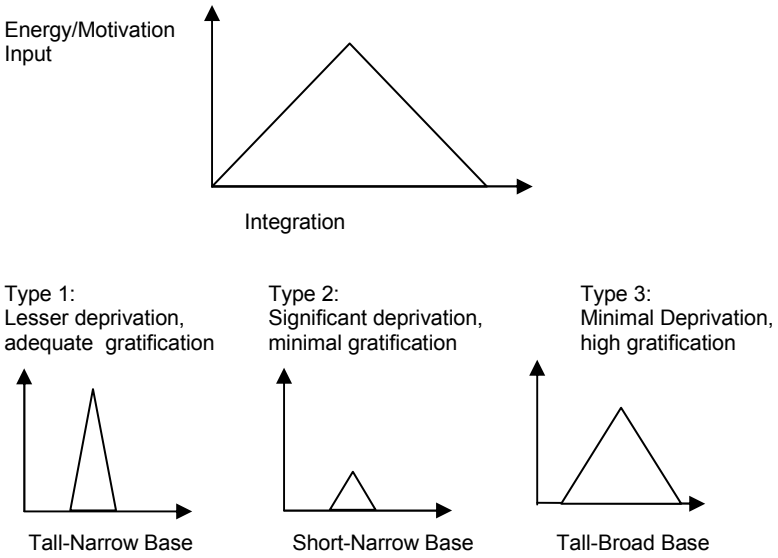


*Figure 4.*Energy–Integration configurations.

These three curves/archetypes form the basis of the Neuro-Triangles Model which was developed by the author as a way of accessing the chemistry of wellness and performance. The application is fully quantifiable by means of an online diagnostic program (Weinberg, 2009).

**Discussion**

The proposed model of the human brain that emerges from a review of ongoing studies is one that integrates multiple disciplines of intervention. As our understanding of neurological processes expands, it becomes evident that neuro-anatomy and neuro-physiology (incorporating neuro-chemistry) are supportive of and in fact unify the full spectrum of neuro-psychology and neuro-endocrinology. The multiple disciplines that have contributed to the development of this model also derive from it. Specific modalities of intervention obviously reflect unique interest areas. However, understanding and accepting this new holistic neurological model will lead to greater levels of collaboration between the disciplines, which would ultimately enhance the quality of intervention.

Memory, emotion, immunity and general body metabolism are intimately connected at the level of fundamental neurophysiology. Consequently, our thoughts and feelings impact upon our bodies, the internal environment, as well as upon the external environments in which we find ourselves. But with this action comes a reaction. All processes generate feedback loops that positively or negatively impact upon the neurophysiology at source. In this regard, we note that lowered levels of dopamine and serotonin are associated with raised levels of pro-inflammatory cytokines, which in turn circulate through the brain and further lower the levels of dopamine and serotonin. This situation negatively impacts memory, predisposes individuals to sickness behavior, anxiety and depression and leads to raised levels of cortisol (Raison et al., 2006). Raised levels of cortisol sensitize the amygdala, which sustains both anxiety as well as raised cortisol.

The fundamental human drive is motivated by gratification and pleasure. When this is experienced, our levels of function in terms of mentation, general metabolism and immunity are greatly enhanced. The greatest impediment to achieving lasting gratification, however, rests with inherited deprivation influences. The challenge therefore is to engage this heritage and to neutralize its negative influences by embracing a multi-modality approach. In the context of intervention it should be remembered that while negative physiological processes conspire against us, positive processes, once engaged, promote and perpetuate enhancement at multiple levels.

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# Part 2 – The Neuro-Triangles Model: Application

**Research in the area of mind-body influences has revealed the significant effects that thoughts and feelings have upon body function by altering body chemistry. Equally dramatic has been the findings that these induced changes in body chemistry in turn affect our thoughts and feelings. No longer can we neatly remove the phenomenon of consciousness or the psyche, from the dynamic of body structure and function. For the inescapable truth is that our thoughts and emotions are intimately connected to our body structure and function by heavy two-way traffic. In this section a working model is described which we currently use to define the relevant variables of this dynamic and which also forms the basis for accurate diagnostic evaluations and intervention.**

## Introduction

Identifiable mind states are associated with the secretion of neuro-transmitters and neuropeptides which then circulate in the blood stream and impact upon body metabolism (Kiecolt-Glaser, 2003) . In this way, mind states influence wellness and performance in a profound way (Freund, 2006). The study of this mind-body chemical connection was originally referred to as psychoneuro-immunology (PNI). However it became apparent that mind-body influences extended beyond the immune system alone, impacting upon the hormones of the endocrine system and upon metabolism itself. It is therefore more precise to refer to these influences as psychoneuro-endocrinology (PNE). The challenge is to be able to access the core processes of consciousness and thereby move the individual into a resourceful neuro-chemical configuration. The context of this dynamic is summarized by the illustration in figure 1.

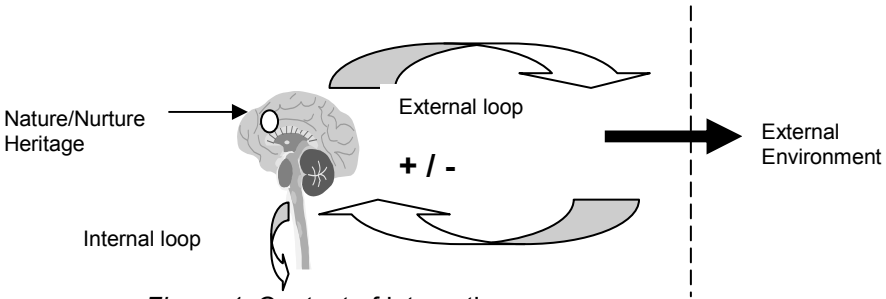



*Figure 1.* Context of interaction.

Our nature-nurture heritage gives rise to our world-view or subjective reality. This heritage refers to our genetics as well as the influences of the early formative years. However, as we have described in the previous section, nurture influences also occur while we are *in utero*, within the womb. If this heritage is comprehensive and free of deprivation, then when we interact with the external environment we see things as they really are and consequently make accurate decisions. This leads to success and we thus return with a positive *feeling*. Conversely, if the nature-nurture heritage is a product of deprivation, we will not see things as they really are and thus experience failure. We return with a negative feeling. These feelings or emotions, products of the *external loop*, drive our PNI chemistry from the emotional centres of the brain via the *internal loop*. The emotional centres and their dynamics have been extensively described in the previous section. Consequently, the emotional dynamic determines ultimately our levels of wellness and performance.

In regard to the emotions, we are now able to discern the traits of the two polar opposites representing positive and negative chemical configurations respectively. This is illustrated in figure 2.

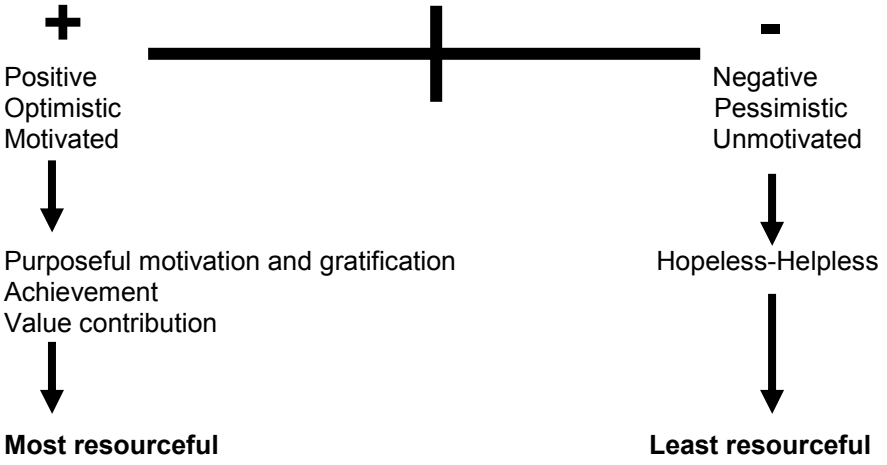



*Figure 2.* Emotional states.

The most positive emotional configuration is reflected by a positive, optimistic and motivated individual whose application incorporates the following **core elements**:

1. Meaning and purpose
2. Self-esteem and self-efficacy
3. Personal gratification
    - Sensory gratification
    - Task engagement gratification
    - Task mastery gratification
    - Reward gratification
4. Achievement
    - Anticipated achievement
    - Achievement experienced, greater than anticipated
5. Value contribution
    - To self
    - To personal environment
    - To the extended environment

This gives rise to the most resourceful chemical milieu in regard to enhanced wellness, performance and leadership. Conversely the individual manifesting the traits of negativity, pessimism and low motivation is prone to devolve into a mind state of hopeless-helpless. The 'hopeless' component refers to a subjective perception of meaninglessness in life while the 'helpless' component reflects a subjective belief that they are powerless to change their life situation. This emotional state is in effect an entrapment situation and gives rise to the most negative of chemical configurations impacting directly upon levels of wellness, performance and leadership (Everson et al., 1996).

**Neuroplasticity**

The chemistry associated with the resource state of enhanced wellness, performance and leadership, mediates the neurophysiological process referred to as *neuroplasticity*. The process of neuroplasticity refers to the ongoing re-modeling of the brain in response to changing environmental circumstances. Neuroplasticity incorporates the neurophysiology of learning and as such it supports change technology at the

neuropsychological level. The process of neuroplasticity has been observed in the recovery of impaired neurological function following strokes and head injuries (Cramer & Nudo, 2010). It follows therefore that a heightened state of neuroplasticity resulting from the promotion of the core elements as summarized above, leads to the enhancement of wellness, performance and leadership.

**The Chemistry of Wellness, Performance and Leadership**

The chemistry underpinning wellness, performance and leadership is illustrated in figure 3. Much of these processes were dealt with in the first section. In this section, the more comprehensive body or somatic influences are emphasized as opposed to the pure neurochemistry. Once again the widespread influences upon body function, including the brain, become apparent.

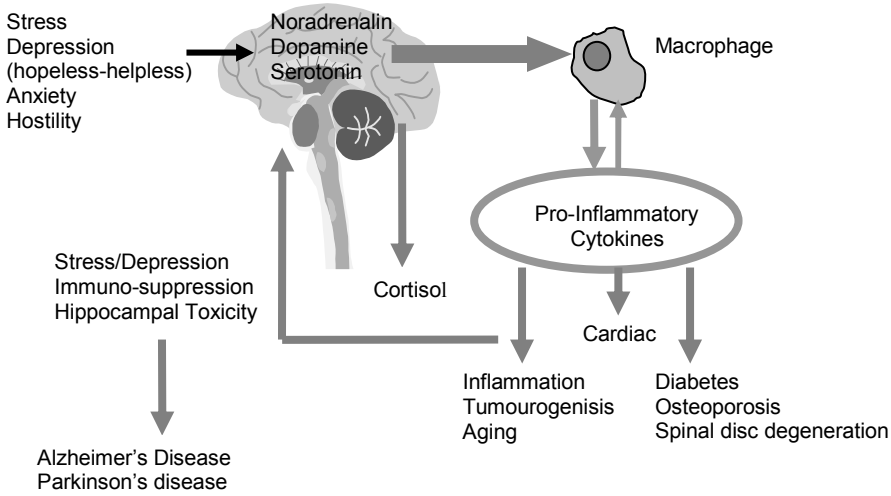



*Figure 3.* The chemistry of wellness and performance.

At the heart of the chemical process is the interaction of brain chemistry, the neurotransmitters, with the modulating messenger chemistry in the body, the neuropeptides (Miller et al., 2006). The important neurotransmitters are serotonin, dopamine and noradrenalin while the important group of neuropeptides have been identified as the pro-

inflammatory cytokines (Interleukin 1, Interleukin 6 and Tumour Necrosing Factor α). Experiencing stress, anxiety, states of hopeless-helpless and hostility is associated with a change in the relative concentrations of the neurotransmitters. The configuration that arises is one in which levels of serotonin and dopamine are diminished while levels of noradrenalin (and adrenalin) are raised. The configuration of decreased levels of serotonin and dopamine with raised levels of noradrenalin is associated with the increased secretion of pro-inflammatory cytokines by the macrophage cells of the immune system. Raised levels of noradrenalin and generalized sympathetic activity have been shown to directly stimulate pro-inflammatory cytokine production. Conversely, parasympathetic stimulation decreases pro-inflammatory cytokine production.

The pro-inflammatory cytokines have a widespread negative effect on multiple target areas. Included in the identifiable effects of the pro-inflammatory cytokines are the following:

1. Precipitate or enhance inflammatory activity in any target area
2. Contribute to athero-sclerosis, most notably in the coronary and cerebral arteries. This may give rise to heart attacks and/strokes (Appels et al., 2000)
3. Suppress cardiac muscle contractility
4. Contribute to the development of osteoporosis and Type 2 diabetes
5. Suppress enzymes that correct abnormal DNA splicing – gives rise to tumour formation (myeloma, breast cancer) (Kiecolt-Glaser et al., 2002; Peng et al., 2005)
6. Feedback on the brain and result in the following effects:
    - Disruption of hippocampal function – results in impairment of short term memory
    - Disruption of neuro-transmitter production (diminished serotonin and dopamine levels) resulting in *sickness behaviour*
    - The latter may go on to evolve into depression in susceptible individuals (enhancement of negative mind-states)
    - Stimulation of the release of CRF which increases cortisol production. This will contribute to immuno-suppression, Type 2 diabetes and osteoporosis. Raised cortisol levels also affect the hippocampus resulting in loss of cells and atrophy. The latter effect, hippocampal atrophy, has been

shown to be reversible if appropriate intervention is initiated before threshold loss of tissue.

- Chronically raised levels of pro-inflammatory cytokines are associated with loss of neuronal cells in the basal ganglia, giving rise to possible Parkinson's disease. In addition there may also be cell loss in the pre-frontal cortex and temporal lobe. This cell loss together with hippocampal atrophy may evolve into Alzheimer's disease. Research has shown that Alzheimer's sufferers have raised levels of pro-inflammatory cytokines which is often preceded by hippocampal atrophy and atrophy of the pre-frontal and temporal lobes (Leonard, 2007).

Two other situations have been shown to increase pro-inflammatory cytokine production and thereby give rise to a similar chemical cycle. The first of these is sleep deprivation. Diminishing the duration and/or quality of sleep results in a decrease in melatonin production. Melatonin normally suppresses pro-inflammatory cytokine levels. Therefore the decrease in melatonin results in raised levels of pro-inflammatory cytokine levels. The second situation is one of chronic pain. Pain nerve endings secrete peptides such as Substance P. These peptides stimulate the macrophages of the immune system to secrete pro-inflammatory cytokines thus initiating the chemical cycle as described previously.

It becomes clear that this underpinning chemistry maintains a profound influence on the mind-body connection in terms of wellness performance and leadership. Creating a means of accessing this chemistry and thereby the functions supported by the dynamic becomes pivotal if one were to bring about meaningful and sustained positive change. The Triangles Model was developed specifically to this end. The derivation, as discussed in the previous section, was based on neuropsychological configurations incorporating associative memory and emotional processes.

**The Neuro-Triangles Model**

The Neuro-Triangles Model forms the foundation for accessing the comprehensive mind-body chemistry as well as associated, defined mind states (Weinberg, 2007). It is fully quantifiable by an online diagnostic which measures stress profiles, PNE resilience in terms of wellness and performance as well as cardiac risk. Due to the comprehensive quantification, the effectiveness of intervention may be evaluated on an ongoing basis. Central to the *Neuro-Triangles Model* is the *energy-integration* curve depicted by a triangle (refer to the end of the previous section for the derivation of the triangular configuration). This is illustrated in figure 4.

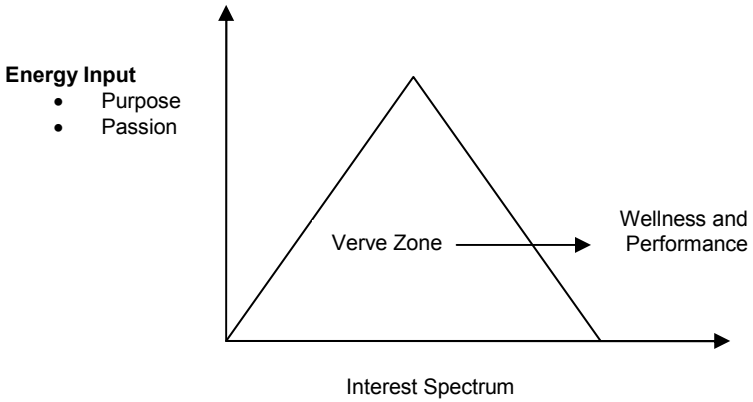



*Figure 4.* Energy – integration curve.

The Y-axis or height of the triangle represents passionate, purposeful energy input while the X-axis represents the spectrum of the environment perceived as meaningful and which has been integrated into the subjective world-view. The volume within the triangle has been shown statistically to represent positive chemical resilience as manifest in wellness and performance. Three archetypes of behaviour are described which reflect differing nature-nurture dynamics reflected in variations of the basic energy-integration curve. The neuropsychological derivation of the archetypes was comprehensively described in the previous section.

The first of the archetypes is referred to as the Bravo Archetype. This is illustrated in figure 5.

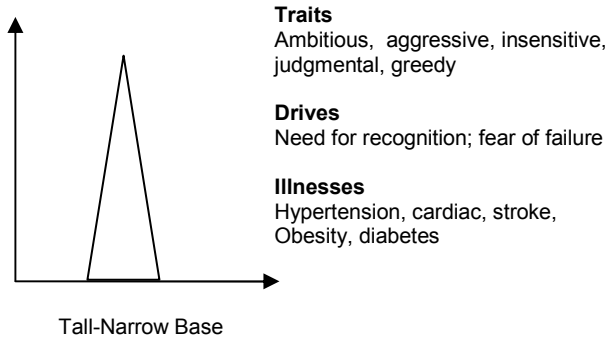



*Figure 5.* Verve Archetype 1- Bravo.

This archetype reflects a nurture dynamic in which a response to needs was delayed. A fear that the response would not be forthcoming resulted in the infant narrowing down the interest area to “own needs”. Ultimately the needs (mainly feed) were appeased and the efforts in this regard were thus justified. The archetype is represented by a tall and narrow-based triangle. The spectrum of the environment that is integrated in the base represents only “my needs”. This is therefore an archetype obsessed only with own needs and driven ambitiously to achieve these needs. The first drive is essentially one of fear – fear of failing to achieve the objectives. The second drive is one characterized by the need for recognition and adoration. The excessive drives give rise to the very tall triangle. This archetype has integrated only “own needs” into the baseline. Therefore everything which lies outside of the triangle of interest (subjective world-view) is judged to be unimportant and of inferior value. These unintegrated components are either deleted or if persistent, are distorted to fit into the subjective world view. This archetype is thus insensitive to all that lies outside of the triangular configuration. The volume of the triangle is statistically adequate to drive PNI resilience in terms of wellness and performance.

As regards chemistry the Bravo archetype is associated with higher levels of noradrenalin and adrenalin with only moderate levels of pro-inflammatory cytokines and cortisol. This archetype is associated with pathologies reflecting the higher levels of adrenalin and noradrenalin such as hypertension. Excessive noradrenalin also compromises pre-frontal cortex, executive function (Arnsten et al., 2009). Levels of serotonin and dopamine are adequate.

The next archetype is termed the Charlie Archetype. The Charlie traits are illustrated in figure 6.

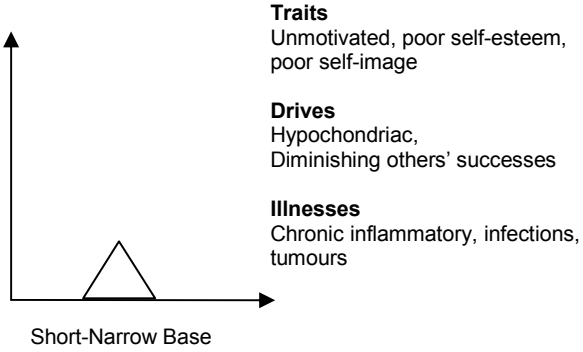



*Figure 6.* Verve Archetype 2 – Charlie.

This archetype is represented by a small triangle, both in terms of height and base. Once again the narrow spectrum of integration represents "own needs". The difference between the Bravo and Charlie archetypes in terms of the height of the respective triangles is that while the Bravo archetype has experienced success, the Charlie archetype has only experienced very limited success and gratification. Therefore the Charlie Archetype emerges from a heritage of futility. This futility results from continued failure to experience success and gratification in the nurture environment for "own needs" despite the repeated attempts in this regard. A point is reached where subjectively the Charlie Archetype believes that no amount of

energy input will result in any meaningful result. This mind state is termed hopeless-helpless and is associated with self-destructive chemistry. Other traits include low self-esteem, low self-efficacy, a belief that they are not deserving of success and a belief that they are born to serve the needs of others. As a consequence of this dynamic, the energy input diminishes as manifest by the low triangle height. Statistically there is insufficient PNI resilience to positively drive wellness and performance.

There are three noticeable drives inherent in the Charlie Archetype, one positive and two negative ones. The positive one is the abundance of talents seen in this Archetype. This possibly reflects the original need to seek other forms of gratification in the context of the nurture deprivation environment. The negative drives include hypochondriasis and the need to diminish the successes of others. The former reflects the need to be noticed and acknowledged while the latter results from a situation wherein the Charlie Archetype, having never really experienced success and gratification, finds it difficult to share an environment with successful individuals. The Charlie Archetype may therefore resort to acts of vengeance and hostility, thus negatively affecting the successes of others. The Charlie Archetype is prone to suffering the ailments of inadequate PNI resilience such as recurrent infections and tumours.

In terms of the chemical configuration, the Charlie archetype is associated with higher levels of pro-inflammatory cytokines which appear to correlate with the hopeless-helpless mind state. High levels of the pro-inflammatory cytokine Il-6 have been observed in the chronic care-giver situation and appear to suppress the DNA splicing correction enzyme which may then evolve into malignant lesions. Cortisol levels are generally raised but may be paradoxically low if the individual experienced chronic infantile deprivation. This is possibly explained on the basis of amygdala atrophy. Levels of dopamine and serotonin are chronically low. Paradoxically, the vengeful/hostile Charlie may derive raised dopamine levels (gratification) from vengeful/hostile actions.

The final archetype is the Alpha Archetype. This is the “gold standard” and is illustrated in figure 7.

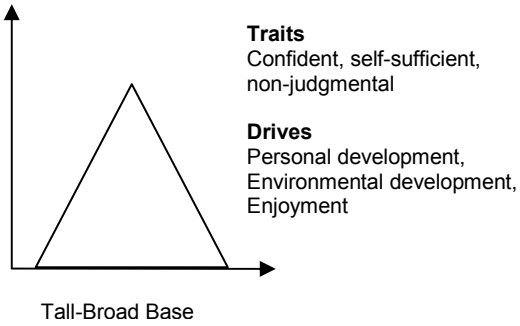



*Figure 7.* Verve Archetype 3 – Alpha.

In this Archetype we find adequate triangular height signifying a healthy purposeful energy input together with a very broad base reflecting an environmental integration well beyond "own needs". In this archetype, "own needs" were never an issue. As a result the volume of the Alpha archetype reflects a significant surplus of PNI resilience in terms of wellness and performance. The broad environmental appreciation precludes the development of insensitivity and / or judgementalism which is found in the Bravo type. The Alpha type is driven by the need for personal development and fulfillment as well as enjoyment. There is very little fear of failure in this confident and self-assured individual. Illness occurs very rarely.

The chemical configuration of the Alpha Archetype is associated with high levels of serotonin, dopamine and oxytocin, with lower levels of noradrenalin. This reflects high levels of personal gratification (triggering the nucleus accumbens) and low levels of anxiety. Markedly low levels of noradrenalin however may become counter-productive in that the configuration gives rise to complacency (low motivation).

The three Archetypes are summarized in figure 8 in terms of the positive, negative, nurture and chemical characteristics. It becomes apparent that each Archetype has both positive and negative traits. Therefore on the positive side the Bravo archetype is motivated and efficient while on the negative side Bravo is self-interest orientated, judgemental and prone to the negative consequences of high noradrenalin and adrenalin levels. This manifests as hypertension and its complications as well as diminished pre-frontal cortex efficiency.

The Charlie Archetype on the positive side is usually sensitive and often has a talent. They will often to the menial work that others choose not to do. On the negative side they may manifest the traits of hypochondiasis, hostility or vengefulness. In terms of chemistry, pro-inflammatory cytokines are usually raised while dopamine and serotonin levels are diminished. There is a tendency to raised levels of noradrenalin.

The Alpha Archetype is generally the big picture thinker and mentor. On the negative side however there may be diminished motivation to engage due to lower levels of noradrenalin.

| **Archetype** | **Nurture** | **Chemistry** | **Positives** | **Negatives** |
|---|---|---|---|---|
| Bravo | Moderate deprivation<br>Adequate gratification | Adequate dopamine, serotonin and high noradrenalin | Motivated<br>Efficient<br>Dependable | Self-orientated<br>Judgemental<br>Fear-based |
| Charlie | High deprivation<br>Low gratification | High pro-inflammatory cytokines.<br>Low dopamine, serotonin | Sensitive<br>Has talents<br>Does menial work | Hypochondriasis<br>Hostility<br>Vengeance |
| Alpha | High gratification<br>Low deprivation | High dopamine, serotonin, oxytocin<br>Lower noradrenalin<br>Low pro-inflammatory cytokines | Big picture<br>Mentor<br>Non-judgemental | May have low motivation and diminished engagement |

*Figure 8.* Summary of the three Archetypes

Each Archetype manifests characteristic language traits. The language of the Bravo Archetype reflects aggression, self-interest and judgementalism. The Charlie Archetype language reflects the despair of hopeless-helpless, and a tendency or need to disengage. The language of the Alpha Archetype is one of dialogue. Dialogue reflects a non-judgemental and empathic communication.

Based on nurture dynamics, each of the Archetypes tends to live in a different time period. The Bravo Archetype is driven by the fear of not gaining or achieving to appease 'own needs'. All efforts are therefore directed to some future destination. The Bravo Archetype therefore lives predominantly in the future. The Charlie Archetype is pre-occupied with nurture-based deficiencies of recognition of 'own needs'. The diminished gratification, self-esteem and lost opportunities anchors the Charlie Archetype to the past. It is only the fully gratified Alpha Archetype whose needs in the present were appeased, that is free to live mindfully in the present without the Bravo distractions of the future and the Charlie pre-occupation with the losses of the past.

Following on from the work of Arnsten, it becomes apparent that executive functions of the pre-frontal cortex differ in each of the Archetypes based on the levels of dopamine and noradrenalin (Arnsten et al., 2009). The executive functions of the pre-frontal cortex include motivation, working memory (abstract memory), concentration and suppressing extraneous emotional distractions, appreciating consequences of actions and self-correcting processes.

If these functions are plotted against levels of dopamine and noradrenalin, it is possible to discern the characteristics in terms of pre-frontal performance of each of the Archetypes. This is illustrated in figure 9.

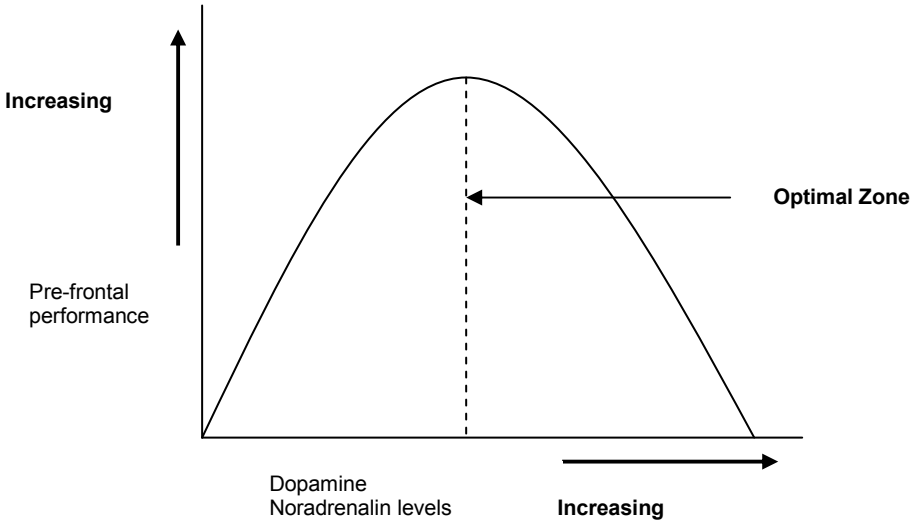



*Figure 9.* Modulation of pre-frontal performance (*Arnsten*)

The optimal zone reflects adequate but not excessive amounts of dopamine and noradrenalin. Beyond the optimal zone, increasing amounts of noradrenalin result in diminishing levels of pre-frontal executive functions as occurs in the Bravo Archetype. Increasing amounts of dopamine beyond the optimal zone result in diminishing levels of pre-frontal performance with increasing levels of paranoia and eventual psychosis. Diminishing levels of noradrenalin tending to the zero level on the left is associated with less motivation and engagement as seen in some Alpha Archetypes. Diminishing levels of dopamine to the left of the optimal zone and tending to the zero point are associated with increasing levels of hopeless-helpless as seen in the Charlie Archetype. This may be compounded by excessive fear and associated high levels of noradrenalin that may be encountered in the panic-stricken Charlie Archetype, serving only to further disrupt pre-frontal performance.

Studies indicate that the linear, strategic drive of the Bravo Archetype appears to be associated with increased activity in the left pre-frontal cortex. When activity decreases in the left pre-frontal cortex, activity in the right pre-frontal cortex becomes more prominent. Diminished left pre-

frontal cortex activity with increased activity in the right pre-frontal cortex is associated with a hopeless-helpless mind state (Grimm et al., 2008).

**Applications in the Extended Environment**

We spend most of our lives in one or more of three areas of interest. These are:

- Work or application
- Personal or inter-personal
- Recreation

As a result of the requirements of daily life we will prioritize these areas of interest accordingly. Furthermore, because each of these interest areas occupy a different segment of the environment our triangular configuration will separate into three independent, identifiable areas. The separation of these interest areas is termed un-integration. As a result of the different priorities given to these areas and the subsequent energy input, the triangles of interest representing these interest areas may range from Charlie to Alpha in their configurations. When functioning within a specific interest area, we take on all the traits of that specific configuration. We also become unaware of the other triangles of interest. This concept is illustrated in figure 10.

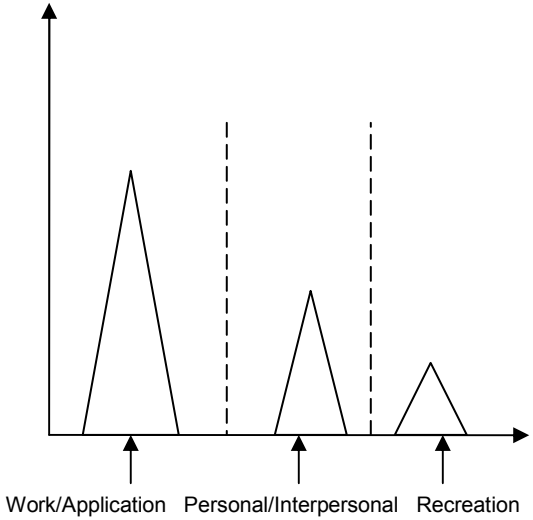



*Figure 10.* Interest areas.

The above illustration depicts three un-integrated areas of interest where work/application is a Bravo Archetype while personal/interpersonal and recreation triangles reflect Charlie Archetypes. The un-integrated configuration refers to free standing triangles which have no connection to each other. When one is functioning within an un-integrated triangle, there is no awareness of a reality reflected in some other un-integrated triangle. In this situation most of the chemical resilience in terms of wellness and performance is derived from the Bravo work triangle. Should circumstances such as retrenchment or retirement result in loss of the work triangle, the individual will default into the remaining un-integrated Charlie triangles and experience the traits of hopeless-helpless. This will further diminish the available chemical resilience manifesting in compromised wellness and performance.

The loss of the Bravo triangle may also be subjective in that the apparent activity and interaction still exists but passionate and purposeful energy within the Bravo triangle has diminished. Outwardly the individual still appears to be interacting normally. However the loss of purposeful energy has resulted in the individual imploding into a functional Charlie Archetype within that specific sphere of interest. We refer to this as a *pseudoverve* phenomenon. Within a Charlie pseudoverve, the individual will once again experience all the subjective traits of the Charlie Archetype as well as a significant loss of chemical resilience. See figure 11.

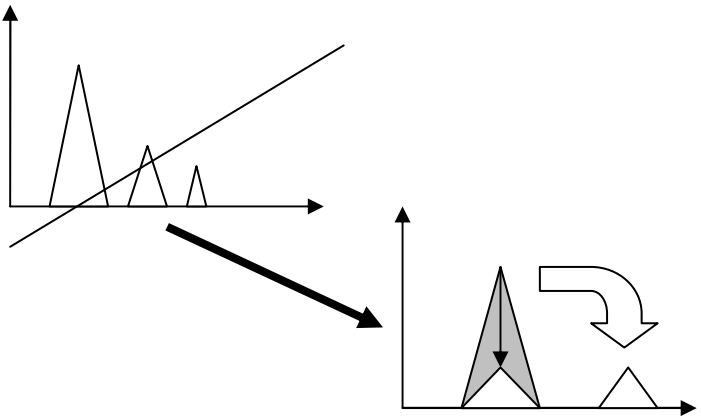


*Figure 11.* Pseudoverve.

The solution to diminishing the risks of un-integration leading to defaulting into a low resource state is to move towards a situation of integration. To illustrate the process required to attain integration let us refer to the triangles as folders and the information contained in the folders let us refer to as files. It follows then that in the context of un-integrated triangles, if there is a similar file representing a particular entity in two different un-integrated triangles or folders, one will have a fragmented perception of that entity depending upon which folder one occupies at a given point in time.

As an example consider the case of a woman who may have experienced sexual abuse as a child. In this case the file representing “male” in the personal triangle or folder will have an extremely negative connotation. However she may be working with very reasonable males and therefore the file *men* within the folder representing work/application would have a reasonable connotation. The particular perception of the entity or file would therefore depend on which folder or triangle she finds herself in. It follows that by having an un-integrated configuration, we will never be able to perceive an entity as it really is, due to the fragmentation of reality as reflected in the fragmented triangles of interest. The solution provided by the Triangles Model is to fuse or cross-wire a particular file which is common to different folders/triangles of interest. This is illustrated in figure 12. This will result in a true overlap of different spheres of interest, which have been brought together by cross-wiring or connecting the same file in the different folders or triangles of interest.

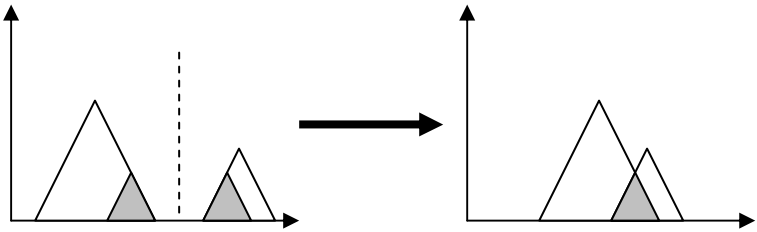


*Figure 12*. Common file overlap.

This process of overlapping brings us to the ideal configuration, being ultimately the overlapping of Alpha triangles reflecting each of the areas of interest. This is illustrated in figure 13.

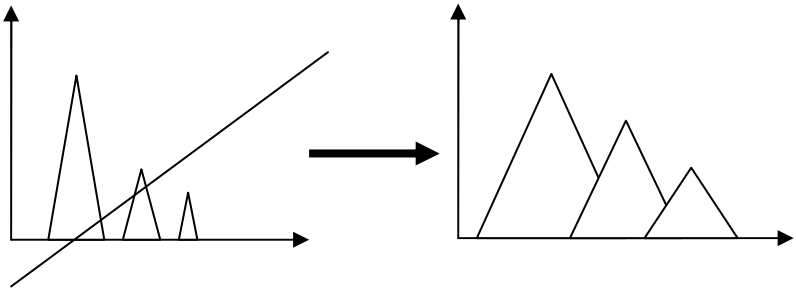


*Figure 13.* Optimal Alpha overlapping.

The overlapping of Alpha triangles is the optimal configuration in terms of chemical resilience. It is the consequence of expanding the base of integration of each triangle of interest such that an overlap occurs. In this way awareness is maintained of other areas of interest even while prioritizing the environment in which we find ourselves at a given time. For example while functioning in the work environment, awareness is maintained of personal as well as recreational needs. This translates into a sensitivity to the full environment irrespective of the priority area in which we are interacting at a specific time. Functionally this translates into a situation of balance. Furthermore, should a specific triangle of interest pseudo-verve, there will still be adequate purposeful energy to drive the re-creation of a new triangle of interest.

The overlapped Alpha configuration is one in which the full continuum of the environment is appreciated. This configuration can be defined on the basis of layering of traits from the bottom, up. The foundation is characterized by empathy and sensitivity for all entities, including oneself, within the extended environment. Derived from this level is the drive towards value contribution – to make things better than they were before engaging with them. The value contribution applies firstly to oneself and thereafter to one's personal environment and then to the environment at large. Value contribution is further sustained by the acknowledgement of value contribution by others. Added to these components is the concept of gratitude. This equates to empathy received which physiologically, results in the same chemistry as empathy given – primarily the secretion of

oxytocin. As indicated in the first section, oxytocin suppresses amygdala activity, increases dopamine and decreases levels of pro-inflammatory cytokines and cortisol. Finally if one removes the fear element of future possibilities as occurs with abundance in the Bravo Archetype and one removes the regret and sense of loss associated with the past as occurs in the Charlie Archetype, a point is reached of mindfulness in the present with maximal insight.

By its very nature, this configuration has risen above the limiting beliefs of the deprivation Archetypes of Bravo and Charlie. As a consequence, this configuration can be regarded as truly authentic. From this place of authenticity derives a life path which incorporates our true essence.

**Hollow integration**

Generally, the process of integration results from a bottom-up synthesis of labeled entities and their associations. As happens in life, we may incorporate the superficial characteristics of entities into our world view without their complexities and the representative circuitry. For example, we integrate all the characteristics of a car without engaging and integrating the intricacies of its mechanics. The unintegrated segment of our configuration is termed a hollow integration. See figure 14.

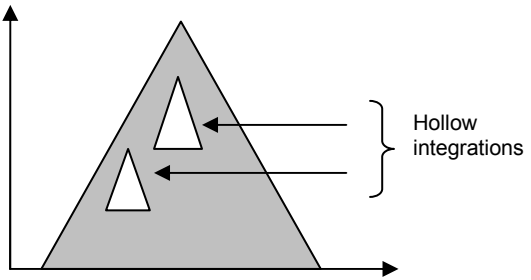



*Figure 14.* Hollow integrations

It is still feasible that an individual with an Alpha configuration remains a functional Alpha even with multiple hollow integrations. The deciding factor whether an individual with an Alpha configuration and hollow integrations is a functioning Alpha is their attitude towards their hollow integrations. An Alpha attitude will acknowledge the shortcomings of their hollow integrations while a Bravo will conceal or fabricate the absent information represented by the hollow integration.

**Inter-personal Dynamics**

At this point we are in a position to review the dynamics that occur when different archetypes interact with each other. The first example reflects the interaction of the Alpha with Bravo and Charlie Archetypes. The fundamental characteristic of the Alpha configuration is that its broad base and adequate height incorporates the Bravo and Charlie triangles well within its subjective world view. In this way, all aspects of the subjectivity of Bravo and Charlie are integrated within Alpha thereby maximizing sensitivity and minimizing judgmentalism (from the Alpha perspective). This is illustrated in figure 15.

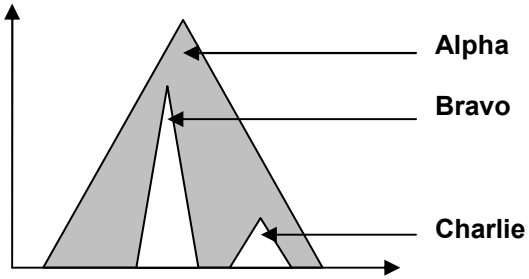



*Figure 15.* Relative integrations.

Consider the next example in which a Bravo Archetype interacts with a second Bravo. This is illustrated in figure 16.

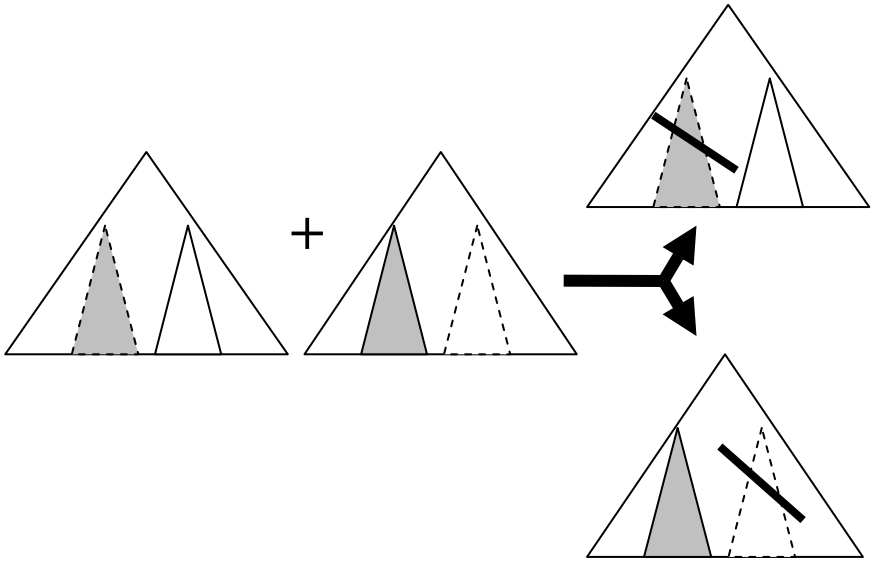


*Figure 16*. Bravo-Bravo Clash: Mechanism.

In this situation each Bravo occupies a different segment of the prevailing environmental spectrum. As a result, each will take a judgmental stand against the other and attempt to deny their existence. This is because each falls outside of the other's subjective reality driven by own needs. There are several possible outcomes to this interaction as indicated in figure 17.

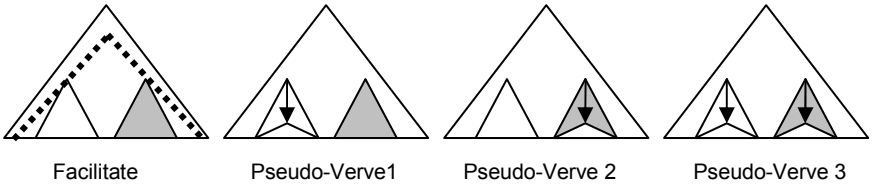



*Figure 17*. Possible Bravo-Bravo Outcomes.

The most optimal outcome is arrived at through facilitation. When facilitated by an Alpha Archetype the fears, aspirations and preferences of each are incorporated into a phantom Alpha triangle which will function as a vehicle of co-operation for the specified environment. This facilitation may need to be repeated on a regular basis. Without facilitation either or both of the two conflicting Bravo's may devolve into *pseudo-verve* Charlie's with all the associated hopeless-helpless traits. This situation is commonly seen in inadequately facilitated mergers where merging groups assume the postures of fearful Bravo's.

The union between a Bravo and a Charlie occurs as a result of the needs of each. The Bravo needs an individual to control (and in some cases, to abuse) and someone to provide ongoing adoration. The Charlie on the other hand requires recognition which in this union is derived from the accolades bestowed upon the Bravo partner. The Bravo triangle is therefore incorporated by the Charlie into his/her own configuration – but as a phantom. It is a phantom because on dissolving the union, the phantom Bravo triangle will disappear leaving the Charlie in *hopeless-helpless* wretchedness. This is illustrated in figure 18.

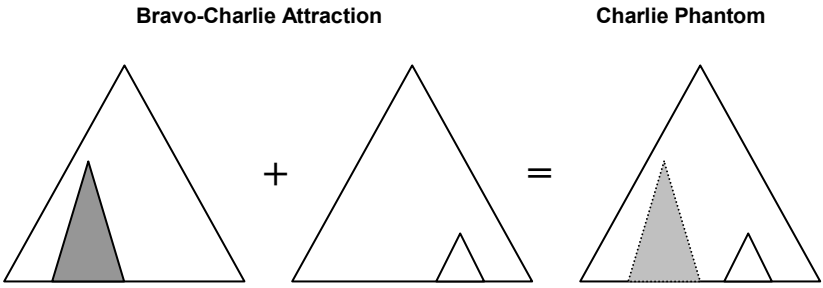



*Figure 18.* Bravo-Charlie Attraction.

Charlie-Charlie attraction occurs because each Charlie empathizes with the other. Each identifies with the other's loss of self-esteem as well as misfortunes which may prevail. In this way they find mutual solace in each other. However should the female of the union experience any success or gratification, the male will be quick and brutal to bring her back to wretchedness because her success or gratification is too painful for him to

bear. This is therefore the configuration that may lead to physical and emotional abuse. The dynamic is illustrated in figure 19.

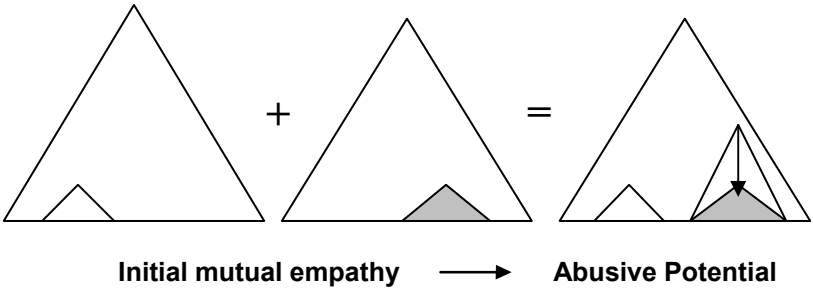



*Figure 19*. Charlie-Charlie Interaction.

**Archetypes and Leadership**

Archetypal traits directly determine leadership styles. Thus in the case of Alpha, the broad-based integration reflects the traits of unprejudiced sensitivity, adequate self-confidence and an appreciation of the bigger picture. This translates into an individual who leads by facilitating dialogue between Archetypes. The intrinsic understanding that the Alpha has for the Bravo's aggressive ambition and judgmentalism, fuelled by self-interest and the fear of not achieving, gives rise to facilitation in which the fear element is neutralized. Once fear is minimized through assurances of value within the team, the Bravo is reconciled with the bigger picture and encouraged to contribute to the collective dynamic. In effect, the Alpha functions as facilitator and mentor. In regard to the Charlie, the Alpha understands the deficient self-esteem and self-worth of this archetype. Sensitivity and support are essential in buffering the Charlie and ensuring that suppressed value gains expression. Through facilitation, Alpha maximizes the human resource potential. Supported dialogue contributes to morale and enhanced productivity.

The Bravo leads by prescription. The management structure is denoted by a collective Bravo configured triangle, tall and narrow-based. Anyone expressing a view which falls outside of the triangle of interest is regarded

as a threat to the organization. Thus unquestioning conformity is a prerequisite for tenure and promotion. Unfortunately a significant amount of intrinsic human resource potential is lost as a result. This leadership style is driven by fear.

The Charlie in a leadership position may result in a potentially damaging situation. The Charlie's with significantly compromised self-esteem may surround themselves with competent Bravo's. In effect the Bravo's are held to ransom by the leading Charlie. As long as the Bravo's perform, they remain in good standing with the Charlie. If the Charlie perceives questionable loyalty, vengefulness born out of a threat to self-esteem and self-worth may cause the Charlie to inflict damage upon the offending Bravo.

In a business environment, the Alpha tends to become the entrepreneur in that they are devoid of fear, see the bigger picture and are adequately self-assured. Practically speaking however, the ideal entrepreneur would need in addition, the Bravo traits of motivation and engagement to supplement the potential deficiencies of these qualities in the true Alpha configuration. The pure Bravo configuration on the other hand, with inherent fear and a narrow base centered upon self-interest, is more orientated to success within a corporate hierarchy. In terms of their respective approaches, the Bravo is driven by ambition to achieve an objective/destination. Inherent in this drive is the fear of not achieving. Very little regard is given to the journey in pursuit of the destination. As indicated previously, the Bravo thus lives almost entirely in the future which is invariably fear-based. Alpha on the other hand confidently aspires to the objective/destination. In this case however, Alpha attributes as much importance to the journey in the present as to the destination in the future.

**The Triple Wheel Combination Model of Value-based Leadership**

In effect there are three priority zones in every individual's existence which require levels of personal gratification to grease the wheels of life.

**Zone one** is the zone of self-actualization. Here we need to engage our essence and select a path which appeases our personal mission statement. It requires that we rise above deprivation-induced behavior, which is invariably driven by the need to appease expectations, and align ourselves with that which is uniquely authentic to us.

**Zone two** is our immediate personal environment. Here we attend to our family obligations and engage with close friends at a social level.

**Zone three** is the extended environment in which we engage with work and application.

Common to all three zones is the need to contribute value. Value contribution may be defined as the enhancing of any given environment and making it better than it was before we engaged with it.

The ultimate value contribution would be to bring all zones into alignment. This is best illustrated by the analogy of the combination lock. Consider a combination lock with three wheels: Each wheel would conform to one of the three zones defined above. Each wheel has an open slot at one segment of its circumference conforming to maximum value contribution. When all slots are aligned, the mechanism unlocks and allows free movement through the wheels.

Applying this to the life situation, when value contribution is maximal in each zone and free movement occurs between zones, then the motivation and inspiration experienced in each zone will be carried over to the others. In addition, adequate sensitivity to the elements in each zone will provide the substrate required to self-perpetuate the value evolution in each zone. Only on this basis can we arrive at authentic, value-based leadership.

**Inflammation, cancer and aging**

Wellness and performance are ultimately a reflection of the vitality of individual living cells. The living cell is an autonomous entity which maintains the process of life by creating energy from nutrients and oxygen and replenishing its functioning components from amino acids. The replenishment is co-ordinated by the DNA template together with messenger and transfer RNA. The overall modulation of cellular activity occurs at the level of the cell membrane where messenger chemicals dock with receptors and influence intra-cellular activity.

Every cell produces electro-chemical activity as a consequence of its living processes. The collective electro-chemical environment derived from all cells within the body has been shown in turn to have an effect on every living cell by interfacing with the cell membrane. Increased electro-

chemical activity results from driven, purposeful activity while the diminished activity seen in states of hopeless-helplessness decreases electro-chemical activity. One of the effects of electro-chemical activity on the cell membrane is the activation of an enzyme called sodium-potassium ATPase (Tsong et al., 1989). This enzyme functions by maintaining the concentrations of the electrically active ions, sodium and potassium, at the correct levels and on the correct sides of the membrane. Potassium is maintained in higher concentrations on the inside of the membrane while sodium is maintained in higher concentrations on the outside.

Hopeless-helpless mind states are also associated with raised levels of pro-inflammatory cytokines. Raised levels of pro-inflammatory cytokines have been shown to suppress the activity of the sodium-potassium pump. Therefore diminished electro-chemical activity as well as raised levels of pro-inflammatory cytokines resulting from the hopeless-helpless mind state both contribute to decreased activity of sodium-potassium ATPase. Decreased sodium-potassium ATPase activity results in raised levels of extra-cellular potassium and low levels of extra-cellular sodium. This contributes to the syndrome of sickness behaviour (also referred to as the sick cell syndrome) seen in states of hopeless-helpless as well as in situations of physical illness and injury. Other features of sickness behaviour include irritability, a disinterest in the environment, fever, anorexia and lowered libido.

Associated with high levels of pro-inflammatory cytokines are raised levels of intra-cellular free radicals. Free radicals are highly toxic to intracellular organelles. Free radicals are products of the metabolic pathway which are usually broken down by intracellular enzymes. Levels of free radicals however will increase in inflammation, in response to toxins, in response to UV and therapeutic irradiation and with increasing age. Both pro-inflammatory cytokines and free radicals negatively affect chromosomal function and DNA replication. There is evidence that they interfere with the methylation process (suppression and de-suppression of chromosomal segments) as well as with the enzymes that correct abnormal DNA splicing. The resultant abnormal DNA has been shown to give rise to neoplastic (tumour) cells (Schetter et al., 2010). Chronic inflammation therefore may give rise to tumour formation over a period of time. The risk of tumour formation is enhanced when immune function is suppressed, as occurs in states of hopeless-helpless.

Chronic inflammation, mediated by chronically raised pro-inflammatory cytokines has also been shown to initiate an auto-immune process in predisposed individuals. An example of this has been clearly demonstrated in the early stages leading up to the onset of Type 1 diabetes (Holger *et al*, 2002). Chronic inflammation also predisposes to allergic pathologies.

Changes associated with the aging processes have been shown to be related to and mediated by the effects of raised pro-inflammatory cytokines and free radicals. It is postulated therefore that the hopeless-helpless mind state, associated with lowered levels of dopamine and serotonin and raised levels of pro-inflammatory cytokines and free radicals, contributes directly to the aging process.

**Neuromodulation**

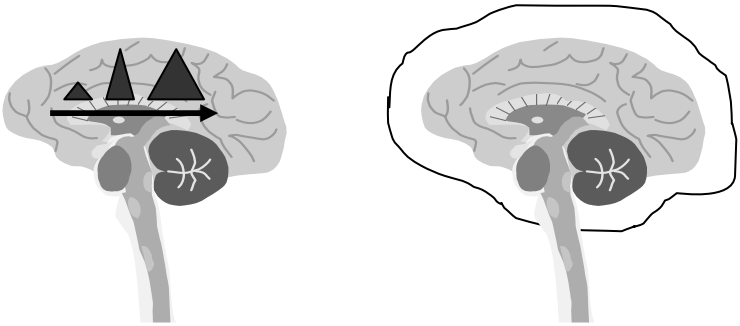
Neuromodulation refers to the unique neurophysiologically-based intervention which occurs in the context of the Neuro-Triangles Model. As a rule, this intervention is offered only when there is a need. The existence of a defined illness state and/or a life crisis associated with hopeless-helpless are in themselves, clear indications for intervention. However even in these challenging situations the individual would need to exhibit receptivity and a degree of motivation, together with a belief in this modality of intervention, for the intervention to be effective. Belief is fundamental because by its very nature, it generates levels of dopamine which serves to drive the process. In principle there are two defined stages of intervention. Firstly a process needs to be implemented in which the height of the nurture-based Charlie triangle is enhanced and/or the narrowed base of the Bravo triangle is broadened. The height of the Charlie triangle is increased through processes that enhance the purposeful energy of meaning and purpose. The narrowed triangular base of the Bravo is broadened through processes that lessen fear and provide sensitivity to meaningful environmental entities – beyond own needs.

Effective neuromodulation requires empathy, belief and trust as essential ingredients. These components are important for establishing rapport. In addition however, they have been shown to stimulate the secretion of oxytocin (Hurlemann et al., 2010). As indicated in the previous section, oxytocin suppresses amygdala activity and decreases levels of pro-inflammatory cytokines and cortisol. In this way it functions as an anxiolytic.

It has also been shown to diminish the raised levels of cortisol associated with nurture deprivation.

Once the fundamental configurations are addressed and hopefully moved towards a more resourceful state, a second process needs to be engaged. We are always subjected to negative influences in our environments which may cause us to react in kind. Thus a Bravo challenge may cause us to react in a Bravo manner or a vengeful Charlie challenge may cause us to respond in a hostile Charlie manner. In this way, all our best efforts at establishing a resourceful configuration would come to nothing unless we integrate prospectively a neutralizing process designed to buffer us against unanticipated negative challenges. The second process of intervention is therefore the establishment of a very necessary *calm zone*. This is illustrated in figure 20.

**Intervention Summary**



**Configuration enhancement** **Establishing a calm zone**

*Figure 20.* Intervention summary

The intervention required to enhance the nurture-based Charlie configuration can be challenging. Many nurture-based Charlie individuals have experienced an inadequate peer interaction in their early nurture period as a result of being forced into a role of premature responsibility. This may occur as a result of maternal absence/disinterest or maternal narcissism. If one accepts that peer interaction is vital for the development of a self-identity, early self-actualization, self-confidence and the experience of enjoyment, then the absence of this interaction results in an

adult who is characterized by poor self-esteem, self-confidence and an inability to enjoy life, termed *anhedonia*. This translates into the classical hopeless-helpless Charlie trait. Intervention is further aggravated by a subjective feeling on the part of many of these individuals, of not being deserving of any gratification and believing that they are born to serve others. The intervention requires at the outset, the formulation of a personal mission statement which incorporates elements that provide a degree of meaning and purpose. Once formulated the individual would need to strategize the implementation. On implementing the action, the individual would have to be de-briefed. The success of the action would need to be emphasized as would the personal gratification because, as indicated above, the nurture-based Charlie may not believe that they are worthy of gratification. This process would need to be repeated and hopefully the sum of small increments of success would serve to re-wire the Charlie configuration. One should also remember that the nurture-based Charlie Archetype often has talents and sensitivities. These should be emphasized and are often an appropriate starting point in formulating a personal mission statement. Physical exercise is also very useful in that it is conducive to increasing levels of dopamine and serotonin.

Once intervention is underway in neutralizing the hopeless-helpless circuitry of the Charlie configuration, the individual would need to engage core nurture-based circuitry. In principle, they would need to be walked down a time line in an objective, meta-state. Through facilitation they are brought face to face with themselves as they were as infants in the midst of the pain of nurture deprivation. They are encouraged to dialogue with the infant (themself) and in so doing impart the new found wisdom of latter experience. In effect they are contributing to a re-wiring process. Finally one would need to work towards dissipating limiting beliefs through a process of *disputation*. In this process we need to show and emphasize that there is ample evidence in life's experiences that demonstrate success and gratification and thus defy the expectations of a limiting belief.

The fundamental principle required to move the Bravo towards an Alpha Archetype is the broadening of the integration reflected in the triangular base. The broadening of integration represents a shift away from a narrow base representing *my needs* and fear of these not being fulfilled, to one of accepting that my needs will be fulfilled and becoming aware of and sensitive to the bigger picture. The pre-occupation of the Bravo with the fear of not experiencing the fulfillment of own needs results in an insensitivity to other elements of the prevailing environment not included in

the Bravo configuration. Only once the obsession with own needs is modulated, can there be a shift to appreciating more of the prevailing environment, with the appropriate sensitivity. This step facilitates the evolution into the Alpha configuration.

It is futile to impose intervention upon a Bravo who is gratified in functioning as a Bravo. Bravo's that may be amenable to intervention are those that experience degrees of dis-ease in living as Bravo's. Dis-eases include excessive fear and the need to excessively control elements of their environments; illnesses, especially those related to excessive noradrenalin such as hypertension and vascular complications; illness of a close relative or friend; a life crisis in the form of a pseudo-verve phenomenon.

From a coaching perspective, the Charlie Archetype requires the following intervention:

1. Derive a comprehensive mission statement
2. Enhance meaning, purpose and personal gratification by implementing strategies in fulfillment of the mission statement
3. Enhance self-esteem by amplifying positive attributes and successes and challenging destructive core beliefs

Intervention in regard to the Bravo Archetype is centered upon neutralizing fear of failure, loss and fear of losing control. This may be achieved by implementing the following principles:

1. Manage small chunks of delegated tasks to others. In this way, confidence and trust in the environment evolves
2. Confidence in a successful outcome is built on prevailing attributes as well as a history of previous successful outcomes. The fear of failure is shown to be based on inappropriate core beliefs
3. Contingency strategies should be formulated for a possible worst case scenario

Figure 21 is a summary of all the components required to complete the first part of the first phase of intervention, the achievement of a more resourceful Archetype. Initially meaningful, passionate energy needs to be enhanced. This is achieved by compiling at the outset, a personal mission statement. The personal mission statement would apply to the three

interest areas, work/application, personal/interpersonal and recreation. It is important that the mission statement incorporates our genuine needs rather than appease the expectations of the environment. An authentic mission statement needs to address the fundamental source elements – meaning and purpose; self-esteem and self-efficacy; sensory gratification and the gratification of task engagement and mastery; anticipated achievement; value contribution (to self, to personal environment and to the extended environment).

Once the mission statement is formulated we turn to our current environments and establish whether we can make them more meaningful by approaching things differently. If this does not bring about an improved level of personal gratification, we may need to diversify. If none of these efforts enhance meaning and purpose and thus personal gratification, we may need to re-structure our lives. This should never be undertaken unless a comprehensive mission statement is in place. Furthermore, a re-structuring should only be undertaken once an *ecology check* is performed. An ecology check is a review of all possible consequences of the planned changes.

The second phase of this intervention is the broadening of the base of integration by incorporating meaningful elements of our environments. The height and base then become mutually enhancing in that more meaningful and purposeful energy results in the incorporation of more meaningful environmental elements which in turn enhance the meaningful energy.

The intervention continues with the incorporation of elements designed to move us towards an Alpha configuration. Thus an awareness of the traits such as empathy, gratitude, contributing value and acknowledging other's value contributions, neutralizing the fear of tomorrow and the losses and regrets of yesterday, all contribute to the overlapped Alpha state with all its advantages. Being aware of the symptoms of the deprivation states will also serve to keep us in a more resourceful place. Thus shirking responsibility for a failed venture is the domain of Bravo and Charlie. Probably because Bravo fears that the failure will negatively affect future needs being appeased while for Charlie, failure serves to endorse all the negatives of their configuration. Fear of future failures is the domain of Bravo while a deep seated survival fear occurs in the Charlie configuration. Regret, loss and guilt based in the past occur in the nurture-based Charlie configuration.

1. Maximize ***meaning*** and ***purpose*** ..... ***Energy***

    - Establish own mission statement
    - Maximize positivity – distance from negativity
    - Diversify within environment
    - Re-structure

2. Maintain ***Broad Base*** of activity … ***Integration***

    - New activities, people, environments - **sensitize and empathize**
    - Prioritize and manage

3. ***Mind-State*** Enhancers

    - Live in the present …….maximize the present
    - Acknowledge feeling, express feeling …empathy + gratitude
    - Strive for Alpha ……..neutralize Bravo, Charlie
        - Shirking responsibility ……..… Bravo + Charlie
        - Envy and malice ……..……. Charlie
        - Self-interest and insensitivity .. Bravo
        - Fear ……. Bravo
        - Guilt and regret ……. Charlie

*Figure 21*. Principles of Approach.

As indicated previously, the second component of neuromodulation requires that we establish a buffer zone. The buffer zone would need to be created to neutralize impinging negative influences. These influences may arise from our environments or alternatively, from internal deprivation thoughts and emotions. There are two levels of approach to neutralizing potentially negative influences:

1. Accept the impinging information without judgment or response
2. Modulate the information by neutralizing the deprivation consequences

The level one response in essence is one of initial inaction. We are aware that the stimulus can give rise to a response which can move us into a deprivation Bravo/Charlie configuration. We choose to deal with this information in dialogue mode – non-judgmental and fully mindful of the individual or circumstances that may be the source of the information.

The second level of response is designed to neutralize the Bravo fear complex and its conversion to anger. If the aggravating stimulus persists, the fear-anger complex may devolve (pseudoverve) into hopeless-helpless. The prevailing fear of losing control and not meeting objectives may be aggravated by any environmental situation which obstructs the Bravo type in his/her quest. This environmental situation effectively pushes a button which converts the Bravo fear into anger (See figure 22). The resulting anger precipitates all the extreme Bravo traits centred upon achieving "own needs". This includes the need to control, driving ambition, judgementalism and insensitivity. If the prevailing situation defies the Bravo's ability to manage and control, fear and anger may devolve to hopeless-helpless.

The solution is to factor in a second "button" which is pushed simultaneously with the first and which triggers a program of **patience** and **trust**. In this program patience functions as a break state enabling the Bravo individual to change from aggressive language to non-judgmental dialogue. The internal dialogue then functions to highlight the following aspects of the situation:

- The acceptance of prevailing elements which cannot be managed or changed
- Empathy towards others who may have inadvertently obstructed the Bravo quest
- Dissipation of ego self-interest in the face of a far bigger and uncontrollable environmental dynamic
- Trust in one's own ability (based on previous successes)
- Trust in one's own aspirations which invariably come to fruition
- Remain mindfully in the present emphasizing the positives of one's life (gratitude)

**Bravo-Charlie Dynamic**

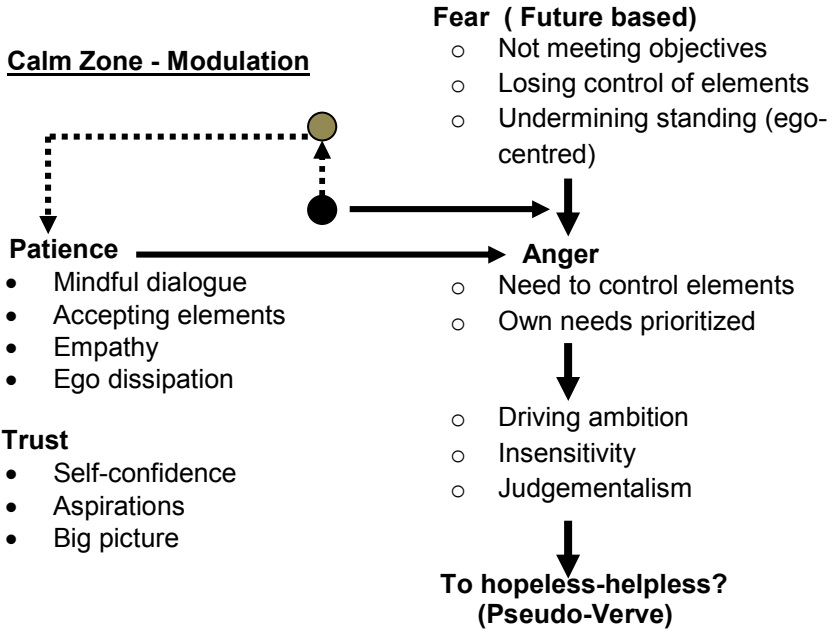



*Figure 22.* Calm Zone modulation

**Intervention based on Chemical Processes**

It is far more effective and sustaining to optimize the chemistry of wellness and performance by applying the principles outlines above. By enhancing meaning and purpose and diminishing issues relating to poor self-esteem, a chemical configuration is attained in which serotonin levels are raised and dopamine and noradrenalin levels are brought into the optimal zone for performance. The resultant lowering of pro-inflammatory cytokine levels predisposes to enhanced wellness.

In addition to the above application one may need to introduce more direct interventions designed to correct disadvantageous chemical profiles. In this regard it should be noted that exercise enhances dopamine levels. However excessive exercise may result in raised levels of pro-inflammatory cytokines (usually as a result of the secretion of endorphins) which will tend

to lower the levels of dopamine. This then becomes counter-productive. The use of drug therapy may be required to bring the individual into the most resourceful state. Thus the use of SSRI's will tend to raise levels of serotonin which would ameliorate states of fear, anxiety and panic. Several agents can be used to raise dopamine activity which enhances subjective feelings of gratification. The use of agents that enhance dopamine and noradrenalin activity, specifically in areas connected to the pre-frontal cortex, may enhance the executive functions of the pre-frontal cortex.

The use of non-steroidal anti-inflammatory agents (NSAID's) diminishes the inflammatory activity of the pro-inflammatory cytokines. The use of NSAID's also diminishes the negative effects of pro-inflammatory cytokines on the brain and has been shown to enhance levels of personal gratification. Finally it has been shown that stimulation of the parasympathetic nervous system tends to lower levels of pro-inflammatory cytokines. Consequently direct stimulation of the vagus nerve with a paced electrode has been shown to decrease levels of pro-inflammatory cytokines.

**Discussion**

The Neuro-Triangles model is proposed as a working application in which individuals and their unique behavior can be defined and quantified in the context of the full spectrum of daily life. The model, which was derived from neuro-physiological processes occurring in the visual cortex, provides the means whereby the chemistry of wellness and performance may be accessed. This is achieved consequent upon the fact that the three defined archetypes reflect not only traits of behavior but also associated chemical activity. Cognitive intervention therefore results in a profound effect upon body physiology, including consciousness itself.

The vast majority of individuals live their lives in default mode. They remain unaware of their strengths and weaknesses and make no attempt to engage fundamental neuro-psychological processes. If in fact they are the products of significant deprivation in their heritage, by not engaging and initiating appropriate intervention, they may remain victims of a less resourceful configuration. In this way they compromise themselves in terms of wellness, performance, quality of life and longevity. In this regard, the Neuro-Triangles model can be viewed as a practical, empowering application supporting the enhancement of wellness and performance and thus personal efficiency and gratification. The application is not restricted to

personal coaching of the individual. Rather, it should be viewed as providing a comprehensive framework for the implementation of multiple modalities of intervention, including leadership training, team-building, management re-structuring, and wellness enhancement.

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